

## CHAPTER 10 POWER AND ENERGY

*At present 80 percent people of Bangladesh have access to electricity facilities. There is enormous demand for electricity, oil, gas and natural resources in agriculture, industry and service sector as well as daily life of Bangladesh. In this context, the Government is giving top priority to the development of power and energy sector. The total installed electricity generation capacity stood at 15,755 MW of which the highest generation was 9,479 MW in FY2016-17. Besides, net electricity production was 52,193 million kilowatt-hours in FY2015-16 which increased to 57,276 million kilowatt-hours in FY2016-17. In addition, total system loss of transmission and distribution of electricity substantially declined to 9.98 percent in FY2016-17 from 21.25 percent in FY2005-06. Moreover, energy saving and environment-friendly power generation systems have been introduced using renewable and modern technology. On the other hand, natural gas met almost 68 percent of the country's total commercial use of energy. A total of 26 gas fields have been discovered up to June 2017 from which about 14.73 trillion cubic feet of gas has been produced cumulatively leaving recoverable net at 12.39 trillion cubic feet. Besides, the country has a reserve of about 12.21 million metric tonnes fuel oil. For ensuring the energy security, a plan to set up a new unit of the Eastern Refinery has been undertaken. 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 2030.*

### **Power Sector**

At present 80 percent people of the country are covered by electricity facilities (including renewable energy). After assuming the office in 2009, the Government took several initiatives such as instant, short, medium and long term plan to meet the increasing demand of electricity. As a result installed generation capacity has been raised by more than three-fold to 15,755 MW (including captive) during this period. At present per capita generation is 433 kWh (including captive) which is lower compared to that of many developing countries. Up to June 2017 about 25.9 million consumers are connected with the national grid of 4,01,000 km. The system loss of electricity decreased to 12.19 percent in

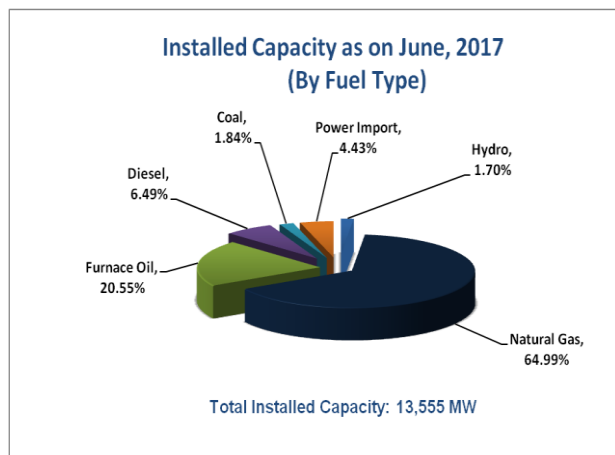
FY2016-17 from 21.25 percent in FY2005-06.

### **A. Power Generation**

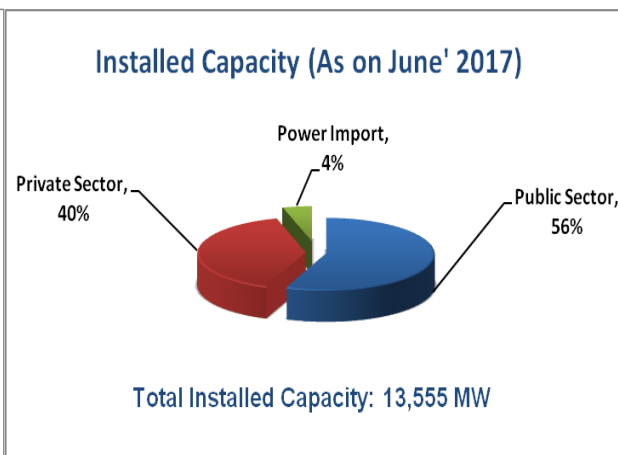
#### **Power Generation Capacity**

Total grid based installed capacity was 13,555 MW in FY2016-17 including 7,582 MW in public sector, 5,373 MW in private sector and 600 MW from cross border. In order to enhance the reliability and productivity of these plants, the Government has taken initiatives for renovation of the old and inefficient power plants. The installed capacity of power generation by fuel type and ownership in FY2016-17 is shown in Figures 10.1 and 10.2 respectively.

**Figure 10.1: Installed Capacity (Derated)**



**Figure 10.2: Installed Capacity (Derated)**



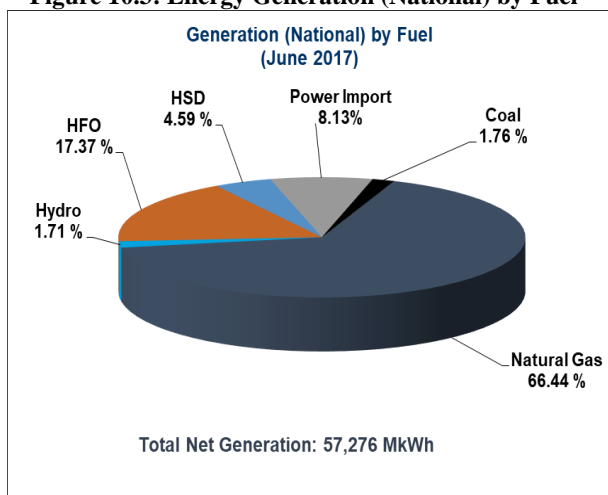
Source: Bangladesh Power Development Board (BPDB)

**Power Generation**

A total of 57,276 million kWh net energy was generated from public and private sector power plants during FY2016-17. Out of which 46.44 percent electricity was generated by public sector power plants. The share of

