Present Electricity Generation Scenario In Bangladesh And in The World

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

Submitted by

Tofaiel Ahmed

(ID: 171-33-406)

Md. Riaj Ahmmed Shadhin

(ID: 171-33-364)

Supervised by

Dr. Mohammad Tawhidul Alam

Associate Professor & Director

Department of EEE

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

FACULTY OF ENGINEERING

DAFFODIL INTERNATIONAL UNIVERSITY

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Certification

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This is to guarantee that this postulation named " Present electricity generation scenario in Bangladesh and in the world" is finished by the accompanying understudies under my immediate management and this work has been completed by them in the labs of the Department of Electrical and Electronic Engineering under the personnel of Engineering of Daffodil International University in incomplete satisfaction of the necessities for the level of Bachelor of Science in Electrical and Electronic Engineering. The introduction of the work was hung on 27 June 2021.

Md. Riaj Ahmmed Shadhin

ID: 171-33-364

Tofaiel Ahmed

ID: 171-33-406

____

Dr. Mohammad Tawhidul Alam

Associate professor & Director,

Department of EEE

Daffodil International University

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Professor
Department of EEE, IUB — External Member

Dedicated to

Our Beloved Parents

DECLARATION

We do thusly proclaim that this theory depends on the outcome found without anyone else. The materials of work found by different analysts are referenced by reference. This postulation is submitted to Daffodil International University for incomplete satisfaction of the necessity of the level of B.Sc. in Electrical and Electronics Engineering. This postulation neither in entire nor to a limited extent has been recently submitted for any degree.

Signature of the candidates

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Md Riaj Ahmmed Shadhin

ID: 171-33-364

____

Tofaiel Ahmed

ID: 171-33-406

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List of Abbreviations

PSMP	Power System Master Plan
BPDB	Bangladesh Power Development Board
IPPs	Independent Power Producers
BERC	Bangladesh Energy Regulatory Commission
APACL	Ashuganj Power station company limited
EGCB	Electricity generation company of Bangladesh
NWPGCL	North west power generation company limited
PGCB	Power grid company of Bangladesh
DPDC	Dhaka power distribution company
DESCO	Dhaka electric supply company limited
WZPDC	West zone power distribution company
REB	Rural electrification board
PE	Primary energy
SE	Secondary energy
GHG	Greenhouse gas
TEG	Thermoelectric generator
OTEC	Ocean thermal energy conversion
PV	Photovoltaics and present value

ABSTRACT

Power sector of Bangladesh is a challenging sector and development of power sector is dependent on many factors. In this thesis, a brief discussion on Power Generation in Bangladesh has demonstrated with recent information and data. A total review of Power generation, transmission and distribution is demonstrated and also power crisis of Bangladesh and future plans and programs of Power sector has been discussed. A details study on Power plant of Bangladesh and Power demand is also demonstrated. Along with the discussion about the impact of renewable energy. Renewable energy sources (RES) are acquiring expanding significance in the dispersion framework and they are anticipated to assume a more significant part soon. Renewable energy ought to be created as quickly as time permits to forestall an energy emergency.

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Bangladesh is a little non-industrial nation with restricted native energy assets. Per capita utilization of energy in Bangladesh is quite possibly the most decreased on earth. Present usage of Energy and force in the country is around 200 KGOE/year and 130 KWh/year independently. In affirmation of the meaning of energy in the monetary development, the Government has given continuing.

Regard for the general improvement of the energy area. BPDB had additionally completed twenty years "Power System Master Plan" (PSMP) for the time skyline of 1996. In 1996 the government provided the "Private Sector Power Generation Policy of Bangladesh" and started to request proposition from global organizations for Independent Power Producers (IPPs). A few underlying changes in the Power Sector were likewise made for speeding up the force area improvement.

1.2 Objective

1. To study the present and future power generation is Bangladesh.
2. To determine the brief overview of the power sector in Bangladesh and in the World with the information and data.
3. To identify the impact of renewable and Non-renewable energy on power generation.
4. To determine per unit cost for different electricity supply of Bangladesh.
5. To determine the future benefits from the renewable energy
6. To determine the present power crisis of Bangladesh and World. Also discuss which challenges are making obstacle in the way of power development.
7. To ensure energy security by using renewable energy of power generation.

1.3 Research Methodology

In this research, we have used different research techniques to achieve our objectives.

Literature Review:

Literature review is one of the most important things for every research and we will also start our research by reviewing various literature. We will collect and review all recent years latest informative power related literatures and we will review them for our required information and data.

Data Collection:

In our research, we have shown different data of recent years power generations, transmissions and distributions. We have also demonstrated power sector plans and achievements through data based study. All these data are collected from verified sources and references. Most data are collected from respective Power Stations ‟annual reports, performance analysis reports, review and overall year based review on our power developments on various literatures. We have also collected data from various respective websites of Power Stations and Power Organizations.

Data Analysis:

To analyze the data by analyzing the data to verify the formulas and to obtain accurate information, chart diagrams and graph diagrams were then used to display our data analysis by analyzing in detail how close the same data and the results of the analysis are or how different this report shows.

CHAPTER 2

POWER GENERATION IN BANGLADESH

2.1 INTRODUCTION

In the world renewable energy is becoming more popular day by day. Statistics show that quantity of consumption of fossil fuel is increasing at a higher rate in Bangladesh. The production of total electricity cannot fulfil the demand of the consumers adequately and peoples are not getting sufficient electricity. Now the public energy demand is increasing so government can't supply the whole energy that need to our public. Therefore, many Government and non-government organizations are working with different types of renewable energy sources such as solar energy, bio-gas, wind energy etc. to provide electricity to the common masses. In the process is more popular cause of its more advantages and many people solve their energy demand which they needed.

2.2 What is power generation

The route toward making electric energy or the proportion of electric energy conveyed by changing various sorts of energy into electrical energy; commonly imparted in kilowatt-hours (kWh) or megawatt-hours (MWh). Force is made at an electric power plant. Some fuel source, similar to coal, oil, vaporous petroleum, or nuclear energy produces heat. The turning turbine speaks with a plan of magnets to convey power. The force is imparted as moving electrons through a movement of wires to homes and associations.

2.3 Present structure of power generation, transmission & distribution

Present structure of Power sector can be described by below:

Apex Institution:

- Power Division
- Ministry of Power
- Energy & Mineral Resources (MPEMR)

Regulator:

- Bangladesh Energy Regulatory Commission (BERC)

Generation:

- Bangladesh Power Development Board (BPDB)
- Ashuganj Power Station Company Ltd. (APSCL)
- Electricity Generation Company of Bangladesh (EGCB
- North West Power Generation Company Ltd. (NWPGCL)
- Independent Power Producers (IPPs)

Transmission:

- Power Grid Company of Bangladesh Ltd (PGCB)

Distribution:

- Bangladesh Power Development Board (BPDB)
- Dhaka Power Distribution Company (DPDC)
- Dhaka Electric Supply Company Ltd (DESCO)
- West Zone Power Distribution Company (WZPDC) Rural Electrification Board (REB).

