CHAPTER 10
POWER AND ENERGY

[Power and energy are the main driving forces of country's economy and prerequisite for development. There is enormous demand of electricity, oil, gas and natural resources in agriculture, industry, service sector as well as daily life of Bangladesh. In this context, the Government has given top priority for the development of power and energy sector. Currently 76 percent of the total population of the country has access to electricity (including renewable energy). The total installed generation capacity stood at 14,565 MW in FY2015-16 while 9,036 MW was the highest production. Besides, net electricity was produced 45,850 million kilowatt-hours in FY2014-15, which stood at 52,193 million kilowatt-hours in FY2015-16. In addition, total system loss of transmission and distribution of electricity stood at 13.54 and 13.10 percent respectively in FY2014-15 and FY2015-16 from 27.97in FY2001-02. In addition, energy saving, environment-friendly power generation systems from renewable energy equipment have been undertaken. On the other hand, natural gas met almost 72 percent of the country's total commercial use of energy. A total of 26 gas fields have been discovered till now, the cumulative actual gas production is about 13.90 trillion cubic feet and recoverable net reserves are 13.22 trillion cubic feet. Besides, the country has about 10.91 million metric tonnes reserves of fuel oil. For ensuring the energy security, plans to set up a new unit of the Eastern Refinery has been undertaken. The new unit, whose production capacity is about 45 million metric tonnes. However, energy facilities are not enough against total demand of the country. A policy has been formulated to encourage private sector to generate electricity under public-private partnership (PPP), rental power producer (RPP), and independent power plant (IPP) arrangements. According to Power System Master Plan (PSMP), the Government has set a target to increase installed electricity generation capacity to 24000 MW by 2021 and 40,000 MW by 2031. It is expected that, after successful completion of ongoing projects, daily gas production capacity will stand at 4,800 million cubic feet.]

Power Sector

Power and energy are the main driving forces of country's economy and prerequisite for development. Up to June 2016, 76 percent of the total population of the country has access to electricity (including renewable energy). Because of the implementation of short, medium and long term plan for power generation, the generation capacity (including captive) reached at 14,565 MW. Per capita electricity generation is 407 KWh. The Government has undertaken lots of activities to improve the distribution line. Consequently, the distribution line reached to 3,74,561 km and the number of user become 2,04,91,325. Among these the number of commercial user is 16,98,619. Because of continuous monitoring and evaluation the performance of power sector increased at a mentionable rate. Therefore, system loss has been decreased at 13.55 percent in FY2015-16 which was 27.97 percent in FY2001-02. The Government has taken necessary initiatives to reform and restructure the power sector to make electricity available to all by 2021. In order to fulfill the vision and election manifesto target, the Government has planned to generate additional 24,000 MW electricity within 2021. There is also a plan to generate 40,000 MW and 60,000 MW within 2031 and 2041.

A. Power Generation

Power Generation Capacity

Total grid based installed capacity was 12,365 MW in FY2015-16 including 6,512 MW in public sector, 5,253 MW in private sector and 600 MW from cross border power trade from India. In the public sector, many generation units have become very old and are operating at a much-reduced capacity. In order to enhance the reliability and productivity of these plants, government has taken initiatives for rehabilitation and repowering of old and inefficient power plants. The installed capacity of power generation by fuel type and ownership in FY2015-16 are shown in Figures 10.1 and 10.2 respectively.

Figure 10.1: Installed Generation Capacity (Derated)

(Based on type of fuel consumes)

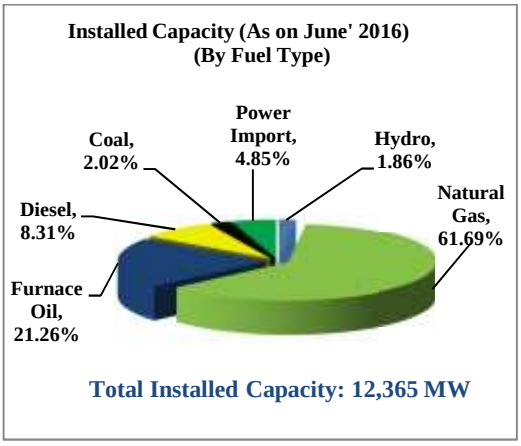
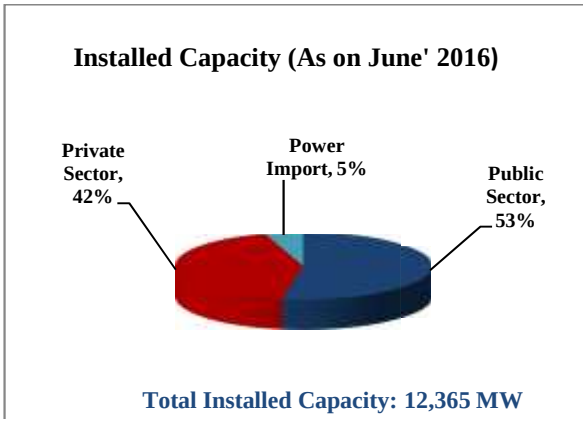


Figure10.2: Installed Generation Capacity (Derated)

(Based on ownership)



Source: Bangladesh Power Development Board (BPDB)

Power Generation

The total net 52,193 MkWh energy was generated from public and private sector power plants during FY2015-16. Out of total net generation 43 percent electricity was generated by public sector power plants. The share of gas, hydro, coal, import and oil based energy generation were 68.63 percent, 1.84 percent, 1.62 percent, 7.32 percent and 20.58 percent respectively. Energy growth in FY2015-16 was about 13.87 percent. Fuel wise and Sector wise net energy generation in FY2015-16 is shown in figure 10:3 and 10:4 respectively.

Figure 10.3 Fuel Wise Net Energy Generation

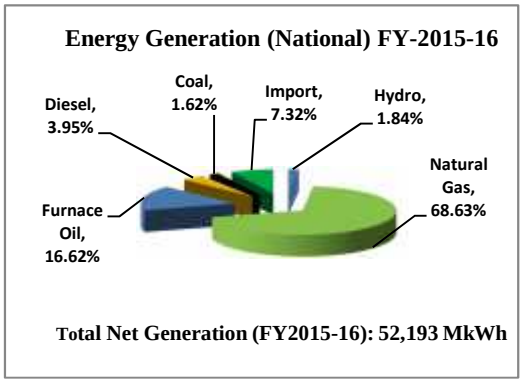
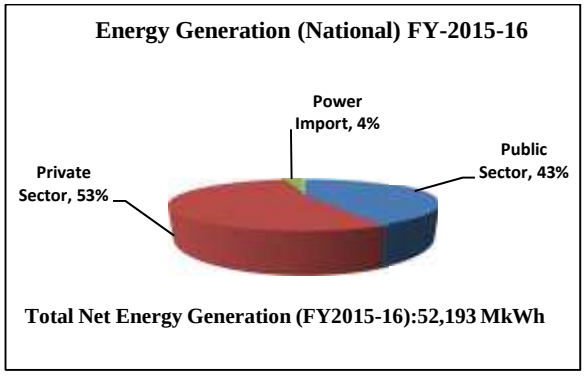


Figure 10.4 Sector Wise Net Energy Generation



Source: Bangladesh Power Development Board, Power Division.