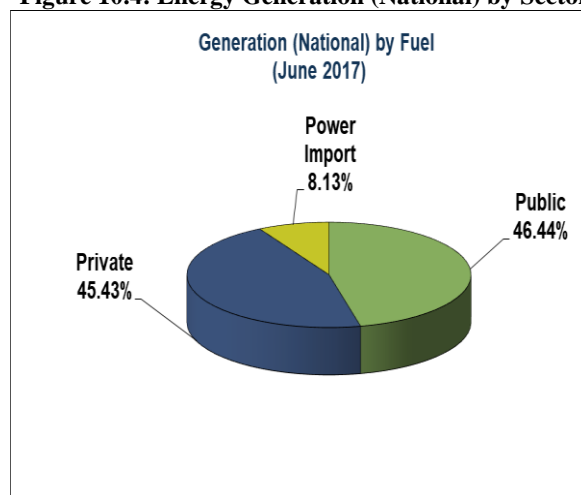
gas, hydro, coal, import and oil based energy generation were 66.44 percent, 1.71 percent, 1.76 percent, 8.13 percent and 21.96 percent respectively. Energy growth in FY2016-17 was about 9.74 percent. Fuel wise and sector wise net energy generation in FY2016-17 are shown in figure 10.3 and 10.4 respectively.

**Figure 10.3: Energy Generation (National) by Fuel**



Bangladesh Power Development Board, Power Division.

**Figure 10.4: Energy Generation (National) by Sector**



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### Maximum Power Generation

In spite of significant increase in generation actual demand for electricity could not be met due to the transmission and distribution bottlenecks as well as deficit in gas supply to

power plants. From the historical data it is evident that in FY2005-06 maximum generation was 3,812 MW which increased to 9,479 MW on 7 June 2017. The installed capacity (derated) and maximum generation since FY2005-06 are presented in Table 10:1.

**Table 10.1: Installed Capacity and Maximum Generation**

Fiscal Year	Installed capacity (derated) MW	Maximum generation MW
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	9036
2016-17	12771	9479

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 154 billion cubic feet in

FY2005-06, which increased to 218 billion cubic feet in FY2016-17. The consumption of natural gas and liquid fuel since FY2005-06 are given in Table 10.2.

**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
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
2016-17	218	587	513	348

Source: BPDB, Power Division

### Power Sector Development and Future Plan

The Power Sector Master Plan-2016 (PSMP) has been prepared considering the scarcity of natural gas and increasing demand for electricity. According to the PSMP, under long-term plan, there are targets of achieving electricity generation capacity of 24,000 MW

against a demand of 19,000 MW by 2021, 40,000 MW against a demand of 33,000 MW by 2030 and 60,000 MW against a demand of 52,000 MW by 2041. The Power Division is now reviewing the Power System Master Plan-2016 considering the changing scenarios in the power sector. Table 10.3 shows power sector development and future plan of the Government.

**Table 10.3: Power Sector Development and Future plan**

S L	Description	2017 (June'17)	2021(PSMP 2010)	2030 (PSMP 2010)	2041(PSMP 2016)
1.	Installed Capacity (MW)	15,755	24,000	40,000	60,000
2.	Electricity Demand (MW)	9,500	19,000	33,000	52,000
3.	Transmission Line (Ckt. KM)	10,436	12,000	27,300	34,850
4.	Substation Capacity (MVA)	30,993	46,450	1,20,000	2,61,000
5.	Distribution Line (KM)	401,000	4,78,000	5,26,000	5,30,000
6.	Per Capita Power Generation (KWh)	433	700	715	1,475
7.	Access to Electricity (%)	80	100	100	100

Source: Power Division

### Power Generation Projects

Several projects are underway both in public and private sectors. The expected power generation targets by 2021 under ongoing projects are summarised in Table 10.4.

**Table 10.4: Power Generation Projects (Under Construction)**

Sector	No. of Projects	Capacity (MW)
Public Sector	17	7225
Private Sector	19	4772
Total (Under Construction)	36	11,997

Source: Power Division

Among them mentionable projects are:

#### Public Sector

- Siddirganj 335 MW CCPP
- Shikalbaha 150-225 MW CCPP
- Bheramara 360 MW CCPP (ST unit)

- Chapainawabganj 104 MW PP
- Ghorasal 300-450 MW CCPP
- Bibiana South 383 MW CCPP
- Sirajgonj 225 MW CCPP (2<sup>nd</sup> Unit)
- Sirajgonj 225 MW CCPP (3<sup>rd</sup> Unit)
- Bibiana number 3 CCPP
- Ghorasal Repowering 3rd Unit

#### Private Sector

- Shorishabari 3 MW Power Plant
- Kamalaghat, Munshiganj 50 MW Power Plant
- Kushiara 163 MW CCPP
- Dhormopasha, Sunamgonj 32 MW Solar Power Plant
- Sutakhali, Mymensingh 50 MW Solar Power Plant
- Teknaf 200 MW Solar Park
- Teknaf Cox's Bazar 20 MW
- Kodda 149 MW Power Plant
- Sirajgonj 400+/-10 MW CCPP

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- Jolda, Chittagong 100 MW Power Plant
- Anowara, Chittagong 300 MW Power Plant
- Chittagong 612 MW Coal Based Power Plant

### B. Transmission System

#### Power Grid Company of Bangladesh Ltd. (PGCB)

Power Grid Company of Bangladesh Ltd. (PGCB) is responsible for operation, maintenance and development of transmission system all over Bangladesh. Power generated in different power plants all over the country is transmitted to the national grid through 400 kV, 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. As on June 2017, the lengths of 400 kV, 230 kV and 132 kV transmission lines increased to 559.76 ckt km, 3,324.99 ckt km and 6,550.95 ckt km (including DPDC 85.2 ckt km) 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 was increased to 4,200 km till June 2010 after completing the National Load Dispatch Centre (NLDC) project. Up to June 2017 the length of OPGW became about 5,549 km. Table 10.5 shows transmission system and sub-station infrastructure by PGCB.