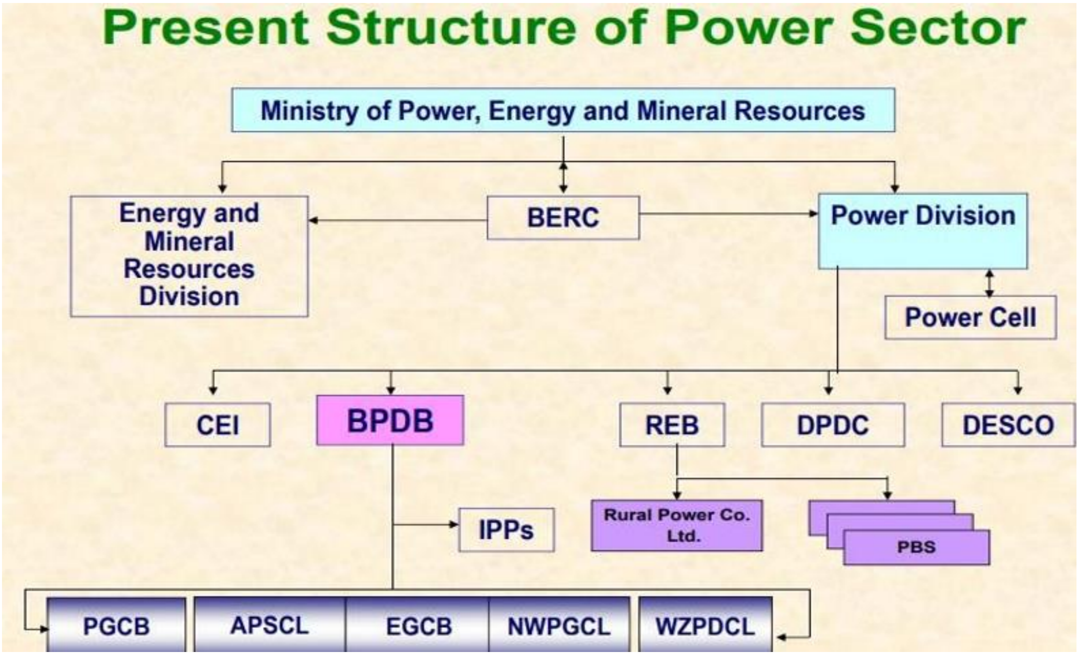

Figure 2.1: Present structure of power sector. [4]

2.4 Bangladesh power sector (At a Glance)

Installed Capacity:	20813 MW (October 2020)
Transmission Lines:	11035 Km (June 2018)
Electricity:	93.5% people
Share of government financing:	56% (2018)
Share of private financing:	46% (2018)
Electricity coverage:	95% (2018)

2.5 Energy source for power plant

A source from which accommodating energy can be isolated or recovered either directly or through a change or change measure (for instance solid fills, liquid invigorates, sun situated energy, biomass, etc) The Energy Source for the plant can be depicted by under:

Primary energy sources:

Primary energy (PE) is an energy structure found in nature that has not been exposed to any human designed change measure. It is the energy contained in crude energizes, and different types of energy got as a contribution to a framework. Primary energy can be non-inexhaustible or sustainable.

Where essential energy is utilized to portray petroleum derivatives, the typified energy of the fuel is accessible as nuclear power and around 70% is regularly lost in the transformation to electrical or mechanical energy. There is a comparable 60-80% change misfortune when sun-based and wind energy is changed over to power.

Secondary energy source:

Auxiliary fuel sources, additionally called energy transporters, are gotten from the change of essential fuel sources. They move energy in a useable structure starting with one spot then onto the next.

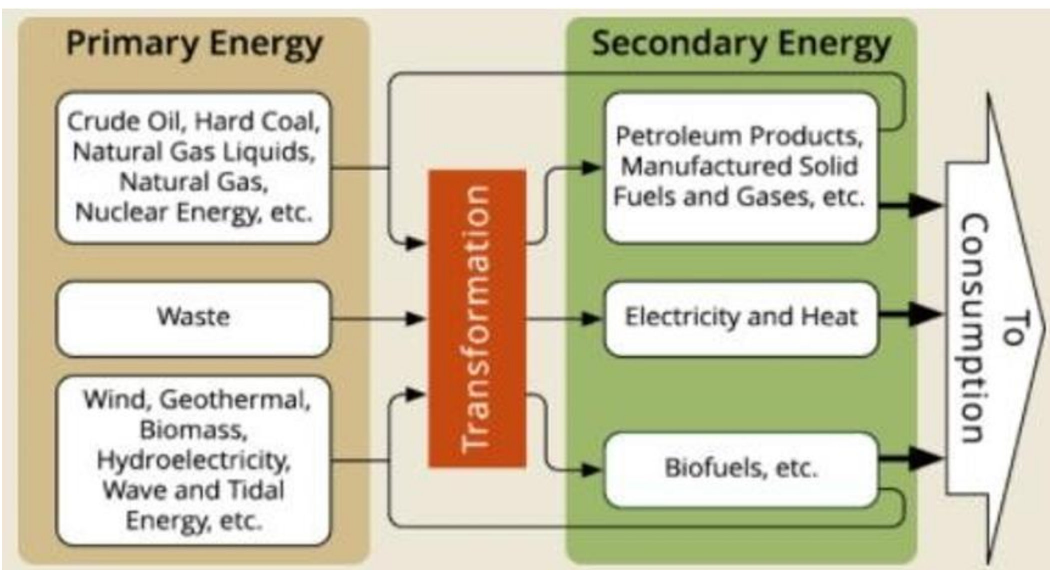

Figure 2.2: Primary energy vs Secondary energy. [1]

2.6 Renewable & Non-renewable energy

Renewable energy:

Renewable energy, often referred to as clean energy, comes from natural sources or processes that are constantly replenished.
Sources:

a) The sun
b) The wind
c) Water
d) Bio-gas

Non-renewable energy:

Non-renewable energy comes from sources that will run out or will not be replenished for thousands or even millions of years. Most sources of non-renewable energy are fossil fuels.
Sources:

a) Fuels (Gas, Coal, Oil, Diesel etc.)
b) Nuclear energy

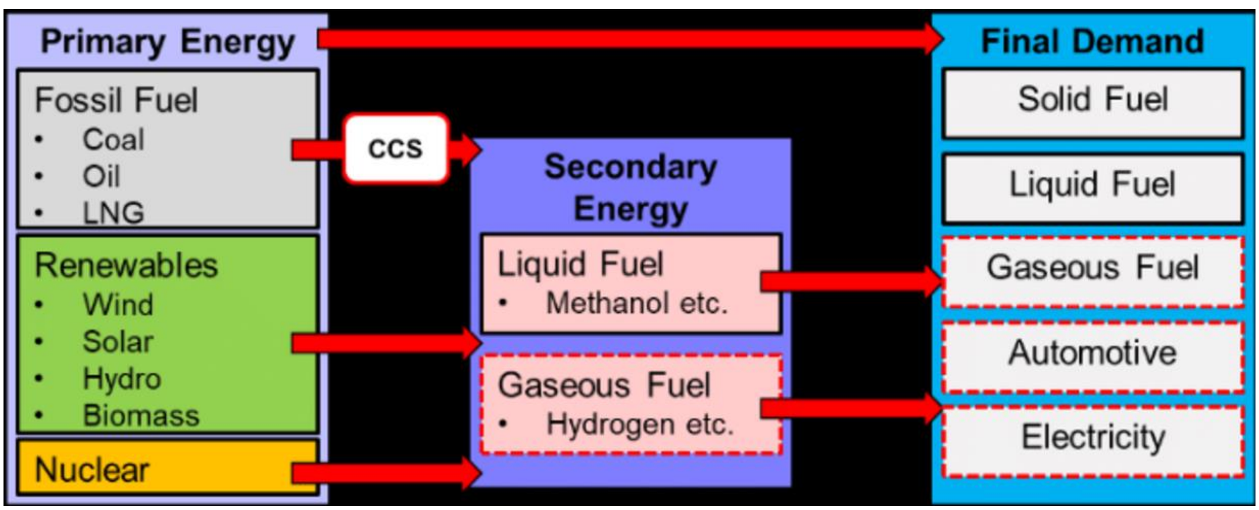

Figure 2.3 Primary and secondary energy considerations and model final demands. [1]

2.7 Sources of electrical energy

This article provides information on the following six methods of producing electricity.

1. Friction**:** Energy produced by rubbing two material together.
2. Heat**:** Energy produced by heating the junction where two unlike metals are joined.
3. Light**:** Energy produced by light being absorbed by photoelectric cells.
4. Chemical**:** Energy produced by chemical reaction in a voltaic cell.
5. Pressure**:** Energy produced by compressing or decompressing specific crystals.
6. Magnetism**:** Energy produced in a conductor that cuts or is cut by magnetic lines of force.

1.Friction

Friction is the least methods which you provide of the six methods of producing energy. On the off chance that a material rubs against an item, the article will show an impact called grinding power. The item gets charged because of the scouring cycle, and now has an electrical charge. There are two main types of electrical charge: positive and negative. Each type of charge attracts the opposite type and repels the same type. This can be stated in the following way: Like charges repel and unlike charges attract. Static electricity has several applications. Its main application is in Van de Graaff generators, used to produce high voltages in order to test the dielectric strength of insulating materials. Other uses are in electrostatic painting and sandpaper manufacturing. The course grains acquire a negative charge as they move across the negative plate. As unlike charges attract, the positive plate attracts the course grains and their impact velocity enables them to be embedded into the adhesive.