Maximum Power Generation

Presently having sufficient generation, actual demand of electricity could not be served to the consumers due to transmission and distribution bottleneck. From the historical data it is found that in FY1995-96 maximum generation was 2,087 MW which has increased to 9,036 MW on 30st June 2016. The installed capacity (derated) and maximum generation since FY1996-97 are given in Table 10:1**.**

Table 10.1: Installed Capacity and Maximum Generation

Fiscal Year	Installed capacity (derated) MW	Maximum generation MW
1996-97	2809	2114
1997-98	2952	2136
1998-99	3432	2449
1999-00	3549	2665
2000-01	3830	3033
2001-02	3883	3218
2002-03	4368	3458
2003-04	4315	3622
2004-05	4364	3751
2005-06	4614	3812
2006-07	4623	3718
2007-08	4776	4130
2008-09	5166	4162
2009-10	5271	4606
2010-11	6639	4890
2011-12	8100	6066
2012-13	8537	6434
2013-14	9821	7356
2014-15	10939	7817
2015-16	11770	9,036

Source: Bangladesh Power Distribution Company Limited.
Note: Excluding captive generation

Fuel Consumption for Power Generation

The natural gas consumption in public sector power plant was 107 billion cubic feet in FY1995-96, which has increased to 208 billion cubic feet in FY2015-16. The consumption of natural gas and liquid fuel since FY1995-96 are given in Table 10.2 below:

Table: 10.2: Fuel Consumption by Public Power Plants

Fiscal Year	Natural gas (Billion cft)	Coal (1000 Ton)	Liquid Fuel (Million Liter)	
			Furnace Oil	HSD, SKO & LDO
1995-96	107	-	76	201
1996-97	107	-	125	304
1997-98	120	-	109	320
1998-99	137	-	53	245
1999-00	141	-	137	111
2000-01	151	-	114	92
2001-02	152	-	102	66
2002-03	131	-	154	74
2003-04	134	-	209	114
2004-05	141	-	230	124
2005-06	154	190	205	150
2006-07	146	510	112	119
2007-08	151	450	137	111
2008-09	161	470	90	113
2009-10	167	480	10	125
2010-11	150	410	119	138
2011-12	151	450	183	60
2012-13	176	592	266	35
2013-14	183	540	425	173
2014-15	181	523	378	291
2015-16	208	489	450	231

Source: BPDB, Power Division

Power Generation Programme

The power sector plan needs constant updating because of the changes in the present and future primary energy scenarios and to make it appropriate for implementation. Accordingly, the Power Sector Master Plan (PSMP) 2010 is being updated which is expected to be completed by December 2016. Currently Forecasted generation capacity would be 23,000 MW against demand of 17,300 MW by 2020; 29,700 MW against demand of 25,200 MW by 2025 and 40,000 MW against demand of 34,000MW by 2031.

Power Generation Projects

There are several projects which are under construction both in public and private sector. The expected power generation during 2016 to 2021 under ongoing project are shown in Table 10.3.

Table 10.3:Power Generation Projects (Under Construction)

Sector	No. of Projects	Capacity (MW)
Public Sector	16	6703
Private Sector	13	3046
Total (Under Construction)	29	9,749

Source: Power Division

Among them mentionable Projects are:

Public Sector

- Payra, Patuakhali 1200-1320 MW Coal based Power Plant
- Bangladesh-India Friendship Power Company Limited 1320MW Coal based Power Plant
- Bibiana South 383 MW CCPP
- Ashuganj (South) 450 MW CCPP
- Siddirganj 335 MW CCPP
- Khulna 150 MW GT upgradation
- Shajibazar CCPP
- Shikalbaha 150-225 MW CCPP
- Bheramara 360 MW CCPP
- ChapaiNababganj 104 MW PP
- Ghorasal 300-450 MW CCPP

Private Sector

- Chittagong 212 MW Coal Based Power Plant (SS Power1)
- Chittagong 212 MW Coal Based Power Plant (SS Power2)
- Bosila, Keraniganj (CLC Power)
- Jamalpur 100 MW Power Plant
- Manikganj 55 MW PP
- Keraniganj 100 MW Power Plant
- Kushiara 163 MW CCPP
- Khulna 630 MW Coal Fired Power Project
- Maowa, Munshiganj 300-650 MW Coal Fired Power Project

Besides, 6 projects having capacity of 988 MW in public sector and 26 projects having capacity of 14222 MW in private sector are in tendering process.

B. Transmission System

Power Grid Company of Bangladesh Ltd. (PGCB) is responsible for operation, maintenance and development of transmission system all over Bangladesh. At present power generated in different power plants all over the country is transmitted to the national grid through 400kV, 230 kV and 132 kV transmission lines. In 1996 when PGCB was formed, the total lengths of 230 kV

and 132 kV line were 838 ckt km and 4,755 ckt km respectively. At present (up to June, 2016), the lengths of 400kV, 230 kV and 132 kV transmission lines are 220.70 ckt km, 3,185.17 ckt km and 6,486.83 ckt km (including DPDC) respectively. The total length of the Optical Ground Wire (OPGW) installed in the transmission line from 1996 to June, 2007 was 2,200 km. This has been increased to 4,200 km up to June, 2010 after completing the NLDC project. Up to June 2016, the length of OPGW has become about 5,315 km. Therefore the major parts of the country are covered by the PGCB optical fiber network.

Present Transmission substation infrastructure including one 500MW HVDC back-to-back substation at Bheramara, one 520 MVA 400/230 kV grid substation, 23 no's of 230/132 kV grid substations (PGCB: 19 & Others: 4) of 10,585 MVA (PGCB: 9,375 MVA + Others: 1,210 MVA) capacity, 132/33 kV 115 grid substations (PGCB: 90 & 25 others) of capacity 15,585.10 MVA (PGCB: 12,655.5 MVA + others 2,929.61 MVA), 450 MVAR capacitor bank in 132kV bus in 8 substations and 1,340 MVAR capacitor bank in 33 kV bus in 46 substations in the country.