**Table-10.5: Transmission System and Substation Infrastructure by PGCB**

Fiscal Year	Transmission System (ckt km)			400 kV HVDC Substation		400/230/132 kV station		230/132 kV Substation		132/33 kV Substation	
	400 kV	230 kV	132 kV	No	MW	No	MVA	No	MVA	No	MVA
2005-06	-	1466	5340	-	-	-	-	09	4500	65	6572
2006-07	-	1466	5529.60	-	-	-	-	10	5175	70	7219
2007-08	-	2314.50	5533.60	-	-	-	-	12	5850	71	7526
2008-09	-	2644.50	5607.60	-	-	-	-	13	6075	71	7399
2009-10	-	2647.30	5670.30	-	-	-	-	13	6300	75	7844
2010-11	-	2647.30	6018	-	-	-	-	13	6675	81	8437
2011-12	-	2647.30	6080	-	-	-	-	13	6675	83	8737
2012-13	-	3020.77	6080	-	-	-	-	15	6975	84	9705
2013-14	164.70	3044.70	6120	01	500	-	-	18	8775	86	10714
2014-15	164.70	3171.45	6358.83	01	500	01	520	19	9075	89	11964
2015-16	220.70	3171.45	6396.83	01	500	01	520	19	9375	90	12420
2016-17	559.76	3324.99	6550.95	01	500	03	2210	24	11485	117	17298

Source: Power Division

### C. Power Distribution System

At present the following six 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)
6. Northern Electricity Supply Company (NESCO)

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### Power Distribution Projects

An integrated power distribution programme has been undertaken to increase the distribution network in order to bring 100 percent populations under electricity coverage by 2021 as well as to improve the customer service. Up to June 2017, about 25.9 million consumers are connected with the grid through construction of 4,01,000 km. distribution lines. Some major ongoing power distribution expansion projects are mentioned below:

- Pre-paid Metering Project for Distribution Southern Zone Chittagong (Phase -1)
- Power Distribution System Development Project, Chittagong
- Rural Electrification Expansion Rajshahi-Rangpur Division Programme-II
- 2.5 Million Consumer Connection through Rural Electrification Expansion
- Expansion and Strengthening of Power System Network under DPDC Area
- Construction and Augmentation of Substation and Installation of Capacitor Bank in Power System under DPDC Area
- Augmentation and Rehabilitation of Distribution System in DESCO Area
- Smart Prepayment Metering Project for West Zone Power Distribution Company Ltd (WZPDCL) Area.

### System Loss

System loss is one of the key performance indicators of the distribution entities. To achieve desired performance of the sector, system loss needs to be reduced further. Various measures, such as continuous

performance monitoring of the utilities reforms and target-oriented measures are being implemented to reduce the system loss. The distribution system loss from FY2005-06 to FY2016-17 is shown in Table-10.6.

**Table 10.6: Year- wise System Loss Statistics**

Fiscal Year	Distribution (%)	Total Loss (%)
2005-06	16.53	21.25
2006-07	16.26	20.25
2007-08	15.56	18.45
2008-09	14.33	16.85
2009-10	13.49	15.73
2010-11	12.75	14.73
2011-12	12.26	14.61
2012-13	12.03	14.36
2013-14	11.96	14.13
2014-15	11.34	13.54
2015-16	10.96	13.10
2016-17	9.98	12.19

Source: Power Division

### Accounts Receivable

To improve the efficiency of power sector the Government is taking various activities which will help to ensure transparency and accountability. From FY2005-06 to FY2016-17 year wise accounts receivables are shown in Table 10.7.

**Table 10.7: Year wise Accounts Receivable**

Fiscal year	Accounts Receivable (Equivalent Months)
2005-06	3.83
2006-07	2.76
2007-08	2.45
2008-09	2.44
2009-10	2.40
2010-11	2.22
2011-12	2.21
2012-13	2.06
2013-14	2.04
2014-15	2.01
2015-16	2.00
2016-17	1.89

Source: Power Division

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### Power System Interface Meter

A total of 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 are being used in energy auditing system and playing significant role in reducing system loss.

### Pre-Paid Meter

Power Division has taken steps to introduce pre-paid metering method with an aim of ensuring faster bill payment with hundred percent collections. To improve power distribution system 3,33,246 prepaid meters have been installed in different entities. A target has been set to install 67,60,000 prepaid meters by June 2018. In addition, installation of 2,00,00,000 smart prepaid meters is underway. A decision has been made by Power Division to install 4,310,000 prepaid meters under 4 projects by BPDB (10,60,000), BREB (31,00,000), DPDC

(10,00,000), DESCO (5,00,000), WZPDCL (5,00,000) and NWZPDCL (6,00,000). After installation of these pre-paid meters, virtually there will be no accounts receivable of pre-paid consumers. Moreover, due to introduction of pre-paid meters, system loss has been reduced significantly. Power Division has set a target to bring all big and medium consumers under pre-paid meter system.

### Bangladesh Rural Electrification Board (BREB)

Up to June 2017 Bangladesh Rural Electrification Board with its 80 *Palli Bidyut Samities* connected a total of 1,90,97,679 consumers. Among them 1,71,81,206 were domestic, 2,31,501 irrigation, 12,51,987 commercial, 2,39,032 charitable institutions, 1,62,435 industrial and 31,515 other constructions. These consumers were connected by constructing 3,51,000 km distribution lines. Target and achievement of line construction and consumer connection of BREB from FY2005-06 to FY2016-17 is shown in Table 10.8.