2.Heat

In 1821 Thomas See beck found that the intersection between two metals produces a voltage that is an element of temperature. If a closed circuit consists of conductors of two different metals, and if one junction of the two metals is at a higher temperature than the other, an electromotive force is created in a specific polarity. An example of this is in the case of copper and iron, the electrons first flow along the iron from the hot junction to the cold one. The electrons cross from the iron to the copper at the hot junction, and from the copper to the iron at the cold junction. This property of electromotive force production is known as the See beck effect. This effect is utilized in the most widely employed method of thermometry.

3.Light

The sun's rays can be used to produce electrical energy. The direct user of sunlight is the solar cell or photovoltaic cell, which converts sunlight directly into electrical energy without the incorporation of a mechanical device. This technology is simpler than the fossil-fuel-driven systems of producing electrical energy. A sun based cell is shaped by a light-delicate p-n intersection semiconductor, which when presented to daylight is eager to conduction by the photons in the light. When light, in the form of photons, hits the cell and strikes an atom, photo-ionization creates electron-hole pairs. The electrostatic field causes separation of these pairs, establishing an electromotive force in the process. The electric field sends the electron to the p-type material and the opening to the n-type material. In the event that an outside flow way is given, electrical energy will be accessible to manage the job. The electron stream gives the flow, and the cell's electric field makes the voltage. With both current and voltage, the silicon cell has power. The more prominent the measure of light falling on the cell's surface, the more noteworthy is the likelihood of photons delivering electrons, and subsequently more electric energy is created.

4.Chemical

When a zinc electrode and copper electrode are placed in a dilute solution of sulfuric acid, the two metals react to each other's presence within the electrolyte and develop a potential difference of about 1 volt between them. When a conducting path joins the electrodes externally, the zinc electrode dissolves slowly into the acid electrolyte, the zinc molecule goes into the electrolyte in the form of positive ions while its electrons are left on the electrode. The copper electrode on the other hand does not dissolve in the electrolyte. Instead it gives up its electrons to the positively charged ions of hydrogen in the electrolyte, turning them into molecules of hydrogen gas that bubble up around the electrode. The zinc ion combines with the sulfate ion to form zinc sulfate, and this salt falls to the bottom of the cell. The effect of all this is that the dissolving zinc electrode becomes negatively charged, the copper electrode is left with a positive charge and electrons from the zinc pass through the external circuit to the copper electrode.

5.Pressure

The molecules of some crystals and ceramics are permanently polarized: a few pieces of the particle are decidedly charged, while different parts are contrarily charged. These materials produce an electric charge when the material changes measurement because of a forced outer power. The charge produced is referred to as piezoelectricity. Many crystalline materials such as the natural crystals of quartz and Rochelle salted together with manufactured polycrystalline ceramics such as lead titan ate zirconated and barium titan ate exhibit piezoelectric effects. Piezoelectric materials are used as buzzers inside pagers, ultrasonic cleaners and mobile phones, and in gas igniters. In addition, these piezoelectric sensors are able to convert pressure, force, vibration or shock into electrical energy. Being capable only of measuring active events, they are also used in flow meters, accelerometers and level detectors, as well as motor vehicles to sense changes in the transmission, fuel injection and coolant pressure. When a voltage or an applied electric field stresses a piezo element electrically, its dimension's change. This phenomenon is known as electrostriction, or the reverse piezoelectric effect. This effect enables the element to act as a translating device called an actuator. Piezoelectric materials are used in power actuators, converting electrical energy into mechanical energy, and in acoustic transducers, converting electric fields into sound waves.

6.Magnetism

The most important and comprehensively used use of fascination is in the making of electrical energy. The mechanical power expected to help this creation is given by different sources. These sources are called key participants and fuse diesel, petrol, and combustible gas engines. Coal, oil, oil gas, biomass, and nuclear energy are fuel sources that are used to warm water to make super-warmed steam. Non-mechanical fundamental players consolidate water, steam, wind, wave development, and streaming force. These non-mechanical key participants attract a turbine that is coupled to a generator. Generators that use the norm of electro-appealing acknowledgment complete the last change of these fuel sources. To do this, three fundamental conditions should exist before a voltage is made by fascination: improvement, conductors, and an appealing field.

According to these conditions, when a chief or chief goes through an appealing field to cut the lines of force, electrons are engaged to enter the conduction band in this manner actuating an electric squeezing factor for the production of the turning stream in an external circuit. This may be implied as a simple alternator, containing a lone wire circle called an armature with each end being joined to slip-rings and coordinated to turn somewhere between the alluring posts. Two copper-graphite brushes interface with the external circuit on the slip-rings accumulate the trading current, created in the transport when the alternator is inertia. Another machine used for changing mechanical energy into electrical energy through electromagnetic enrollment is known as a dynamo or direct stream generator.

The key difference between an alternator and a generator is that the alternator delivers AC (alternating current) rating current is induced in the armature, but the type of current delivered to the external circuit depends on the way in which the induced current is collected. In an alternator, the current is collected by brushes bearing against slip-rings; in a generator, a form of rotating switch called the commutator is placed between the armature and the external circuit. The commutator is intended to turn around the associations with the outside circuit at the moment of every inversion of prompted current in the armature, creating redressed current or direct current. This rectified current is not pure like the current of a voltaic cell but is instead a pulsating current that is constant in direction and varying in intensity

2.8 Installed capacity of BPDB power plants

Installed capacity are described below:

Table 2.1: Installed capacity of BPDB [4]

Fuel Type	Capacity(Unit)	Total(%)
	0.00 MW	0 %
Coal	524.00 MW	2.52 %
Gas	11502.00 MW	55.26 %
HFO	5507.00 MW	26.46 %
HSD	1855.00 MW	8.91 %
Hydro	230.00 MW	1.11 %
Imported	1160.00 MW	5.57 %
Solar	35.00 MW	0.17 %
Total	20813 MW	100 %

Directed capacity are discussed below:

Table 2.2: Directed capacity of BPDB [4]

Fuel Type	Capacity(Unit)	Total(%)
	0.00 MW	0 %
Coal	444.00 MW	2.19 %
Gas	11097.00 MW	54.63 %
HFO	5505.00 MW	27.1 %
HSD	1841.00 MW	9.06 %
Hydro	230.00 MW	1.13 %
Imported	1160.00 MW	5.71 %
Solar	35.00 MW	0.17 %
Total	20312 MW	100 %

BPDB is responsible for generation and distribution of a large part of country's total electricity demand. As of January 2020, BPDB had an all-out introduced limit of 5613 MW at its own Power plants situated in various pieces of the country. The primary fuel utilized for power generation in BPDB plants is a native petroleum gas. BPDP operations also include projects that utilize renewable power sources including offshore wind power generation. The maximum demand served during peak hours was 12,893 MW on 29 May 2019. The total distribution network length under BPDB is 30,051 km, including 33kV, 11kV and 0.4kV lines.