Table 10.4 Transmission Substation Infrastructure by PGCB

Fiscal Year	HVDC		400/ 230 KV Substation		230/132 KV Substation		132/33 KV Substation	
	Number	MW		MVA	Number	MVA	Number	MVA
2002-03	-	-	-	-	7	3150	63	5507
2003-04	-	-	-	-	7	3150	63	5819
2004-05	-	-	-	-	9	3825	63	6165
2005-06	-	-	-	-	9	4500	65	6572
2006-07	-	-	-	-	10	5175	70	7219
2007-08	-	-	-	-	12	5850	71	7526
2008-09	-	-	-	-	13	6075	71	7399
2009-10	-	-	-	-	13	6300	75	7844
2010-11	-	-	-	-	13	6675	81	8437
2011-12	-	-	-	-	13	6675	83	8737
2012-13	-	-	-	-	15	6975	84	9705
2013-14	01	500	-	-	18	8775	86	10714
2014-15	01	500	01	520	19	9075	89	11964
2015-16	01	500	01	520	23	10585	115	15585

Source: Power Division

C. Power Distribution System

At present the following five organisations are responsible for electricity distribution:

1. Bangladesh Power Development Board (BPDB)
2. Bangladesh Rural Electrification Board (BREB)
3. Dhaka Power Distribution Company (DPDC)
4. Dhaka Electric Supply Company (DESCO)
5. West Zone Power Distribution Company (WZPDC)

Power Distribution Projects

An integrated power distribution programme has been undertaken to increase the distribution network in order to bring more people under electrification as well as improving the customer service. Up to June 2016, about 21.5 million consumers are connected with the grid through construction of 3,57,000 km. distribution lines. Some major ongoing power distribution expansion projects are mentioned below:

- Pre-paid Metering Project for Distribution Southern Zone Chittagong (Phase -1) Central Zone Power Distribution Project
- Power Distribution System Development Project, *Rangpur* Zone
- Rural Electrification Expansion Barisal Division program-I
- 1.5 Million consumer connection through Rural Electrification Expansion
- Expansion and Strengthening of Power System Network under DPDC Area
- Augmentation and Rehabilitation of Distribution System in DESCO Area
- Expansion and Up gradation of Power Distribution System in West Zone Area

Operational Activities

The performance of the distribution entities has been increased appreciably due to continuous monitoring of the Government. Distribution entities have taken various steps to improve electricity distribution system, consumer satisfaction, system loss and accounts receivable. At a glance achievement of distribution sector is mentioned below.

Total Distribution Lines	: 357,000 Km
Total Consumers	: 21.8 million
Irrigation Consumer	: 281,662
Access to electricity (including renewable energy)	: 76%
Distribution Loss (overall)	: 10.96%
Accounts Receivable (overall)	: 2.00 Equivalent months

System Loss

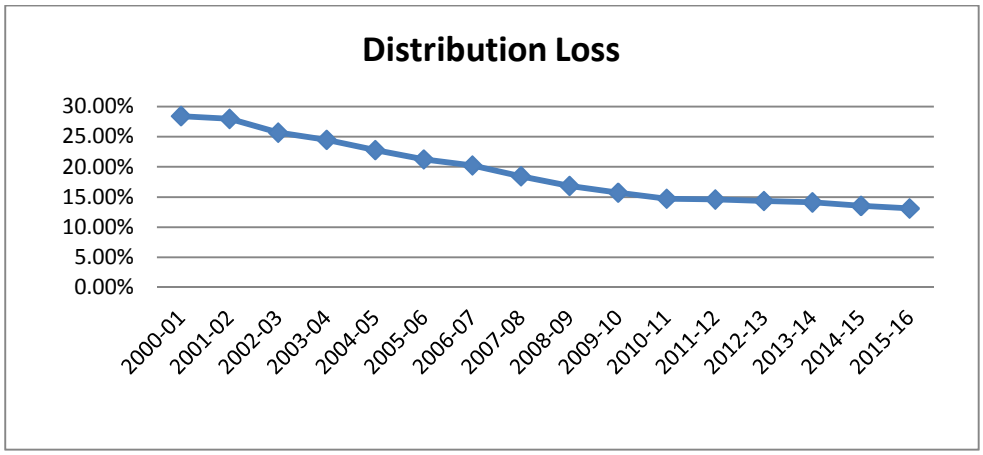
The power sector reform programmes are underway with intense efforts to reduce waste and system loss. System loss is one of the key performance indicators of the distribution entities. To achieve desirable performance and viability of the sector, there is no alternative to bring down the system loss to an acceptable limit. Various measures like continuous performance monitoring of the utilities, reforms and target-oriented measures are implemented to reduce the system loss. The system loss (distribution) has come down to 10.96 percent in FY2015-16 from 25.34 percent in FY2000-01 which is shown in Table 10.5.

Table 10.5: Year-wise System Loss Statistics

Fiscal Year	Distribution (%)	Transmission (%)	Total Loss (%)
2000-01	25.34	-	28.43
2001-02	23.92	-	27.97
2002-03	21.64	3.79	25.69
2003-04	20.04	3.48	24.49
2004-05	17.83	3.42	22.79
2005-06	16.53	3.44	21.25
2006-07	16.26	3.15	20.25
2007-08	15.56	3.51	18.45
2008-09	14.33	3.06	16.85
2009-10	13.49	3.08	15.73
2010-11	12.75	2.66	14.73
2011-12	12.26	2.96	14.61
2012-13	12.03	2.94	14.36
2013-14	11.96	2.74	14.13
2014-15	11.34	2.74	13.54
2015-16	10.96	2.63	13.10

Source: Power Division

Figure 10.5: Year-wise Distribution Loss from FY 2000-01 to FY 2015-16



Power System Interface Meter

410 Interface Meters have been installed at all generating stations throughout the country and Dhaka Distribution Zone to ensure the accountability and transparency of energy inflow/outflow, demand, voltage, current, power factor, meter tempering etc. The interface meters have been using in energy auditing system and playing significant role to reduce system loss.

Pre-Paid Meter

Power division has taken steps to introduce pre-paid metering nationwide aimed at ensuring easier bill payment system with hundred percent collection of electricity bill. To improve power distribution system BPDB installed 56,159 pre-paid meters in *Chittagong, Bogra, Sylhet and Sirajganj*. DESCO has installed 24,431 pre-paid meters in *Uttara, Tongi, Gulshan* area and DPDC has installed 15,116 prepaid meters in *Azimpur* area. BREB has installed 7,318 pre-paid meters under unified pre-payment project. Another 13,96,075 Smart Pre-paid meters installation is underway. After installation of these pre-paid meters virtually there is no accounts receivable of pre-paid consumers. Moreover, due to introduction of pre-paid meters, system loss has been reduced significantly and also demand at consumer level reduced. Unified software for pre-paid meter is underway. Power Division has set a target to bring all big and medium consumers under pre-paid meter.