**Table 10.8: Physical Target and Achievement of BREB**

Fiscal Year	Distribution Line (Km)		Consumer Connection	
	Target	Achievement	Target	Achievement
2005-06	14500	15091	750000	741095
2006-07	5476	4764	65,000	453426
2007-08	5042	3089	245000	226252
2008-09	6116	5062	368275	405990
2009-10	2852	2713	-	461417
2010-11	2095	3028	-	259548
2011-12	7700	10049	-	713713
2012-13	10222	10279	-	304417
2013-14	16971	17544	-	758932
2014-15	18750	18698	-	1839064
2015-16	30998	31612	-	3597883
2016-17	-	36230	-	3600000

Source: Rural Electrification Board (REB)

### **Projects under Implementation of BREB**

Presently 16 projects are being implemented under BREB against which nearly Tk.5,560 crore has been allocated in the revised Annual Development Programme of FY2016-17. Among the 16 projects for expansion and development and enhancement of existing distribution system 4 projects are for development and enhancement of distribution system, 1 for installation for pre-payment meter, 1 for technical assistance, 1 for replacement of overloaded transformers, 6 for expansion of distribution line and 3 for consumer connection. The estimated cost against the ongoing 16 projects is nearly Tk.36,912.88 crore. In addition, 20,737 km new lines have been constructed/renovated till February 2017. Besides, till February 2017, 42 sub-stations have been constructed /renovated against the target of 84 sub-stations and all these plans are underway to connect 3 million consumers and install 7 lakhs pre-payment meters.

### **Power Generation by BREB**

Rural Power Company Limited (RPCL) has been formed incorporating Bangladesh Rural Electrification Board and 13 *Palli Bidyut Samities*. RPCL is generating 287 MW of electricity in total through 3 plants which include a 210 MW combined cycle at *Shambuganj, Mymensingh*; a 52 MW at *Kodak, Gazipur* and a 25 MW at *Raozan, Chittagong*.

## **D. Sustainable Energy Development**

### **Renewable Energy**

The reserve of primary fuel natural gas is decreasing gradually in Bangladesh. To

develop energy sector and promote renewable energy, Sustainable and Renewable Energy Development Authority (SREDA) Act was enacted in 2012. According to the law, SREDA was established for effective utilisation and conservation of renewable energy both in public and private sector. To monitor and co-ordinate renewable energy and efficiency of energy related issue different agencies are working with SREDA. A total of 10 solar park projects (2 solar roof top, 1 solar street lightening, 4 solar charging station, 1 solar irrigation and 2 wind projects) are now under implementation.

### **Energy Efficiency (EE) and Energy Conservation (EC)**

The Government has undertaken a number of initiatives to ensure efficient use of energy. In the meantime, the Government has formulated ‘Energy Efficiency and Conservation Master Plan up to 2030’ as well as Energy Efficiency and Conservation Rules and Action Plan to ensure energy efficiency and conservation where numbers of interventions have been identified for implementation within the stipulated 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 plants
- Conversion of single cycle into combined cycle
- Waste heat recovery from the exhaust of power plant



**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 lines 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' that was approved in 2016 has been prepared by SREDA with the assistance of 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

**Recent Achievements**

- 'Energy Efficiency and Conservation Promotion Financing Project' has been initiated to promote energy efficiency in industries as well as in residential sector through introducing energy efficient equipments, appliances and electrical gadgets. Already 4 No Objection Certificates (NOCs) have been issued in favour of 4 different companies by SREDA for installing energy efficient machinery at 4 percent interest loan.
- Energy Saving School Awareness Programme has already been started and such programmes have been organised in 19 schools.
- A regulation on energy audit is at final stage of approval.
- A regulation on energy labeling is under process.
- Energy efficiency and renewable energy related topics have been incorporated in the curricula of academic institutes.
- Significant numbers of waste heat recovery and co-generation projects have been implemented.
- Country Action Plan (CAP) for Improved Cook Stove (ICS) has been prepared to disseminate ICS around the country. Around 3 million improved cook stoves of 7 different models have been distributed so far and 30 million

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inefficient traditional cook stoves are targeted to be replaced by ICS by 2030.

- Dissemination of Improved Rice Par Boiling System (IRPS) in Rice Husking Mills has been introduced. Around 75 IRPS have been installed so far.
- Replacement of conventional street lights by LEDs and placements of solar lights have been initiated and already different projects have been implemented in different places of different city corporations and municipalities.
- Gradual replacement of inefficient brick kiln by efficient brick kiln (Zig-zag or Hybrid Hoffman) is going on. Seminars and workshops are being organised regularly to create awareness regarding this among relevant stakeholders.
- For mass awareness about energy efficiency and conservation print, electronic and social medias are being used.

### **Result Based Management and Implementation of Key Performance Indicators (KPI)**

Power Division has introduced Annual Performance Agreement (APA) in power sector to improve performance of generation, transmission and distribution entities. Agreements have been signed between the Power Division and the entities. Under APA target, Key Performance Indicators (KPIs) have been set for FY2016-17. The KPI targets are being used as reliable measuring tools for monitoring and evaluating different activities of the entities.

### **Regional Power Cooperation**

To enhance the development of power sector Bangladesh Government is working with neighbouring countries as well as SAARC, BIMSTEC, SASEC and D-8 for regional cooperation. In addition to India, Bangladesh has taken initiative for cross border trade of electricity through bilateral cooperation with Nepal, Bhutan and Myanmar.