2.9 Present Generation Capacity

Present Generation Capacity are given below:

Dhaka Zone

Name of Power Station	Installed Capacity	Directed Capacity
1. Ghorashal TPP (Unit 1&2	110.00	85.000
2. Ghorasal TPP Unit 5	210.00	190.00
3. Ghorasal Repowered CCPP UNIT- 3	210.00	170.00
4. Ghorasal Repowered CCPP UNIT-4	210.00	180.00
5. Ghorashal 365 MW CCPP Unit -7	365.00	365.00
6. Ghorashal 108 MW PP (Regent)	108.00	108.00
7. Ghorashal 78.5 MW PP (MAX)	78.000	78.000
8. Tongi 80 MW GT PP	105.00	105.00
9. Horipur GT PP	32.000	20.000
10. Horippur 360 MW CCPP (HPL)	360.00	360.00
11. Meghnaghat 450 MW CCPP (MPL)	450.00	450.00
12. 210 MW Shiddirganj TPP	210.00	115.00
13. Horipur 412 MW CCPP	412.00	412.00

14. Siddirganj 2*120 MW GTPP	210.00	210.00
15. Siddhirganj CCPP 335 MW	335.00	335.00
16. Siddhirganj 100 PP (Dutch Bangla)	100.00	100.00
17. Meghnaghat CCPP (Summit)	305.00	305.00
18. Meghnaghat 100 MW (IEL)	100.00	100.00
19. Madanganj 102 PP (Summit)	102.00	100.00
20. Madanganj-55 MW PP (Summit)	55.000	55.000
21. Keraniganj 100 MW PP(Powerpac)100 MW	100.00	100.00
22. Gagnagar102 MW PP (Digital Power)	102.00	102.00
23. Narshingdi 22 MW PP(Doreen)	22.000	22.000
24. Summit Power (Madhbdi+ Ashulia)	80.000	80.000
25. Maona 33 MW PP(Summit)	33.000	33.000
26. Rupganj 33 MW PP(Summit)	33.000	33.000
27. Gazipur 52 MW PP	52.000	52.000
28. Gazipur 100 MW PP	105.00	105.00
29. Kodda 150 Power Plant	149.00	149.00
30. Kathpotti 52 mwPP (Sinha)	51.000	51.000
31. Kamalaghat 54 MW PP (Banco Energy)	54.000	54.000
32. Kodda 300 MW PP Unit-2 (Summit)	300.00	300.00
33. Kodda 149 MW PP Unit-1(Summit)	149.00	149.00
34. Keranigonj 300 MW PP (ARP)	300.00	300.00
35. Bramgonj 100MW pp (Agrico)	100.00	100.00
36. Aurahati 100 mw PP (Agreeko)	100.00	100.00
37. Nababganj 55 MW PP (Southern) Power	55.000	55.000
38. Manikganj 55 MW PP (Northen)	55.000	55.000
39. Bosila 108 MW PP (CLC)	108.00	108.00
40. Meghnaghat 104 MW	104.00	104.00
Total (40)	**6119**	**5895**

Chittagong Zone

Name of Power Station	Installed Capacity	Directed Capacity
1. Karnaphuli Hydro PP Unit-1,2,3,4	230.00	230.00
2. Chattogram Tpp:Unit-1	210.00	180.00
3. Chattogram Tpp:Unit-2	210.00	180.00
4. Kaptai 7 MW Solar PP	07.000	07.000
5. Raozan 25 MW PP	25.000	25.000
6. Teknaf 20 MW PP Solartech	20.000	20.000
7. Patenga 50 MW PP(Baraka)	50.000	50.000
8. Sikalbaha 105 MW PP(Baraka Sik)	105.00	105.00
9. Shikalbaha Peaking (GT)	150.00	150.00
10. Shikalbaha 225 MW CCPP	225.00	225.00
11. Anwara 300 MW PP (United)	300.00	300.00
12. Julda 100 MW Unit-1 (Acon)	100.00	100.00
13. Julda 100 MW PP Unit-3(Acom)	100.00	100.00
14. Dohazari Kalaish 100 MW PP	102.00	102.00
15. Hathazari 100 MW Peaking pp	98.000	98.000
16. Barabkunda 22 MW PP (Regent)	22.000	22.000
17. Malancha, Ctg.EPZ (United)	0.00	0.00
18. Chittagong 108 MW PP ECPV	108.00	108.00
19. Sikalbaha 54 MW Power	54.000	54.000
20. Karnaphuli Power Ltd.	110.00	110.00
21. Juldah Unit-2 (Acom)	100.00	100.00
Total	**2326**	**2266**

Comilla Zone

Name of Power Station	Installed Capacity	Derated Capacity
1. Ashuganj ST 3	150.00	135.00
2. Ashugonj ST 4	150.00	129.00
3. Ashugonj ST 5	150.00	134.00
4. ASHUGONJ 50 MW	53.000	45.000
5. (c) Ashuganj CCPP-225MW	221.00	221.00
6. Asuganj 450 MW CCPP South	360.00	360.00
7. Asugonj 450 MW CCPP NORTH	360.00	360.00
8. Ashuganj 55 MW (Precision)	55.000	55.000
9. Ashuganj 51 MW PP (Midland)	51.000	51.000
10. Ashuganj 150 MW PP midland	150.00	150.00
11. Titas 50 MW PP (Dautkandi)	52.000	52.000
12. Chandpur 150 MW CCPPP	163.00	163.00
13. Chandpur 200 MW Desh Energy	200.00	200.00
14. Feni 22 MW (Doreen)	22.000	22.000
15. Feni, 11 MW PP (Doreen)	11.000	11.000
16. Jangalia 33 MW PP (Summit)	33.000	33.000
17. Jangalia 52 MW PP (Lakdamavi)	52.000	52.000
18. Comilla 25 MW PP Summit	25.000	25.000
19. Daudkandi 200 MW	200.00	200.00
20. Fani 114MW Power Plant(Lakdam)	114.00	114.00
21. Chowmuhani113MW	113.00	113.00
22. Tripura	160.00	160.00
23. Asuganj 195 MW PP (APACL united)	195.00	195.00
Total	**3040**	**2980**

Mymensigh Zone

Name of Power Station	Installed Capacity	Derated Capacity
1. RPCL, 210 MW CCPP, Mymensingh	210.00	202.00
2. Tangail 22 MW pp (Doreen)	22.000	22.00
3. Jamalpur 95MWpp (Powerpac)	95.000	95.00
4. Jamalpur 115 MW PP (United)	115.00	115.00
5. Mymenshingh 200 mwpp (United)	200.00	200.00
6. Sarishabari 3 MW Solar Plant	3.00	3.00
Total	**645**	**637**

Sylhet Zone

Name of Power Station	Installed Capacity	Directed Capacity
1) Fenchuganj CCPP-1 (Gas)	97.000	70.000
2) Fenchuganj CCPP-2(New)	104.00	90.000
3) Fenchuganj 51 MW (Barakatullah)	51.000	51.000
4) Fenchuganj 44 MW (Energyprima)	44.000	44.000
5) Hobiganj 11 MW (Confidence-EP)	11.000	11.000
6) Kushiara 163 MW Fenchugonj	163.00	163.00
7) Shajibazar GT Unit-8, 9	70.000	66.000
8) Shahjibazar 330 MW	330.00	330.00
9) Shajibazar 86 MW(Shajibazar)	86.000	86.000
10) Sylhet 225MW CCPP	231.00	231.00
11) Sylhet 20MW GT	20.000	20.000
12) Sylhet 50 MW PP (ENERGYPRIMA)	50.000	50.000

13) Sylhet 10 MW (Desh)	10.000	10.000
14) Shahjahanulla 25mw	25.000	25.000
15) Bibiana 341 MW CCPP(Summit)	341.00	341.00
16) Bibiana-3 CCPP 400 MW	400.00	400.00
17) Bibiana -south 400 MW	0.00	0.00
Total	**2033**	**1988**

Khulna Zone

Name of Power Station	Installed Capacity	Directed Capacity
1. Bheramara GT (Unit-3)	20.000	16.000
2. Bherama 410 MW CCPP	410.00	410.00
3. Faridpur 50 MW Peaking PP	54.000	54.000
4. Gopalganj 100 MW Peaking PP	109.00	109.00
5. Khulna 225 MW CCPP	230.00	230.00
6. Khulna 115 PP MW (KPCL-2)	115.00	115.00
7. Noapara 100 MW PP Bangla Track	100.00	100.00
8. Noapara 40 MW PP (khanjahan ali)	40.000	40.000
9. Rupsha 105 MW orion rupsha	105.00	105.00
10. Modhumati Power Plant	105.00	105.00
11. Bheramara HVDC Interconnector	1000.0	1000.0
Total	**2288**	**2284**

Barisal Zone

Name of Power Station	Installed Capacity	Directed Capacity
1. Barisal 110MWPP (Summit)	110.00	110.00
2. Bhola 33MW PP Venture	33.00	33.00
3. Bhola 225 MW CCPP	194.00	194.00
4. Bhola 95 mw Agreeco	95.000	95.000
5. Payra 1320 MW	622.00	622.00
Total	**1054**	**1054**