Bangladesh Rural Electrification Board (BREB)

Up to June 2016 Bangladesh Rural Electrification Board based with its 78 *polli bidyut samities* has connected total consumer 1,55,86,106 among them of 1,38,66,977 domestic, 2,20,292 irrigation, 11,06,381 commercial, 1,55,938 industrial and 2,36,518 others of 58,505 villages become possible by constructing 3,14,770 km distribution lines. Target and achievement of line construction and consumer connection of BREB from FY2005-06 to FY2015-16 is shown in Table 10.6.

Table 10.6: Physical Target and Achievement of BREB

FY	Distribution Line (Km)			Consumer Connection		
	Target	Achievement	Decrease/Increase (-)/(+)	Target	Achievement	Decrease/Increase (-)/(+)
2005-06	14500	15091	-1169	750000	741095	70832
2006-07	5476	4764	-10327	65000	453426	-287669
2007-08	5042	3089	-1675	245000	226252	-227174
2008-09	6116	5062	1973	368275	405990	179738
2009-10	2852	2713	-2349	420000	468563	62573
2010-11	2095	3028	315	180000	259548	-209015
2011-12	7700	10049	7021	269500	713713	464165
2012-13	10222	10279	230	300000	142899	-570814
2013-14	16971	17544	7265	600000	758932	616033
2014-15	18750	17021	-523	-	1839064	1080132
2015-16	30998	31612	14591		3597883	1758819

Source: Rural Electrification Board (REB), [Variance = Current year Achievement – Previous year Achievement]

Projects under Implementation of BREB

Presently, 16 projects are running under Bangladesh Rural Electrification Board under guidance of Power Division of Ministry of Power, Energy and Mineral Resources (MPEMR). In FY2015-16 Tk.4,411.21crore is allocated in Annual Development Programme (ADP) with a view to bring newer consumers under electrification umbrella. Besides, 15 *upazila* complexes is successfully electrified implementing a project "Electrification in local area (upazila complex) by using solar energy" under climate change trust fund of Ministry of forestry and Environment.

D. Sustainable Energy Development

Renewable Energy

Considering challenges of primary fuel, more emphasis has been given in power generation through renewable energy. This would especially meet the demand in areas where grid supply is not possible. According to the Renewable Energy Policy 2008, 10 percent of electricity is to be generated from renewable energy sources by 2021. Government has established Sustainable and Renewable Energy Development Authority (SREDA) in 2014 under Sustainable and Renewable Energy Development Authority Act, 2012. The establishment of SREDA is aimed to provide dedicated institutional support to promote renewable energy. The achievement of renewable energy is shown in table 10.7.

Table 10.7: Renewable Energy Contribution and Achievement (Up to April, 2016)

S.L.	Technology	Off-Grid	On-Grid	Total
1	Solar PV	193 MW	1 MW	194 MW
2	Wind	1 MW	0.9 MW	1.9 MW
3	Hydro	-	230 MW	230 MW
4	Biogas to Electricity	5 MW	-	5 MW
5	Biomass to Electricity	1 MW		1 MW
	Total	200 MW	232 MW	432 MW

Source: Power Division

Energy Efficiency and Energy Conservation

Government has undertaken a number of initiatives for efficient use of energy to reduce misuse of energy. Government has prepared an Action Plan to ensure Energy Efficiency and Conservation both at supply and demand side, where numbers of interventions have been identified for implementation with in time-frame.

Some initiatives on energy efficiency and energy conservation are given below:

a) **Efficiency Improvement in Power Generation Sector**

- Repowering of old and inefficient power plant
- Conversion of simple cycle to combine cycle

b) **Efficiency Improvement in Transmission Sector**

- Upgradation of transmission line and grid sub-stations
- Automation of generation control system

c) **Efficiency improvement in Distribution Sector**

- Upgradation of distribution line and sub-stations
- Power factor improvement through installation of capacitor bank/PFI plants
- Implementation of Pre-payment metering system
- Reduction of technical and non-technical losses

d) **Demand Side Management:**

- The 'Energy Efficiency and Conservation Master Plan up to 2030', approved in 2016, has been prepared by SREDA with the assistance from Japan International Cooperation Agency (JICA). The Government has set the following targets in the Master Plan for energy saving:
  - Save 15 percent primary energy per GDP by 2021
  - Save 20 percent primary energy per GDP by 2030

The main components of the Energy Efficiency and Conservation Master Plan up to 2030 are:

1. Energy management programme for large industries
2. Energy efficient or star labeling programme for electrical appliances
3. Energy efficient building programme and introduction of green building rating system.
4. Provide technical support and identify financing for project implementation
5. Create awareness of mass people

Regional Power Cooperation

To enhance the development of power sector Bangladesh Government is working with neighboring countries as well as SAARC, BIMSTEC, SASEC and D-8 for regional cooperation. In addition to India Bangladesh has taken initiative in cross border trade of electricity through bilateral and cooperation with Nepal, Bhutan and Myanmar. Effort has been taken to import hydro power from Nepal. A Memorandum of Understanding (MoU) between Bangladesh and Myanmar is underway. Discussion is going on to import electricity from Bhutan. Collaboration effort with the SAARC countries is continued.

Electricity Import from India

500 MW power is being imported from *Boharampur*, India since 5 October, 2013. Additional 500 MW power will be imported from *Bheramara* after enhancement of the same grid substation capacity by June 2018. Besides 100 MW power is being imported from *Palatana*, Tripura state

since March 2016. A feasibility study on grid interconnection facilities is going on to import additional 1,000 MW hydro power from India.

Electricity Import from Bhutan

A plan has been taken to import 2000 MW hydro power from Bhutan by constructing a interconnected grid line via *Alipurduar*, India to *Thakurgoan* , Bangladesh to *Purnia*, India.

Electricity Import from Nepal

Plan has been undertaken to import about 2,000 MW electricity from Nepal through grid interconnection. Recently fruitful dialogue has been started between the two countries.

China Cooperation in Bangladesh Power Sector and Investment Opportunity

A Memorandum of Understanding (MoU) has been signed between Bangladesh and China on October 21, 2012 to enhance cooperation in power sector. As a result cooperation and investment opportunity in Bangladesh power sector will be extended. For this both the countries will contribute to uplift the trade and economic cooperation. Electricity generation, transmission, distribution, energy efficiency, renewable energy have been identified as the scope of cooperation.

Oil, Gas and Mineral Resources

The main purpose of oil, gas and mineral resource sector is to meet growing energy demand of the country by undertaking enhanced exploration activities based on modern seismic survey like 3D survey and development and appraisal of oil and gas fields. Besides strengthening exploration and development of gas fields, the sector strategy also aims to reduce extreme dependence on natural gas through diversification of energy- mix, balanced and synchronised development of gas production, transmission and distribution activities, encourage participation of private entrepreneurs in oil and gas exploration, production and distribution.