#### **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 powers from India.

#### **Electricity Import from Bhutan**

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

#### **Electricity Import from Nepal**

A plan has been taken 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 21 October 2012 to enhance cooperation

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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 scopes of cooperation.

### Oil, Gas and Mineral Resources

The main purpose of oil, gas and mineral resource sector is to meet energy demand of the country by undertaking exploration, production, development and appraisal of oil and gas fields and subsequent energy reserve enhancement. The sector mainly aims to reduce extreme dependence on natural gas through diversification of energy-mix and alternative/renewable energy resource usage,

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 accounts for 68 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 38.03 trillion cubic feet (Tcf), of which 27.12 Tcf is recoverable in proven and probable categories. Till June 2017, a total of 14.73 Tcf gas has been produced leaving 12.39 Tcf as net recoverable. Status of field-wise gas production and reserves is presented in Table 10.9.

**Table 10.9: Status of Gas Production and Reserve**

In Billion Cubic Feet (BCF)

Gas field	Wells	Total Reserve (Proven and Probable) (GIIP)	Reserve (Recoverable)	Production 2016-17	Cumulative Production June 2017	Net Recoverable Reserve July 2017
1. Titas	26	8148.9	6367.0	191.0	4323.5	2043.5
2. Habiganj	7	3684.0	2633.0	81.2	2313.1	319.9
3. Bakhrabad	6	1701.0	1231.5	14.8	809.8	421.7
4. Narsingdi	2	369.0	276.8	10.3	189.0	90.8
5. Meghna	1	122.1	69.9	4.4	63.6	6.3
6. Sylhet	2	370.0	318.9	2.8	212.6	106.3
7. Kailashtilla	5	3610.0	2760.0	23.7	659.4	2100.6
8. Rashidpur	5	3650.0	2433.0	20.6	595.9	1837.1
9. Beanibazar	2	230.7	203.0	4.2	97.1	105.9
10. Saldanadi	1	379.9	279.0	1.9	88.5	190.5
11. Fenchuganj	3	553.0	381.0	8.8	152.3	228.7
12. shahbazzpur	3	677.0	390.0	9.8	32.3	357.7
13. Semutang	2	653.8	317.7	0.8	12.4	305.3
14. Sundalpur	0	62.2	35.1	0.0	10.0	25.2
15. Srikail	3	240.00	161.0	15.0	61.9	99.1
16. Begumganj	0	100.0	70.0	0.0	0.9	69.1
17. Rupganj	1	48.0	33.6	0.4	0.4	33.2
18. Jalalabad	7	1491.0	1184.0	96.6	1094.2	89.8
19. Moulavibazar	5	1053.0	428.0	13.7	296.9	131.6

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Gas field	Wells	Total Reserve (Proven and Probable) (GIIP)	Reserve (Recoverable)	Production 2016-17	Cumulative Production June 2017	Net Recoverable Reserve July 2017
20. Bibiyana	26	7427.0	5754.0	436.9	2747.6	3006.4
21. Bangura	5	1198.0	522.0	34.8	376.8	145.2
<b>TOTAL</b>	<b>112</b>	<b>35768.6</b>	<b>25848.5</b>	<b>971.6</b>	<b>14134.6</b>	<b>11714.0</b>
<b>NOT IN PRODUCTION</b>						
1. KUTUBDIA		65.0			0	45.5
<b>TOTAL</b>		<b>65.0</b>			<b>0</b>	<b>45.5</b>
<b>PRODUCTION SUSPENDED</b>						
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
<b>TOTAL</b>		<b>2195.6</b>	<b>1227.1</b>		<b>597.9</b>	<b>629.2</b>
<b>Grand total</b>		<b>38029.2</b>	<b>27121.1</b>		<b>14732.5</b>	<b>12388.7</b>
<b>TCF</b>		<b>38.03</b>	<b>27.12</b>		<b>14.73</b>	<b>12.39</b>

Source: Petrobangla, Energy and Mineral Resources Division.

### Natural Gas Production and Sector-wise Consumption

Natural gas is the main source of fuel for power, fertiliser, industrial, commercial and

domestic sectors. Year-wise/sector-wise natural gas production and consumption from FY2005-06 to FY2016-17 are shown in Table 10.10.

**Table 10.10: Production of Natural Gas and its Consumption by Sector**

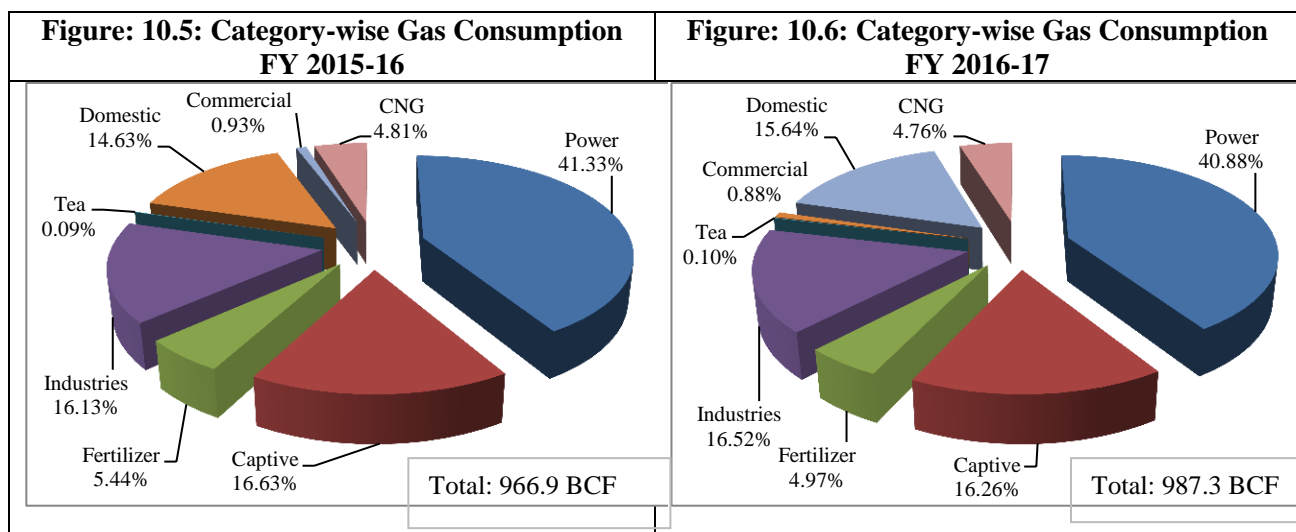
(In billion cubic feet)