Rajshahi Zone

Name of Power Station	Installed Capacity	Directed Capacity
1. (a)Baghabari 71 MWGTPP	71.000	71.000
2. (b)Baghabari 100 MWGTPP	100.00	100.00
3. Baghabari 50 MWPP Peaking	52.000	52.000
4. Baghabari 200 MWPP Peaking (Paramount)	200.00	200.00
5. Bera 70 MW Peaking	71.000	71.000
6. Amnura 50 MW PP	50.000	50.000
7. Chapainawabgonj 100 MW	104.00	104.00
8. Katakhali 50 MW (Peaking)PP	50.000	50.000
9. Khtakhali 50 MW PPP (Northern)	50.000	50.000
10. Santahar 50 MW PP Peaking	50.000	50.000
11. Sirajganj 225 MW CCPP Unit-1	210.00	210.00
12. Sirajganj , 225MW PP Unit-2	220.00	220.00
13. Sirajganj , 225MW PP Unit-3	220.00	220.00
14. Sirajgonj-400 MW CCPP Unit4	414.00	414.00
15. Bogra 22 MW PP GBB	22.000	22.000
16. Bogra 20 MW PP (Energyprima)	20.000	10.000

17. Ullapara 11 MW PP (Summit)	11.000	11.000
18. Natore 52 MW PP (Rajlanka)	52.000	52.000
19. Bagura 113 MW PP (Confidence) Unit-1	113.00	113.00
20. Bogra 113MW PP(Confedence)-2	113.00	113.00
Total	**2193**	**2183**

Rangpur Zone

Name of Power Station	Installed Capacity	Directed Capacity
1. Barupukuria TPP Unit-1	125.00	85.000
2. Barapukuria TPP Unit-2	125.00	85.000
3. Barapukuria 275 MW TPP Unit-3	274.00	274.00
4. Rangpur 20 MW GTPP	20.00	20.00
5. Rangpur 113 MW PP(Confidence)Rangpur	113.00	113.00
6. Syedpur 20 MW GTPP	20.000	20.000
7. Majhipara Tetulia 8 Mw Solar pp (Sympa)	8.00	8.00
Total	**685**	**605**

Under long term maintenance

Name of Power Station	Installed Capacity	Directed Capacity
1. Barishal GTPP -unit-1,2	40.00	30.00
2. Ashuganj (Aggreko)	0.00	0.00
3. Shikalbaha ST	0.00	0.00
4. Khulna(KPCL-1)	0.00	0.00
5. Brahmanbaria (Agrico) (Gas)	0.00	0.00
Total	**40**	**30**

Summation of total Data	Installed Capacity	Directed Capacity
	20813. 00	20312.00

2.10 Demand in Bangladesh

In the Power System Master Plan (PSMP) - 2010 interest gauge was made dependent on a 7 % GDP development rate. The power advancement is needed to be sped up to build get to and achieve a financial turn of events. The attractive monetary development rate would be about 7% p.a. In light of this examination, the pinnacle request would be around 10,283 MW in FY2015, 17,304 MW in FY2020, and 25,199 MW in 2025. As indicated by the PSMP-2010 Study year-wise pinnacle request figure is given underneath.

Table 2.3: Peak Demand in Bangladesh. [4]

Fiscal Year	Peak Demand (MW)
2010	6,454
2011	6,765
2012	7,518
2013	8,349
2014	9,268
2015	10,283
2016	11,405
2017	12,644
2018	14,014
2019	15,527
2020	17,304
2021	18,838
2022	20,443
2023	21,993
2024	23,581
2025	25,199
2026	26,838
2027	28,487
2028	30,134
2029	31,873
2030	33,708

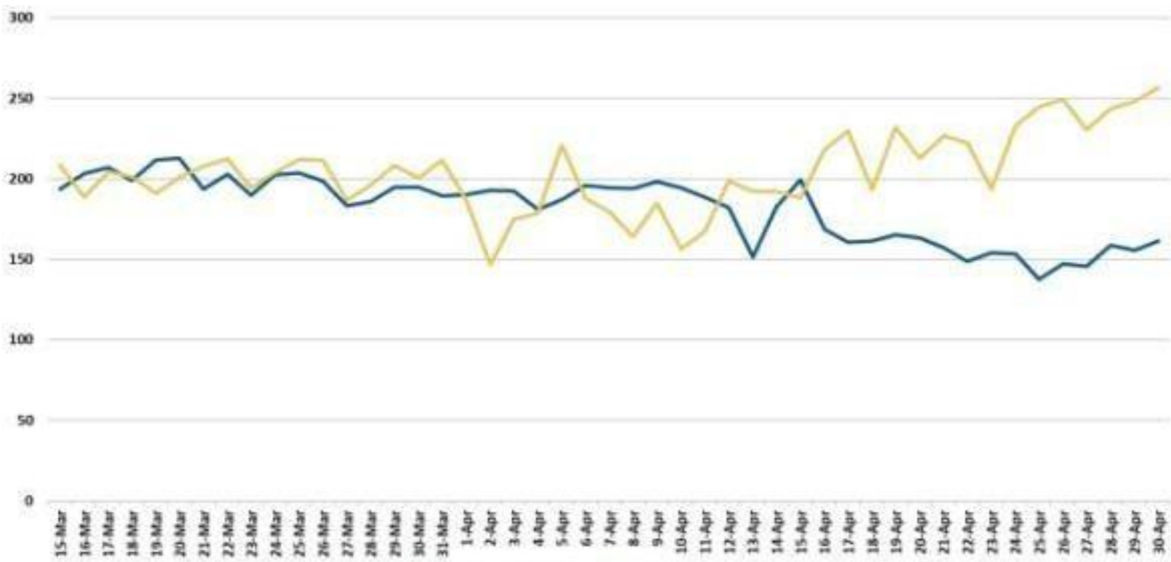

Figure 2.4: Bangladesh power generation 2020 vs 2019 (GWh).[4]

2.11 Retail Electricity Rate

The Tariff to the measure of cash the buyer needs to pay for making the force accessible to them at their homes. The levy framework considers different variables to figure the absolute expense of power.

Low Voltage AC Single Phase 230 Volt and Three Phase 400 Volt

Frequency: 50 cycle/second

Approved Demand: Single Phase 0-7.5 KW and Three Phase 0-50 KW

Table 2.4: A. Low Voltage (LT) 230/400 Volt Electricity Supply **[4]**

SL	Customer Category and Slab	New Tariff Per Unit Rate (Tk.) Effective from Bill month 1st December, 2017	Demand Charge (Tk./KW/Month)
1	**LT- a: Residential**		
	Life Line: 1-50 Units	3.50	25.00
	First Step: From 00 to 75 units	4.00	
	Second Step: From 76 to 200 units	5.45	
	Third Step: From 201 to 300 units	5.70	
	Fourth Step: From 301 to 400 units	6.02	
	Fifth Step: From 401 to 600 units	9.30	
	Sixth Step: From 601 to above	10.70	
2	**LT- b: Agricultural pumping**	4.00	15.00
3	**LT- c 1: Small Industries**		
	Flat Rate	8.20	15.00 (Applicable for approved demand upto 25 KW) 25.00 (Applicable for approved demand more than 25 KW)
	Off-Peak Time	7.38	
	Peak Time	9.84	

4	LT- c 2: Construction	12.00	80.00
5	LT- d 1: Education, religious and charitable organizations and hospitals	5.73	25.00
6	LT- d 2: Street lamp, water pump and battery charging station	7.70	40.00
7	LT- e: Commercial & Office		
	Flat Rate	10.30	30.00
	Off-Peak Time	9.27	
	Peak Time	12.36	
8	LT- t: Temporary	16.00	100.00

11 KV Electricity Supply: Medium Voltage AC 11 KV

Frequency: 50 cycle/second

Approved Demand: 50KW to maximum 5MW

Table 2.5: B. Medium Voltage (MT) [**4**]