Natural Gas Reserves

Natural gas is an important source of energy that accounts for 72 percent of the commercial energy of the country. Till now 26 gas fields have been discovered in the country. According to the latest estimate total initial gas in place (GIIP) is 38.02 trillion cubic feet (tcf), of which 27.12 tcf is recoverable in proven and probable categories. As of June 2016, total 13.90 tcf gas has been produced leaving 13.22 tcf net recoverable. Field-wise gas production and reserves are presented in Table 10.8.

Table 10.8: Status of Gas Production and Reserve

In Billion Cubic Feet (BCF)

Gas field	Total Reserve (Proven and Probable) (GIIP)	Reserve (Recoverable)	Production 2015-16	Cumulative Production 2015-16	Net Recoverable Reserve 2015-16
1. Titas	8148.9	6367.0	187.56	4035.86	2331.1
2. Habiganj	3684.0	2633.0	82.32	2231.89	401.1
3. Bakhrabad	1701.0	1231.5	13.84	795.52	436.0
4. Narsingdi	369.0	276.8	10.23	634.96	2125.0
5. Meghna	122.1	69.9	4.32	575.30	1857.7
6. Sylhet	370.0	318.9	3.00	209.81	109.1
7. Kailashtilla	3610.0	2760.0	26.15	59.18	10.7
8. Rashidpur	3650.0	2433.0	21.31	175.71	101.1
9. Beanibazar	230.7	203.0	3.46	92.92	110.1
10. Saldanadi	379.9	279.0	3.32	144.46	236.5
11. Fenchuganj	553.0	381.0	12.88	86.56	192.4
12. shahbazpur	677.0	390.0	10.41	22.51	367.5
13. Semutang	653.8	317.7	1.22	11.63	306.1
14. Sundalpur	62.2	35.1	1.24	9.98	25.1
15. Srikail	230.0	161.0	13.71	46.06	114.9
16. Begumganj	100.0	70.0	0.33	0.87	69.1
17. Jalalabad	1491.0	1184.0	95.22	1045.04	139.0
18. Moulavibazar	1053.0	428.0	15.32	290.23	137.8
19. Bibiyana	7427.0	5754.0	430.61	2490.96	3263.0
20. Bangura	1198.0	522.0	36.77	341.35	180.7
TOTAL	**35710.60**	**25814.96**	**973.25**	**13300.81**	**12514.1**
NOT IN PRODUCTION					
1. KUTUBDIA	65.0	45.5		0	45.5
2. RUPGANJ	48.0	33.60		0	33.6
TOTAL	**113.0**	**79.1**		**0**	**79.1**
PRODUCTION SUSPENDED					
1. SANGU	899.6	577.8		487.9	89.9
2. CHHATAK	1039.0	474.0		26.5	447.5
3. KAMTA	71.8	50.3		21.1	29.2
4. FENI	185.2	125.0		62.4	62.6
TOTAL	**2195.6**	**1227.1**		**597.9**	**629.2**
Grand total	**38019.2**	**27121.1**	**973.25**	**13898.71**	**13222.42**
TCF	**38.0**	**27.12**	**0.97**	**13.90**	**13.22**

Source: Petrobangla, Energy and Mineral Resources Division.

Natural Gas Production and Sector-wise Consumption

Natural gas is the main source of fuel for power, fertilizer, industrial, commercial and domestic sectors. Year-wise/sector-wise natural gas production and consumption are shown in Table 10.9.

Table 10.9: Production of Natural Gas and its Consumption by Sector

(In billion cubic feet)

FY	Production	Consumption									
		Power	Captive Power	Fertilizer	Industry	Tea Estate	Bricks	Com.	Dom.	CNG	Total
1990-91	172.84	82.6	-	54.2	13.2	0.7	0	2.9	10.5	0	164.1
1991-92	188.48	88.1	-	61.6	13.4	0.7	0.2	2.9	11.6	0	178.5
1992-93	210.98	93.3	-	69.2	15.2	0.7	0.2	2.4	13.5	0	194.5
1993-94	223.76	97.3	-	74.5	20.26	0.7	1.1	2.87	15.4	0	212.13
1994-95	247.38	107.4	-	80.5	24.24	0.6	1.1	2.88	18.86	0	235.58
1995-96	365.51	110.9	-	90.98	27.31	0.72	0.99	3	20.71	0	254.61
1996-97	260.99	110.82	-	77.83	28.62	0.71	0.48	4.49	22.84	0	245.79
1997-98	282.02	123.55	-	80.07	32.32	0.74	0.39	4.61	24.89	0	266.57
1998-99	307.48	140.82	-	82.71	35.79	0.71	0.35	4.71	27.02	0	292.11
1999-00	332.35	147.62	-	83.31	41.52	0.64	0.35	3.85	29.56	0	306.85
2000-01	372.16	175.27	-	88.43	47.99	0.65	0.44	4.06	31.85	0	348.69
2001-02	391.53	190.03	-	78.78	53.56	0.72	0.53	4.25	36.74	0	364.61
2002-03	421.16	190.54	-	95.89	63.76	0.74	0.52	4.56	44.8	0.23	401.04
2003-04	454.59	199.4	32.03	92.8	46.49	0.82	0.12	4.83	49.22	1.94	427.66
2004-05	486.75	211.02	37.87	93.97	51.68	0.8	0	4.85	52.49	3.62	456.3
2005-06	526.72	222.72	49.02	88.58	63.44	0.76	0	5.24	57.13	6.71	493.61
2006-07	562.21	221.1	93.47	62.51	77.48	0.75	0	5.66	63.25	11.99	536.26
2007-08	600.86	234.28	80.23	78.67	92.19	0.8	0	6.6	69.02	22.82	584.51
2008-09	653.75	256.31	94.7	74.85	104.39	0.65	0	7.46	73.78	31.02	643.16
2009-10	703.6	283.15	112.61	64.72	118.81	0.80	0	8.12	82.69	39.33	710.23
2010-11	708.9	273.8	121.2	62.8	121.5	0.8	0	8.5	87.4	38.5	714.4
2011-12	743.57	304.30	123.56	58.39	128.45	0.76	0	8.55	89.15	38.55	751.7
2012-13	800.6	328.8	134.1	60.0	135.7	0.8		8.8	89.7	37.8	795.8
2013-14	820.3	337.0	143.8	53.8	141.9	0.8	0	8.9	101.5	40.1	827.8
2014-15	890.7	354.3	150.1	54.0	147.3	0.8	0	9.1	118.2	42.9	877.0
2015-16	973.2	399.6	160.8	52.6	156.0	0.9	0	9.0	141.5	46.5	966.9

Source: Petrobangla , Energy and Mineral Resources Division

Sector- wise Gas Consumption Pattern

Sector-wise consumption pattern in FY2014-15 and FY2015-16 are given below:

Figure:10.6: Category-wise Gas Consumption FY2014-15

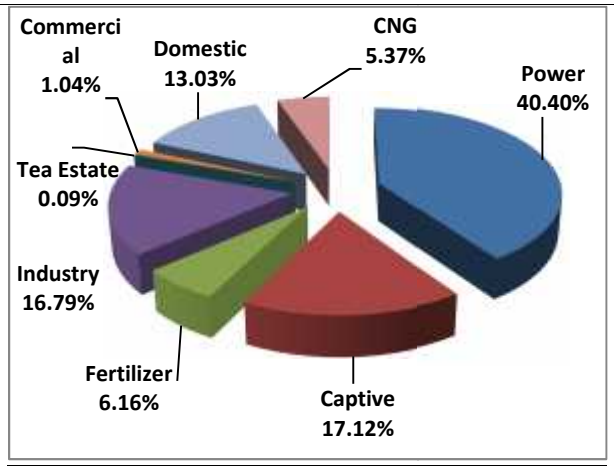
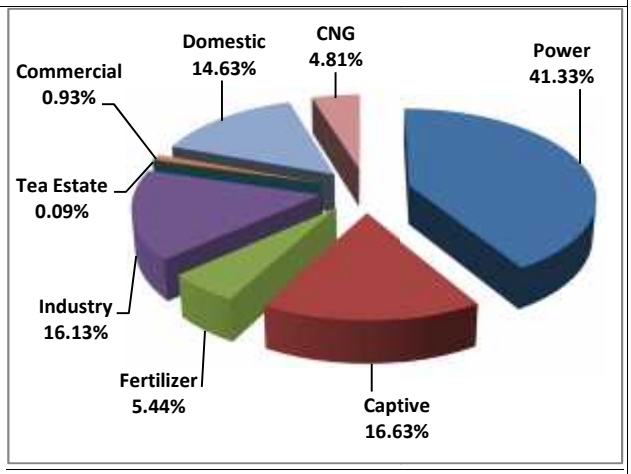


Figure:10.7: Category-wise Gas Consumption FY2015-16



Source: Petrobangla

Demand for Natural Gas

Various long term activities have been taken to increase gas production by 2,800 million cubic feet per day. Besides, steps have been taken for importing 5 million tonnes of LNG per annum in emergency basis. It is expected that, after successful completion of these planning daily production of gas will be stood at 4,800 million cubic feet per day.

Table 10.10: Sector-wise Average Gas Demand

(In Billion Cubic Feet)

CY	2016	2017	2018	2019	2020
Power	553	581	617	622	633
Captive	164	159	152	145	145
Fertilizer	104	104	104	104	104
Industry	156	172	183	199	203
Commercial	9	9	10	10	10
Brick	0	0	0	0	0
Domestic	115	120	127	132	135
Tea-Estate	3	3	3	3	3
CNG	43	43	43	43	43
Total	1147	1191	1239	1577	1276

Source: Petrobangla, Energy and Mineral Resources Division

Mineral Resources

Bureau of Mineral Development (BMD) grants exploration license, mining lease and quarry lease of different minerals like Coal, Hard Rock, Peat, Mineral Sand, Metallic Minerals, White

clay, Silica Sand, Ordinary Stone, Sand mixed Stone, Limestone, Clay/Shell, Coal Bed Methane etc.

Coal

BMD has granted mining lease of Coal in 1994 in favour of *Barapukuria* Coal Mining Company Limited (a company of *Petrobangla*) at *Barapukuria* of *Parbatipur Upazila* in *Dinajpur* District. Coal is being produced from this mine at present. Besides this in 2008 an exploration license was granted in favor of *Petrobangla* for coal at *Dighipara* of *Nawabgonj Upazila* in *Dinajpur* District. In order to develop *Dighipara* coal field, the exploration license agreement with *Petrobagnla* was assigned in favour of *Barapukuria* coal mining company Ltd. on 21st October, 2015.

Hard Rock

Mining lease of Hard Rock has been granted in 1994 in favor of *Maddhyapara* Granite Mining Company Limited (a company of *Petrobangla*) at *Maddhyapara* of *Parbatipur Upazila* in *Dinajpur* District. Hard Rock is being produced from the underground mine site at present.

Mineral Sand

Three exploration licenses for Mineral Sand exploration at *Chapainawabgonj sadar* and *Shibgonj Upazila* under *Chapainawabgonj* District and *Raypura Upazila* under *Narshingdhi* District were granted to Premier Minerals Ltd. (PML) in 2012. The validity of those exploration licenses already expired. Approval of new exploration and Mining lease for Mineral Sand extraction are under procedure.

Peat

Three exploration licenses for Peat at *Rajoir upazila* of *Madaripur* District and *Kotalipara upazilla* of *Gopalgonj* District were granted to *Padma* Mining and Energy Corporation Ltd. *Shadain Bangla* Mines and Electricity Ltd. and Reliance Mineral and Power Ltd. in 2010. The validity of those exploration licenses already expired. Approval of new exploration licenses are under procedure.

White Clay

BMD grants quarry lease to extract White Clay/China Clay which is the raw material of ceramic industry. Currently 14 quarries have been leased out to different companies in *Mymensingh* and *Netrokona* Districts.

Silica Sand

30 Silica Sand quarries have been leased out to different parties for silica sand extraction in Habiganj and Moulvibazar Districts from government khas land and another 15 silica sand quarries are leased out in private land in Habiganj District.

Ordinary Stone

Among the 40 Ordinary Stone/ Sand mixed stone quarries 8 have been leased at *Jaflong* in *Sylhet,* 2 in *Panchagar,* 6 in *Lalmonirhat* Districts to different parties for stone extraction. Remaining 24 quarries are being operated by local district administration on *Khas* land.

Petroleum Products

Bangladesh Petroleum Corporation (BPC), one of the largest state owned enterprises in the country, is responsible for importing petroleum product, provides storage facilities and ensures their uninterrupted supply. Present capacity of reserve of petroleum products are 10.91 lakh metric tonnes. To ensure the security of petroleum products a plan is taken to establish a new unit at Eastern Refinery for scaling up the capacity. The production capacity will be 45 metric tonne including the new unit. In order to create facilities for discharging refined and crude oil in the deep sea, BPC has taken up a project titled *'Single Point Mooring'*. Table 10.11 and 10.12 show the import quantity of crude and refined petroleum products during the period from FY2005-06 to FY2015-16:

Table 10.11: Import of Crude Oil

Fiscal Year	Quantity(Metric tonnes)	CandF Value/Million US$	Crore Taka
2005-06	1253285	573.65	3901.16
2006-07	1211037	604.73	4196.85
2007-08	1040084	762.08	5288.85
2008-09	860877	494.44	3431.40
2009-10	1136567	646.21	4491.41
2010-11	1409302	978.81	7037.00
2011-12	1085937	919.26	7053.51
2012-13	1292102	1060.30	8536.70
2013-14	1173825	968.55	7957.29
2014-15	1303194	734.00	5739.35
2015-16	10,93,120	336.49	3225.92