FY	Production	Consumption									
		Power	Captive Power	Fertilizer	Industry	Tea Estate	Bricks	Com.	Dom.	CNG	Total
2005-06	527.0	224.4	48.9	89.09	63.3	0.8	0	3.3	56.7	6.8	493.3
2006-07	562.2	221.1	93.5	62.5	77.5	0.8	0	5.7	63.3	12.0	536.2
2007-08	600.9	234.3	80.2	78.7	92.2	0.8	0	6.6	69.0	22.8	584.6
2008-09	653.8	256.3	94.7	74.9	104.4	0.7	0	7.5	73.8	31.0	643.2
2009-10	703.6	283.3	112.6	64.7	118.8	0.8	0	8.1	82.7	39.3	710.2
2010-11	708.9	273.8	121.2	62.8	121.5	0.8	0	8.5	87.4	38.5	714.5
2011-12	743.7	304.3	123.6	58.4	128.5	0.8	0	8.6	89.2	38.6	751.7
2012-13	800.6	328.8	134.1	60.0	135.7	0.8	0	8.8	89.7	40.2	798.2
2013-14	820.4	337.4	143.8	53.8	141.9	0.8	0	8.9	101.5	40.1	828.1
2014-15	892.2	354.8	150.0	53.8	147.7	0.8	0	9.1	118.2	42.9	877.3
2015-16	973.2	399.6	160.8	52.6	156.0	0.9	0	9.0	141.5	46.5	966.9
2016-17	971.6	403.6	160.5	49.1	163.1	1.0	0	8.7	154.4	47.0	987.3

Source: Petro Bangla, Energy and Mineral Resources Division

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Sector wise gas consumption pattern in FY 2015-16 and FY2016-17 are given in Figure 10.5 and Figure 10.6.



Source: Petrobangla

### Demand for Natural Gas

Demand for natural gas is increasing along with the increasing demand for electricity. The demand for natural gas in power sector was 607 billion cubic feet (Bcf) in 2017, which is expected to increase to 705 Bcf in

2020. At present the demand for natural gas in industry sector is fixed at 191 Bcf which is expected to reach 366 Bcf in 2020. For domestic use this demand has been targeted at 133 Bcf in 2020. Table 10.11 shows sector-wise average gas demand from FY2017-18 to FY2021-22.

**Table 10.11: Sector-wise Average Gas Demand**

(In Billion Cubic Feet)

	2017-18	2018-19	2019-20	2020-21	2021-22
Power	607	657	728	705	709
Captive	152	152	152	152	140
Fertilizer	98	98	98	98	98
Industry	191	253	321	366	390
Commercial	9	9	9	9	9
Domestic	133	133	134	133	133
Tea-Estate	2	2	2	2	2
CNG	41	41	41	39	34
Total	1235	1346	1487	1505	1516

Source: Petrobangla, Energy and Mineral Resources Division

### Mineral Resources

The Bureau of Mineral Development (BMD) issues exploration license and grants mining lease and quarry lease for different minerals

like coal, hard rock, peat, mineral sand, metallic minerals, white clay, silica sand, ordinary/sand mixed stone, limestone, clay etc.

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### Coal

BMD granted mining lease of coal in 1994 in favour of *Barapukuria* Coal Mining Company Limited (BCMCL) (a company of Petrobangla) at *Barapukuria* of *Parbatipur Upazila* in *Dinajpur* district. At present coal is being produced from this mine. As on 30 June 2017 cumulative production of BCMCL was 92,40,718.75 MT and in FY2016-17 the production was 11,60,657.81 MT.

Besides, in 2008 an exploration license was granted in favour of Petrobangla for the coal field at *Dighipara* of *Nawabgonj upazila* in *Dinajpur* district. In order to develop *Dighipara* coal field, the exploration license agreement with Petrobangla was assigned in favour of *Barapukuria* coal mining company Ltd. on 21 October 2015. Table 10.12 shows the coal fields of Bangladesh with their mentionable attributes.

**Table: 10.12 Coal Fields of Bangladesh**

Place/Field (Discovery Year)	Depth (Meter)	Area (Sq.Km)	Reserve (Million Ton)	Calorific Value (BTU/lb)
Barapukuria, Dinajpur (1985)	119-506	6.68	390	11,040
Khalaspir, Rangpur (1995)	257-483	12.00	523	12,700
Phulbari, Dinajpur (1997)	150-240	30.00	572	11,900
Jamalganj, Jaipurhat (1965)	900-1000	16.00	1,054	11,000
Dighirpar, Dinajpur (1995)	327	15.00	600	13,090
			<b>Total = 3,139</b>	

Besides, coal, some good quality peats are available in different parts of the country. The total peat reserve (dry peat) discovered in Bangladesh is 146.36 million MT. At present no commercial utilisation of peat exists in Bangladesh.