SL	Customer Category and Slab	New Tariff Per Unit Rate (Tk.) Effective from Bill month 1st December, 2017	Demand Charge (Tk./KW/Month)
1	MT-1: Residential		
	Flat Rate	8.00	50.00
	Off-Peak Time	7.20	
	Peak Time	10.00	
2	MT-2: Commercial & Office		
	Flat Rate	8.40	50.00
	Off-Peak Time	7.56	
	Peak Time	10.50	
3	MT-3: Industries		
	Flat Rate	8.15	50.00
	Off-Peak Time	7.34	
	Peak Time	10.19	

4	**MT-4: Construction**		
	Flate Rate	11.00	80.00
	Off-Peak Time	9.90	
	Peak Time	13.75	
5	**MT-5: General Purpose***		
	Flat Rate	8.05	50.00
	Off-Peak Time	7.25	
	Peak Time	10.06	
6	**MT- 6: Temporary**	15.00	100.00

Electricity Supply: High Voltage AC 33 KV

Frequency: 50 cycle/second

Approved Demand: 5MW to maximum 30MW (Must be Double circuit for above 20MW)

Table 2.6: C. High voltage (HT):33 KV **[4]**

SL	Customer Category and Slab	New Tariff Per Unit Rate (Tk.) Effective from Bill month 1st December, 2017	Demand Charge (Tk./KW/Month)
1	**HT-1: General Purpose**		
	Flat Rate	8.00	40.00
	Off-Peak Time	7.20	
	Peak Time	10.00	
2	**HT-2: Commercial & Office**		
	Flat Rate	8.30	40.00
	Off-Peak Time	7.47	
	Peak Time	10.38	
3	**HT-3: Industries**		
	Flat Rate	8.05	40.00
	Off-Peak Time	7.25	
	Peak Time	10.06	

4	HT-4: Construction		
	Flat Rate	10.00	40.00
	Off-Peak Time	9.00	
	Peak Time	12.50	

Electricity Supply: Extra High Voltage AC 132 KV and 230 KV

Frequency: 50 cycle/second

Approved Demand: EHT-1: 20MW to maximum 140 MW (Single or double circuits in technical consideration); EHT-2: Above than 140 MW

Table 2.7: D. Extra High voltage (EHT): 132 KV and 230 KV **[4]**

SL	Customer Category and Slab	New Tariff Per Unit Rate (Tk.) Effective from Bill month 1st December, 2017	Demand Charge (Tk./KW/Month)
1	EHT-1: General Purpose		
	Flat Rate	7.95	40.00
	Off-Peak Time	7.16	
	Peak Time	9.94	
2	EHT-2: General Purpose		
	Flat Rate	7.90	40.00
	Off-Peak Time	7.11	
	Peak Time	9.88	

CHAPTER 3

POWER GENERATION IN THE WORLD

3.1 Power plant

A power plant is a get-together of frameworks or subsystems to produce power, i.e., power with economy and prerequisites. The force plant itself should be valued monetarily and harmless to the ecosystem to society. The current book is situated to customary just as non-traditional energy age.

While the pressure is on energy-effective framework respects ordinary force frameworks viz., to expand the framework change proficiency the preeminent objective is to create, plan, and producer the non-customary force creating frameworks in coming many years, ideally after 2050 AD, which is helpful for society just as having possible energy transformation effectiveness and non-accommodating to contamination, keeping in see the contamination act. The subject overall can be additionally expressed as present-day power plants for power viz power age in the 21st century. The word current methods relating to time. At present because of the energy emergency, the primary objective is to moderate energy for the future while the subsequent advance is to foster elective energy frameworks, including direct energy transformation gadgets, with the commitment, devotion, and assurance to recollect the expression, "Dig and Delve Again till swim into".

3.2 Types of power plant

Power plants are mainly two types:

01. Conventional:

1.Steam Engines Power Plants.

The steam-electric power station is a power station in which the electric generator is steam-driven.

Water is warmed, changes into steam, and winds a steam turbine which drives an electrical generator. The waste warmth from a gas turbine can be used to raise steam, in a merged cycle plant that improves all-around viability.

2.Steam Turbine Power Plants.

A steam power plant contains a pot, steam turbine and generator, and various partners. The radiator produces steam at high squeezing variables and high temperatures. The steam turbine changes over the glowing energy of steam into mechanical energy.

3.Diesel Power Plants.

An electrical establishment furnished with one or a few electric flow generators driven by diesel motors. The upsides of a diesel power plant are a good economy of activity, stable working attributes, and a simple and fast beginning up.

4.Gas Turbine Power Plants.

The gas turbine is the engine at the center of the power plant that makes an electric stream. A gas turbine is a smart engine that can change petrol gas or other liquid empowers over to mechanical energy. This energy then drives a generator that produces electrical energy. It is electrical energy that moves along electrical links to homes and associations.

5.Hydro-Electric Power Plants.

Hydropower is electrical energy delivered through the force of moving water. Force acquired from the (regularly gravitational) development of water., Hydropower plants get energy from the power of moving water and tackle this energy for valuable purposes.

6.Nuclear Power Plants.

A nuclear power plant is a thermal power station in which the glow source is a nuclear reactor. As is regular in thermal power stations, heat is used to create steam The driver Agency declared there were 450 nuclear power reactors idleness in 30 countries all through the planet.

Nuclear plants are ordinarily seen as baseload stations since fuel is a little piece of the cost of creation and because they can't be adequately or quickly dispatched. Their assignments, upkeep, and fuel costs are at the low completion of the reach, making them proper as base-load power suppliers. Nevertheless, the cost of suitable long terms radioactive waste amassing is questionable.

02. Non-conventional

1.**Thermoelectric Generator.**

A thermoelectric generator (TEG), moreover called a See beck generator, is a solid state contraption that converts heat, movement (temperature contrasts) directly into electrical energy through a Wonder called the Sea beck sway (a sort of thermoplastic effect). Thermoelectric generators work like warmth engines, yet are less gigantic and have no moving parts. In any case, TEGs are typically costlier and less capable.

Thermo-electric generators could be used in power plants to change over waste warmth into extra electrical power and in vehicles as auto thermo-electric generators (ATGs) to extend eco-kind disposition. Radioisotope thermoelectric generators use radioisotopes to deliver the important warmth differentiation to control space tests.

2.Thermionic generator.

Thermionic force converter, additionally called thermionic generator, thermionic force generator, or thermoelectric motor, any of a class of devices that convert heat directly into electricity using thermionic emission rather than first changing it to some other form of energy.

3.Fuel-cells Power Plants.

Fuel cell systems typically produce hydrogen gas from hydrocarbon fuels such as natural gas using thermochemical processes such as steam reforming. The hydrogen responds with oxygen across an electrochemical cell like that of a battery to deliver power and water.

4.Photovoltaic solar cells Power System

A photovoltaic system, moreover a PV structure or sun-situated power structure, is a power system planned to supply usable sun-based power through photovoltaics. It's anything but's a game-plan of a couple of sections, including sun arranged sheets to ingest and change over light into power, daylight based inverter to change over the yield from direct to trading stream, similarly as mounting, cabling, and other electrical associates to set up a working structure.

5.MHD Power Plants.

The norm of MHD power age is extraordinarily fundamental and relies upon Faraday's law of electromagnetic acknowledgment, which communicates that when a conductor and an alluring field moves near with each other, then the voltage is started in the conductor, which achieves the movement of current across the terminals.

6.Fussion Reactor NPP Power System

As of now, combination gadgets produce in excess of ten megawatts of combination power. ITER will be fit for creating 500 megawatts of combination power.

7.Biogas, Biomass Energy Power system.

Biogas is a gas that is produced during anaerobic degradation of organic materials. It is composed of methane (60 – 70 percent) and carbon dioxide (30 – 40 percent) and contains also trace amounts of other components (water vapor, hydrogen supplied and ammonia). 30 million tons of methane emissions are produced worldwide each year from agricultural operations As an ozone depleting substance (GHG) with a worldwide temperature alteration capability of multiple times that of carbon dioxide, methane effect sly affects the climate and the environment. However, biogas could cover around 6 percent of the global primary energy supply. By using waste such as feedstock, anaerobic digestion allows energy recovery, closing the nutrient cycle and acting as a measure for climate change mitigation and pollution reduction, as it replaces energy from traditional fossil fuels. The main challenges for implementing biogas as an energy source are the lack of information, governmental policies, trained labor force, and its high costs.