Source: Energy and Mineral Resources Division

Table: 10.12: Import of Refined Petroleum Products

Fiscal Year	Diesel, Octaneand Jet A-1		Lubricating Base Oil		Furnace Oil	
	Quantity (Metric ton)	Value (Crore Taka)	Quantity (Metric ton)	Value (Crore Taka)	Quantity (Metric ton)	Value (Crore Tk.)
2001-02	2072300	2535.62	15316	30.59	-	-
2002-03	2213899	3319.36	1911	5.10	-	-
2003-04	2262348	4015.81	6516	18.38	-	-
2004-05	2691750	7213.88	10189	38.14	39935	61.53
2005-06	2380582	9382.77	5137	35.53	-	-
2006-07	2536535	10443.20	4277	25.13	-	-
2007-08	2227753	14343.04	5006	29.94	-	-
2008-09	2507819	10945.24	4828	23.63	39935	61.53
2009-10	2634212	12024.18	7262	52.03	-	-
2010-11	2488456	21403.69	4749	43.75	230524	1123.17
2011-12	3409935	27111.24	4980	53.11	680982	3819.07
2012-13	2827160	21949.10	4853	38.56	803603	4367.26
2013-14	3158343	23485.56	-	-	1016101	5144.68
2014-15	3403890	18569.62	-	-	691705	2714.30
2015-16	3337427	11110.31	-	-	335150	660.52

Source: Energy and Mineral Resources Division

Subsidy for Petroleum Products

Bangladesh Petroleum Corporation (BPC) imports crude and refined petroleum products every year according to national demand. As the international price of crude and refined petroleum products was higher than the domestic selling price, BPC incurred loss by the selling these. The Government has to pay subsidy for import of petroleum products to recover from losses. However, the sharp reduction of petroleum prices in the international market helped to recover this losses. Table 10.13 shows the amount of subsidy given to BPC during FY2008-09 to FY2015-16.

Table 10.13: Amount of Subsidy given to BPC by the Government

(In Crore Taka)

FY	Amount of Subsidy
2008-09	1500.00
2009-10	900.00
2010-11	4000.00
2011-12	8549.50
2012-13	13557.83
2013-14	2477.60
2014-15	600.00
2015-16	0.00

Source: Bangladesh Petroleum Corporation

Mineral Resources (Except Oil and Gas) Investigation, Exploration and Evaluation

In order to expedite exploration of mineral resources and evaluate of that resource Geological Survey of Bangladesh (GSB) has been implementing a number of projects. Skilled manpower has been developed through the projects. Research facilities has also been made by procuring modern equipment to work in the micropaleontology, petrology-mineralogy, analytical chemistry, engineering geology, geophysics, RS and GIS and clay mineralogy laboratories. As a result, hard rock at *Maddhyapara*, low sulfur *Gondwana* coal at *Jamalganj-Kuchma*, *Barapukuria* and *Dighipara* of *Dinajpur* district and *Khalaspir* of *Rangpur* district has been discovered at shallower depth.

Besides these Peat, Glass Sand, White Clay, Construction Sand, Gravel, Limestone, Heavy minerals have been discovered in different parts of the country. In recent time GSB has discovered Limestone and Magnetic Rock (Iron Ore) in *Chakupara-Masidpur* area of *Alihat Union* of *Hakimpur upazila* of *Dinajpur* district, Titanium Oxide (TiO2) enriched rocks at *Madarpur* of *Mitha pukur upazila*, *Rangpur* district, fossil in *Chalanbil* Area and tress of Heavy Minerals in the Char area of *Jamuna* River. Discovered minerals by GSB take an important role in the revenue income of the Government. GSB actively took part in the delineation of maritime boundary of Bangladesh in accordance with the implementation of United Nations Convention on Law of the Sea UNCLOS III.GSB discovered different types of minerals equivalent to nearlyTk.13,958 billion that takes an important role in the revenue income of the Government (Table 10.14)

Table 10.14: Discovered Minerals in Bangladesh

Name of Minerals	Number of fields	Quantity (Probable) In Million MT
Coal	4	1671
Peat	6	200
Limestone	3+	129
White Clay	3	40
Glass Sand	5	116
Hard Rock	1+	115+
Heavy Mineral	-	-

Source: GSB

Hydrocarbon Unit

Hydrocarbon Unit provides technical support to Energy and Mineral Resources Division for the development of Oil, Gas and Mineral Resources sector and materials related thereto. Important functions of Hydrocarbon Unit are: Reserve and Resource Estimation at regular intervals, Data Management, Production and Depletion Management, Monitoring of Production Sharing Contracts (PSCs), Recommendation on PSCs approval etc.

A mini-data bank in the Hydrocarbon Unit operates some selected data of the Hydrocarbon sector like Gas Reserve, Undiscovered Gas Resources and Gas Production and Consumption. Hydrocarbon Unit has published Monthly Report on 'Gas Reserve and Production' up to February 2016 and also has issued Annual Report on 'Gas Production and Consumption' 2015-16. In addition Besides, Hydrocarbon Unit assists Energy and Mineral Resources Division to provide views/comments on different issues regarding energy sector to international and regional organisations. It is conducting activities as a Think Tank of Energy and Mineral Resources Division.

Hazard Control and Safety Management

Department of Explosives is ensuring the safety during import, storage, transport, handling etc. of commercial explosives, flammable liquid including petroleum, gases and various hazardous substances and inspection of the concerned installation/site/storage, premises and grant license/NOC under acts examination and analysis of the bomb/explosives exhibit sent by honorable Court for expert opinion.

283 MT. Powerjel, 3,18,446 pieces Detonators, 25.55 MT. Emulsion, 10,150 pieces Shape Charge, 100 Kg. main charge, 5520 Kg. Delay Electric Detonators, 4210 pieces Electric Detonators, 500 pieces Fire Works, 24 pieces Fire Head Igniter, 282 Pieces Cutter, 40 pieces Primer, 40 pieces Prime Dile Power, 90 MT. Water Resistant Packaged Explosives, 3,20,000 meter Detonating Fuse, 1,42,886 meter Detonating Cord, 16.60 Kg. Detonating Cord, 440 pieces Boosters, 24 pieces Powder Charges, 15 MT. Emulex have been imported under import permit/license. At the same time 21 transport license and 11 explosives import license granted in favour of nationalised gas field company *Madhapara* hard Rock Mining Co. *Barapukuria* Coal

Mining Company and other international oil companies for exploration of the gas field and seismic survey.