### Hard Rock

Mining lease of hard rock has been granted in 1994 in favour of *Maddhapara* Granite Mining Company Limited (a company of Petrobangla) at *Maddhapara* of *Parbatipur upazila* in *Dinajpur* district. Hard rock is being produced from the mine sites at present by underground mining method.

### Ordinary Stone

Twenty stone quarries have been leased out among different parties for ordinary stone extraction in Sylhet, *Sunamganj*,

*Lalmonirhat* and *Panchagar* districts from the Government's *kuash* land and another 39 ordinary stone quarries are leased out in private land in *Nilphamari* district.

### White Clay

BMD grants quarry lease to extract white clay/china clay which is the main raw material of ceramic industries. At present 14 quarries have been leased out to different companies in *Mymensingh* and *Netrokona* districts.

### Silica Sand

Thirty silica sand quarries have been leased out to different parties for silica sand extraction in *Habiganj* and *Moulvibazar* districts from Government's *khas* land and 15 silica sand quarries are leased out in private land in *Habiganj* district.

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### Petroleum Products

Bangladesh Petroleum Corporation (BPC) imports, acquires, stores and markets petroleum products. The current storage capacity of petroleum products is around 12.21 lakh MT. BPC has taken a project titled 'Installation of ERL Unit-2' to increase processing capacity of existing refinery from 15.00 lakh MT to 45.00 lakh MT to strengthen energy security of the country. 'Installation of Single Point Mooring (SPM) with Double Pipelines' project has been taken for receiving importable crude and refined petroleum from mother vessels at the Bay of Bengal to ensure in smooth and cost effective manner. Information regarding imported

crude oil and refined petroleum products during FY2005-06 to FY2016-17 is shown in Tables 10.13 and 10.14.

**Table 10.13: Import of Crude Oil**

FY	Quantity (Metric tonnes)	CandF Value/Million US\$	Crone 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	1176693	968.55	7957.29
2014-15	1303194	734.00	5739.35
2015-16	1093120	336.49	3225.92
2016-17	1391629	518.53	4102.49

Source: Energy and Mineral Resources Division

**Table: 10.14: Import of Refined Petroleum Products**

FY	Diesel, Octane and Jet A-1		Lubricating Base Oil		Furnace Oil	
	Quantity (Metric ton)	Value (Crone Taka)	Quantity (Metric ton)	Value (Crone Taka)	Quantity (Metric ton)	Value (Crone Tk.)
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	29959	60.38
2009-10	2634212	12024.18	7262	52.03	-	-
2010-11	2488456	21403.69	4749	43.75	230524	1123.17
2011-12	3409934	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
2016-17	4392631	18514.66	-	-	521198	1216.77

Source: Energy and Mineral Resources Division

### Subsidy for Petroleum Products

Bangladesh Petroleum Corporation (BPC) imports crude and refined oil every year according to the country's demand. There are fluctuations in refined and crude oil prices in international market. BPC was continuously incurring losses due to non-adjustment of oil

price and custom duty in the domestic market in conformity with the increases in oil price in the international market. As a result, the Government had to give remarkable amount of subsidy for importing petroleum products. In recent years the price of oil has fallen in the international market. So the Government

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did not require giving any subsidy in FY2015-16 and FY2016-17. Table 10.15 shows the amount of subsidy given to BPC by the Government from FY2008-09 to FY2016-17.

**Table 10.15: 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	8550.00
2012-13	13557.83
2013-14	2477.60
2014-15	600.00
2015-16	0.00
2016-17	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 the same the Geological Survey of Bangladesh (GSB) has been implementing various projects. Skilled manpower is being developed through local and overseas training under different projects. Research facilities have been expanded by procuring modern equipment to work in the micropaleontology, petrology-mineralogy, analytical chemistry, engineering geology, geophysics, remote sensing and GIS, sedimentology and clay mineralogy laboratories. As a result, hard rocks at *Maddhapara* and low sulfur *Gondwana* coal at *Barapukuria* and *Dighipara* of *Dinajpur* district and *Khalaspir* of *Rangpur* district have been discovered.

Besides white clay, construction sand, gravel, limestone, heavy minerals have been discovered in different parts of the country. Among them limestone and magnetic rock (iron ore) at *Hakimpur upazila* of *Dinajpur* district, Titanium Oxide (TiO<sub>2</sub>) enriched rocks at *Mithapukur upazila*, *Rangpur* district, fossil in *Chalanbil* area and heavy minerals in the *Char* area of *Jamuna* river are noteworthy. Discovered coal and peat by GSB are now being used in power generation and household activities.

### Recent Achievements

In FY2015-16 GSB has discovered 30 meter thick limestone deposit from 674.79 to 704.96 meter depth at *Badalgasi upazila* of *Naogaon* district. This is the thickest limestone bed discovered in Bangladesh.

In FY2016-17 an exploratory drill hole for searching energy source in *Naogaon* district has been completed and 29 metre thick limestone at 643 metre depth was found. GSB has also completed geological mapping and geophysical investigation of 3,861 sq. km and 300 sq. km respectively under Annual Performance Agreement (APA). Five field works have been completed and collected sand samples by SPT and Chopping method under the project 'Identification and Economic Assessment of the Valuable Minerals in the River Sands of Bangladesh'. Collected samples are now being analysed in the laboratory of Bangladesh Council of Scientific and Industrial Research (BCSIR) and Bangladesh Atomic Energy Commission (BAEC).