8.Geothermal Energy.

Geothermal energy is heat inside the earth. The word geothermal comes from the Greek words geo (earth) and subject (heat). Geothermal energy is harmless to the ecosystem power source since heat is unendingly conveyed inside the earth. People use geothermal warmth for washing, warming constructions, and making power.

9.Wind Energy Power System

Wind energy is a kind of sun-situated energy. Wind turbines convert the dynamic energy in the breeze into mechanical power. A generator can change over mechanical power into power. Mechanical power can similarly be utilized directly for unequivocal tasks, for instance, siphoning water.

10.Ocean Thermal energy conversion (OTEC)

Ocean Thermal Energy Conversion (OTEC) is a cycle that can deliver power by utilizing the temperature distinction between profound cold seawater and warm tropical surface waters. OTEC plants siphon huge amounts of profound cold seawater and surface seawater to run a Power cycle and produce power.

11.Wave and Tidal Wave.

Waves are framed by wind getting across the outside of the sea. A lot of energy is put away in waves. A wave power gadget. What is flowing energy? Flowing energy will be energy created by the tides of the sea.

12.Energy Plantation Scheme.

Actually talking, energy ranch implies developing select types of trees and bushes that are harvestable in a similarly more limited time and are explicitly implied for fuel. The fuelwood might be utilized either straightforwardly in wood-consuming ovens and boilers or prepared into methanol, ethanol, and maker gas.

3.3 World Electricity Generation Share by Fuel

World energy utilization is the all-out energy delivered and utilized by the whole human civilization. Ordinarily estimated each year, it includes all energy outfits from each fuel source applied towards humankind's undertakings across each and every modern and innovative area, across each country. It does exclude energy from food, and the degree to which direct biomass consumption has been represented is inadequately archived. Being the force source metric of development, world energy utilization has profound ramifications for humankind's financial-political circle.

Figure 3.1 World electricity generation by fuel technology and scenario (TWh) is given below: [7]

Table 3.1 World Electricity Generation Share by Fuel [6]

			Stated Policies		Sustainable Development		Change 2018-2040	
	2000	2018	2030	2040	2030	2040	STEPS	SDS
Coal	5 995	10 123	10 408	10 431	5 504	2 428	307	-7 695
Oil	1 207	808	622	490	355	197	-319	-611
Natural gas	2 760	6 118	7 529	8 899	7 043	5 584	2 781	-534
Nuclear	2 591	2 718	3 073	3 475	3 435	4 409	757	1 691
Hydro	2 613	4 203	5 255	6 098	5 685	6 934	1 895	2 731
Wind and solar PV	32	1 857	5 879	9 931	7 965	15 503	8 073	13 645
Other renewables	217	739	1 344	2 020	1 785	3 628	1 281	2 889
Total generation	15 436	26 603	34 140	41 373	31 800	38 713	14 770	12 110
Electricity demand	*13 152*	*23 031*	*29 939*	*36 453*	*28 090*	*34 562*	*13 422*	*11 531*

3.4 World Renewable Energy Capacity

World renewable energy capacity is given below:

Figure 3.2 World renewable energy capacity. [6]

3.5 Biggest Power station in the world

The world's biggest power plant by capacity is the Three Gorges Dam in the province of Hubei in interior China. Ten largest power station in the world are given below:

Table 3.2: Biggest Power Station in the World. [3]

Rank	Station	Country	Location	Capacity (MW)	Annual generation (TWh)	Type
1.	Three Gorges Dam	China	30°49′15″N 111°00′08″E	22,500	101.6 (2018)	Hydro
2.	Itaipu Dam	Brazil Paraguay	25°24′31″S 54°35′21″W	14,000	103.09 (2016)	Hydro
3.	Xiluodu	China	28°15′52″N 103°38′47″E	13,860	55.2 (2015)	Hydro
4.	Belo Monte	Brazil	03°07′27″S 51°42′01″W	11,233	39.5 (expected)	Hydro
5.	Guri	Venezuela	07°45′59″N 62°59′57″W	10,235	47 (average)	Hydro
7.	Tucuruí	Brazil	03°49′53″S 49°38′36″W	8,370	21.4 (average)	Hydro
-	Kashiwazaki-Kariwa	Japan	37°25′45″N 138°35′43″E	7,965	60.3 (1999) 0 (2012–2019)	Nuclear
8.	Jiuquan	China	40°12′00″N 96°54′00″E	7,965	N/A	Wind
9.	Kori	South Korea	35°19′40″N 129°18′03″E	7,489	43.15 (2016)	Nuclear
10.	Grand Coulee	United States	47°57′23″N 118°58′56″W	6,809	20.24 (average)	Hydro

3.6 Energy consumption in Bangladesh

Bangladesh's outright presented power age limit (tallying prisoner power) was 15,351 megawatts (MW) as of January 2017 and 20,000 megawatts in 2018. The greatest energy customers in Bangladesh are ventures and the private region, followed by the business and green regions.

The most important measure in the energy of Bangladesh is the total consumption of 53.65 billion KWh of electric energy per year.

Per capita this is an average of 329 kwh.

3.7 List of countries by electricity production

Force is routinely delivered at a power plant by electromechanical generators, on a very basic level controlled by heat engines empowered by start or nuclear parting yet furthermore by various strategies like the unique energy of streaming water and wind. Other fuel sources join daylight-based photovoltaics and geothermal Power.

Table 3.3: List of countries by electricity production. [3]

Rank	Country/region	Electricity production (GWh)	Date of information
N/A	*World total*	27,644,800	2019
1	China	7,503,400	2019
2	United States	4,401,300	2019
3	India	1,558,700	2019
4	Russia	1,118,100	2019
5	Japan	1,036,300	2019
6	Canada	954,400	2018
7	South Korea	794,300	2018
8	Brazil	688,000	2018
9	Germany	648,700	2018
10	France	574,200	2018

3.8 List of countries by electricity consumption

Electric energy usage is the sort of energy use that uses electric energy. Electric energy usage is the genuine energy demand made on the flow power supply. The outright force use in 2012 was 20,900 TWh and in 2017 it was 21,372 TWh.

This list of countries by electric energy consumption is mostly based on the Energy Information Administration. Several non-sovereign entities are also included for informational purposes, with their parent state noted. The per capita data for many countries may be slightly inaccurate as population data may not be for the same year that the consumption data are. Population data were obtained mainly from the World Bank in 2019 with some exceptions, in which case they were obtained from the Wikipedia pages for the corresponding countries/territories. Average power per capita was calculated according to the formula:

Electric energy per capita [in wh] = Total populace power utilization [in kwh/yr] * 1,000/populace.

Electric force per capita [in watt] = Total populace power utilization [in kwh/yr] * 0.114077116/populace.

1 kwh/yr = 1,000 Wh/(365.25 x 24)h = 0.11408 Watt

The list of countries by electricity consumption is given below:

Table 3.4: List of countries by electricity consumption. **[3]**

Rank	Country/Region	Electricity consumption (GW·h/yr)	Year of Data	Source	Population	As of	Average electrical energy per capita (kWh per person per year)
—	World	23,398,000	2018 est.	EIA	7,800,000,000	2018	3081
1	China	7,225,500	2018 est.	NEA	1,427,647,000	2019	4,617
2	United States	3,989,566	2019 est.	EIA	328,200,000	2019	12,154
3	India	1,547,000	2018 est.	CSO	1,384,660,000	2019	935
4	Russia	965,156	2019 est.	EIA	146,700,000	2019	6,685
5	Japan	902,842	2019 est.	EIA	126,860,000	2019	7,150
6	Brazil	597,234	2019 est.	EIA	210,000,000	2019	2,830
7	Canada	549,263	2019 est.	EIA	37,534,000	2019	14,612
8	Korea, South	527,035	2019 est.	EIA	51,710,000	2019	10,192
9	Germany	524,268	2019 est.	EIA	83,200,000	2019	6,306
10	France	449,422	2019 est.	EIA	66,980,000	2019	6,702

CHAPTER-4

RESULTS AND DISCUSSION

4.1 Age of Non-renewable fuels

Inexhaustible energizes are required to become quicker than petroleum derivatives, albeit petroleum products will represent more than 3/4 of world energy utilization through 2040. Gaseous petrol is required to be the quickest developing petroleum derivative later on, with worldwide flammable gas utilization expanding by 1.4% each year.