This Department has granted 14,07,827 permit/license to import of LPG cylinders, 466 LPG cylinder storage license and 799 petroleum storage license in favour of diesel/furnace oil based different rental power plant and others companies. Furthermore 11,514 petroleum carrying/ storage tanks of different petroleum oil tanker both live and scrap vessels have been tested and gas free certificate have been issued. 481 bomb/improvised devices have been tested and expert opinion have been furnished to the Honorable Court against the cases framed under the Explosive Substance Act.

Regulatory Functions in Energy Sector

To expedite long term development of the energy sector, the Bangladesh Energy Regulatory Commission (BERC) is carrying out activities for creating favourable environment in electricity generation, energy transmission, transportation and marketing and for management and operation of this sector. In addition, the Commission has been working to ensure transparency in tariff fixation, protecting consumers interests and creating competitive market.

Tariff Determination

The Commission determines bulk tariff for power generation, wheeling charge for transmission and retail tariff for distribution of electricity. The Commission also determines gas transmission charge for gas transmission companies, distribution tariff (margin) for gas distribution companies and tariff for the end users of gas. According to BERC Act, 2003 the Commission is also responsible for petroleum products tariff and for that developing petroleum products tariff regulations. The Commission also fixes the tariff taking into consideration the financial capabilities of the producing/distributing agencies, consumers' affordable capacities and government/public affordability to give subsidy. These steps are ensuring attractive environment to invest in this sector and to promote financial discipline in this sector.

Introduction of Life-line Tariff for Poor and Low Income Group

Considering the socio-economic condition of the poor and lower middle income consumer, the Commission fixed the Life-line tariff for residential uses of 1-50 unit of electricity in harmony to all class of consumers. It remained unchanged in the last announced tariff order and electricity bill remains same as before.

Gas Development Fund

The Commission created 'Gas Development Fund' in July 2009 with a view to provide fund to nationalised companies responsible for exploration and production of gas. The cumulative deposit in the fund is Tk 4,652.70 crores up to June, 2015. 24 prioritised projects have been selected for the FY2010-11 to FY2017-18 with the estimated expenditure of Tk. 3,977.86 crores. Meanwhile, 7 projects have already been implemented with the approximate cost Tk.1,366 crores which are providing about 76 million cubic feet gas in the national grid. More 17 projects

are under construction with the estimated cost of Tk.2,472.00 crores. Hopefully significant amount of gas will be added in the national grid after finishing these projects.

Creation of Electricity Maintenance and Development Fund

In order to increase the efficiency and capability of Bangladesh Power Development Board (BPDB), the Commission has created, on February 1, 2011, the Electricity Maintenance and Development Fund with the increase of 5.17 percent of the bulk tariff. The deposited amount in that fund was Tk.1,034.35 cores in FY2014-15 and cumulative deposits Tk.3,864.03 cores till December, 2015. *Bibiyana* 400 Megawatt (+/-10%) gas based combined cycle power plant is under constructions using this fund. The total expenditure of the project will be Tk.2,508.45 cores. Tk.208.00 cores have been used from that fund. However, the project will be completed in FY2016-17.

Creation of Energy Security Fund

From 1 September, 2015 gas price of the weighted average of per cubic meter has been increased by 26.29 percent or Tk.1.36. 'Energy Security Fund' has been created with this increased tariff earning of per unit Tk.1.01. Every year about Tk.2,600 crores will be deposited by this regulation which will be used for many development works.

Electricity Bulk Tariff Cross Subsidisation Arrangement

To improve financial status of power distributing agency/company*/polli bidyut somities*. Commission is working hard by providing regulatory assistance. Due to backward location, large investment cost, poor consumer mix, more residential and irrigation consumers, low electricity consumption, etc, the financial condition of rural PBSS and other distribution utilities are not sound. Commission has taken an initiative towards expansion of area coverage for electrification by fixing bulk tariff with cross subsidy i.e. higher bulk tariff for agencies responsible for urban distribution areas and lower bulk tariff for rural areas. This helped rural PBSs gradually moving towards break-even-point/solvency from deficit. As the PBSs are of separate entity and because of geographical location they are not of same financial standing, The Commission has issued directive to deposit 75 percent margin of the solvent PBSs in BREB Cross Subsidisation Fund as per procedure guidelines given by the Commission to be distributed among insolvent families according to the procedure authorized by the Commission. Since FY2008-09 to till December 2015, PBSs with margin deposited in BREB cross subsidisation fund Tk.2,854 crores and the money were disbursed among sick PBSs.

Providing License

The Commission awarded licenses during July, 2015 to June, 2016 for different activities in the energy sector. Among those 252 licenses in the power sector, 214 licenses in the gas sector, and 175 licenses in the petroleum sector have been awarded. For this reason investment has increased in the energy sector as well as Commission gained the financial support to run itself and to contribute in the economy.

Arbitration Activities

Bangladesh Energy Regulatory Commission is empowered through BERC Act, 2003 to settle disputes between licensees and consumers of the energy sector. Learned High Court Division of Supreme Court on a writ, ordered that as per BERC Act, 2003, BERC is the most appropriate forum for settlement of any dispute between licensees and consumers and accordingly contesting parties must apply to Bangladesh Energy Regulatory Commission. Significant numbers of cases have been sent to the Commission by the order of the honorable High Court and Lower Court according to this ruling. Since the BERC Act, 2003 and Bangladesh Energy Regulatory Commission Dispute Settlement Regulations, 2014 enacted, the Commission settled a good number of disputes between licensees and consumers and issued orders.

Introduction of Revenue Requirement Format for Tariff Application

Commission developed Revenue Requirement Format for tariff application by the licensees. This will help the licensees to provide all relevant information and document for tariff application as well as help commission to process and determine tariff uniformly.

Establishing Transparency and Accountability

To uphold accountability and transparency in the energy sector the Commission has taken an initiative to introduce Uniform System of Accounts for the all licensees. This procedure is in implementation stage at this moment. By this improved procedure transparency and accountability will be increased in the energy sector.

Preservation of Consumer's Rights

The Commission is working relentlessly to preserve the consumer's rights. To establish the consumer's right the Commission conduct regular outreach programmes, open meeting and public hearing in case of fixing tariff, to protect consumer harassment, and the ghost bill. Others important steps taken by the Commission are pre-paid meter establishment, introduction of mobile billing system, online customer services and issuing of yearly bill clearance certificates.

Energy Efficiency Activities

The Commission has taken steps like proper maintenance of active power plant, uses of energy efficient instruments, converting simple cycle plant into combined cycle plant, and others to increase energy efficiency around the country. These steps will not only increase the electricity production but also will save lots of money. Besides, a step has been taken for co-generation and energy auditing.

Activities relating Energy Auditing

The Commission believes that energy auditing will ensure energy efficiency in the energy sector by proper use of better technologies. Energy audit will give the Commission the real picture of energy waste and standard of instruments. The Commission is working continually on this important matter.