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Besides, GSB has recently completed two development projects and two programmes of Tk.62.23 crore. GSB discovered about 400 million tons of peat. Besides, limestone and magnetic minerals, Titanium oxide rich rutile mineral used as a raw material for colour pigment, heavy minerals at *Jamuna* river beds are also discovered. GSB in collaboration with Norwegian Geotechnical Institute (NGI) has been installed equipment for landslide early warning systems in 4 stations (Chittagong City Corporation, Chittagong University, Cox's Bazar City and Teknaf) for public awareness to prevent the loss of lives and properties. For earthquake assessment, 4 seismometers (*Netrokona, Jessore, Khagrachari* and *Joypurhat*), 30 accelerometer and 7 Global Positioning System (GPS) in different stations have also been installed.

### Hydrocarbon Unit

Hydrocarbon Unit provides technical recommendation to Energy and Mineral Resources Division for the development of oil, gas and mineral resources sector. In particular, hydrocarbon unit has been actively participating in the modernisation of national fuel policy, finalisation of draft policy of coal, development of gas sector, production distribution, supervision and monitoring of various agreements, purification and marketing management of petroleum, formulation of policy regarding development of mines and mineral resources. This unit maintains a mini databank containing the information of gas reserve, undiscovered gas resources etc.

### Explosive Control and Safety Management

The Department of Explosives is responsible for production, import, storage, transport, transmission and use of hazardous substances such as explosive, gas, petroleum, flammable liquids, combustible solids, oxidising substances, etc. to ensure safety of public life and national property. Explosive Substances Act, examining the evidence/ giving opinion in the cases filed under the Quick Trial Tribunal and providing expert services to the Armed Forces are the activities of the Department of Explosives.

### Petroleum

A total of 435 licenses have been given for the augmentation of electricity production immediately through the completion of diesel/furnace oil based quick rental power plants instead of gas based power plants quickly for petroleum storage. A total of 9,099 petroleum live and scrap vessels have been tested and granted gas free test certificate.

### LPG

To encourage the usage of LPG and reduce the dependency on the natural gas, import of 32,80,601 LPG cylinders have been granted. Moreover, 935 licenses have been issued in favour of different companies for storing LPG cylinders.

### Gas Pipeline

For securing high-pressure gas pipelines and enhancing gas transmission capacity the permission for installing 77 gas pipelines has been granted. Moreover, 71 gas pipelines have been permitted after the leakage test.

### Case Settlement

Expert opinion has been provided by examining the evidence (bomb) in 418 matters for the cases filed under the Explosive Substances Act and Quick Trial Tribunal with the target for eradicating terrorism.

### 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 as well as for management and operation of this sector. In addition, the BERC has been working to ensure transparency in tariff fixation, protect consumers' interests and create competitive market.

### Tariff Determination

The BERC 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 BERC is also responsible for petroleum products tariff and the formulation of 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 the Government's affordability in providing 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 consumers, the BERC has fixed the life-line tariff for residential user at 1-50 unit of electricity. It remained unchanged in the latest tariff order.

### Gas Development Fund

To augment the financial capacity for exploration and production of gas by the nationalised companies, the BERC has created 'Gas Development Fund' on 30 July 2009 by adjusting gas tariff by 11.22 percent. The deposited amount in this fund during FY2016-17 was Tk.1490 crores and cumulative deposit up to 30 June 2017 was Tk.9,185.95 crore.

### Creation of Electricity Maintenance and Development Fund

In order to increase the efficiency and capability of Bangladesh Power Development Board (BPDB), BERC has created, on 1 February 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.1,323 crore in FY2016-17 and cumulative deposits Tk.5,962 crore up to 30 June 2017. Bibiyana 383.51 MW (+/-10%) gas based combined cycle power plant is under constructions utilising this fund. In addition, three other projects have been approved for 5 MW solar power plant at *Thakurgaon*, 75 MW power plant at Sylhet and 100 MW gas turbine power plant

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at *Shahjibazar* with TK.71 crore, Tk.760 crore and Tk.888 crore respectively.

### **Creation of Energy Security Fund**

From 1 September 2015 gas price per cubic meter has been increased by 26.29 percent or Tk.1.36. 'Energy Security Fund' has been created with Tk.1.01 per unit from this increased tariff earning. The deposited amount in this fund during FY2016-17 was Tk.2,800 crore and cumulative deposit up to 30 June 2017 was Tk.5,225 crore.

### **Providing License**

BERC awarded licenses during July 2016 to June 2017 for different activities in the energy sector. Among those 282 licenses in the power sector, 46 licenses in the gas sector, and 84 licenses in the petroleum sector have been awarded. For this reason investment has increased in the energy sector.

### **Arbitration Activities**

Bangladesh Energy Regulatory Commission is empowered through BERC Act, 2003 to settle disputes between licensees and consumers of the energy sector. Since the enactment of BERC Act, 2003 and Bangladesh Energy Regulatory Commission Dispute Settlement Regulations, 2014, the BERC settled a good number of disputes between licensees and consumers and issued orders.

### **Introduction of Revenue Requirement Format for Tariff Application**

The Commission developed Revenue Requirement Format for electricity production, transmission and distribution sector in order to determine tariff efficiently.

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 BERC has taken an initiative to introduce Uniform System of Accounts for the all licensees. This procedure is in implementation stage.

### **Preservation of Consumer's Rights**

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

### **Energy Efficiency Activities**

BERC has taken steps like proper maintenance of active power plant, usage of energy efficient instruments, converting simple cycle plant into combined cycle plant, etc. to increase energy efficiency across the country. These steps will not only increase the electricity production but also will save lots of money.

### **Activities relating Energy Auditing**

Energy auditing will ensure energy efficiency in the energy sector by proper utilisation of better technologies. Energy audit will give the

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real picture of energy waste and standard of instruments. The Commission is working

continually on these matters.