It is the current rate of energy consumption continue then coal will be finished within 118 years; **oil:** 46 year and **Gas** is 59 years.

Another thing is we don't have good amount of supply of them. Most of those are imported . Import them is very costly at the same time it hamper our energy security very badly.

So now main challenge now is to maintain energy security.

4.2 Results Discussion

In our opinion in this time our best solution or future policy should be to develop sustainable renewable energy plan. It is future renewable source of energy. The main prospect and field of renewable energy source for our country should be-

1.waste to electricity

2.solar energy

3.Tidal energy

4.wind energy

5.Hydro energy.

Now we need to have more research in this field of renewable energy for Bangladesh. Only more attention and research in the field of renewable energy security of our country. Hope if we can make a strong policy in this field of renewable energy then we can insure the energy security of our country and also can able to make our future of energy more secure.

4.3 Power system master plan

Power System Master Plan (up to 2030):

Updates of PSMP 2006: Due to change of planning perspective

PSMP 2010: Long term planning up to 2030

Findings:

Generation capacity requirement by 2021: 24,000 MW

Generation capacity requirement by 2030: 39,000 MW

Coal based generation capacity by 2030: 20,000 MW

Coal and Nuclear for base load power requirement

Cross border Trade with neighboring countries

Table 4.1: Probable Power Generation

Primary Fuel Sources By 2030

Sl. No.	Description	Capacity (MW)	Probable Location (s)
1	Domestic Coal	11,250	North West Region at Mine Mouth
2	Imported Coal	8,400	Chittagong and Khulna
3	Domestic Gas/LNG	8,850	Near Load Centers
4	Nuclear	4,000	Ruppur
5	Regional Grid	3,500	Bahrampur - Bheramara, Agartola - Comilla, Silchar - Fenchuganj, Purnia-Bogra, Myanmar - Chittagong
6	Others (Oil, Hydro and Renewable)	2,700	Near Load Centers
	Total	38,700	

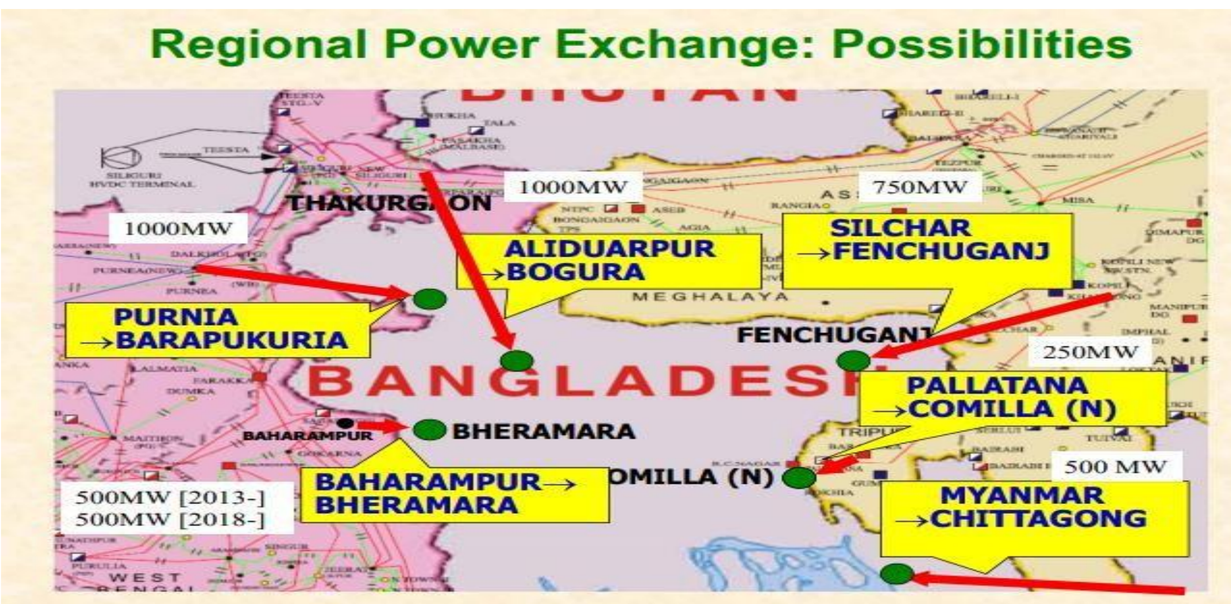

Figure 4.1: Probable Power Generation [4]

4.4 Challenges

Primary Fuel Supply:

1. Enhanced Gas Exploration, Production.
2. Domestic coal development.
3. LNG import.
4. Safe Nuclear Technology.

Project Financing:

1. Ensuring financing for Public and Private sector projects.
2. Availability of foreign currency.

Transportation of fuel and equipment:

1. Infrastructure development by Railway and R&H.
2. Dredging of river routes by BIWTA.
3. Capacity build of BPC, Railway, R&H and BIWTA etc.

Human resources Development:

Development of skilled manpower adopt and operate new technology.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

Providing access to affordable and reliable electricity to all citizens by 2021 is a befitting national goal of the government of Bangladesh. Despite considerable trust on reducing the gap between the demand and supply of electricity, a significant number of people still do not have access to electricity. Consequently, it very well may be very eager to give moderate power to all by 2021. Regardless, accomplishing such an objective inside as far as possible is a principal challenge of the country without which, worldwide experience recommends, the human turn of events, monetary, and business objectives of the public authority might be obstructed, where the hole between the interest and age of power is going on. Moreover, it might be quite difficult to achieve the target if the government does not give top priority on the regarding issue. To accomplish the objective of power supply to all by 2021, the public authority ought to examine guarantee the legitimate execution of the distributed cash in the area. Guaranteeing great administration is likewise required. A separate portion for the support and modernization of old enough old force plants is direly required. Because of the lack of gas, the other essential fuel for producing power that is coal offers more secure and less expensive possibilities. Notwithstanding, the discussion about the strategy for mining coal makes the issue prickly.

5.2 RECOMMENDATIONS

This study revealed the possibility of renewable energy generation with the cost analysis to meet the energy security of Bangladesh. Based on the findings and conclusions presented, the following recommendations are suggested.

1. More methodological work is needed for the approximate calculation of renewable energy by doing field survey and proper data analysis.
2. Research to foster methodologies and do a full money saving advantage examination of influence age.
3. Examination to foster methodologies and do a full money saving advantage investigation of influence age utilizing genuine influence plant information would be advantageous.
4. Further research might explore different fields survey and get data from the perspective area for the proper calculation.

Reference

[1] [V.K Mehta, Rohit Mehta (2019-2020), “Principles of power system” , 4th edition, S.CHANA, AN ISO 9001:2000 company]

[2] [Charles K. Alexander,Department of Electrical and Computer Engineering, Cleveland State University, Matthew N. O. Sadiku, Department of Electrical and Computer Engineering, Prairie View A&M University (2016), “Fundamentals of Electric Circuts”,5th edition].

[3] [International journal of sustainable development & world ecology, volume 26, 2019 - issue 5]

[4] [Rahman and Kholilullah (October 2017). "Use of Solar Panel at Rural Areas in Bangladesh: Impacts, Financial Viability and Future Prospects". International Journal of Science and Research (IJSR). 6 (10). S2CID 51499628].

[5] [http://srren.ipcc-wg3.de/report/IPCC_SRREN_Annex_II.pdf see page 10 Moomaw, W. P. Burgherr, G. Heath, M. Lenzen, J. Nyboer, A. Verbruggen, 2011: Annex II: Methodology. In IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation].

[6] ["BP Statistical Review of World Energy 2020 | 69th edition”].

[7] [Present installed generation capacity (MW) as on October 2020, bpdb.gov.bd].,
https://www.bpdb.gov.bd/bpdb/index.php?option=com_content&view=article&id=5&Itemid=6