

# Studies on Power Supply Scenario of Bangladesh

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## Abstract

*Electricity is a very important element for the improvement of socio-economic condition and for poverty alleviation. The proper supply of electricity has a great impact on the national economy. Supply of enough and reliable electricity have a great positive impact on our GDP and GDP is one of the key measures to understand the economy of a country. Therefore, the use of electrical energy is rapidly increasing day by day. The overall economic development of the country is largely depends on electricity. At present, we have a great demand of electricity. But due to the shortage of production we are not getting the enough supply of electricity. It is unfortunate that as a nation we have not been able to resolve this problem even after forty years of our independence. Bangladesh is a densely populated country with 142.3 million people (BBS, 2011). Population is increasing but the generation of electricity is not increasing as expected. Only 50 percent of the country's population has access to electricity, which is very low compared to other developing countries in the world. The per capita generation is 211.86 kWh and the per capita consumption is only 180.08(FY 2010-11) which is one of the lowest in the region. Every year the demand is increasing at a rate of 10%. Generation capacity could not be increased accordingly which has resulted increasing power shortage in the country. With the advancement of science and technology new industries is rapidly introducing in the country. But due to the shortage of electricity we can not get the support in this field. It is quite evident that the extensive dependence on electricity has put us under a strong challenge. For years, the matter of balancing the supply against the demand for electricity has remained largely an unresolved matter. The country faces a significant challenge for the supply of electricity.*

**Keywords:** Solar Energy, Wind Energy, Load Factor, Load Management

## I. Introduction

There are various agencies in Bangladesh. The electricity sector in Bangladesh is handled by several agencies under the Ministry of Energy and Mineral resources. These are Bangladesh Power Development Board (BPDB), Power Grid Company of Bangladesh (PGCB), Dhaka Electric Supply authority (DESA), Dhaka Electric Supply Company Limited (DESCO), and Rural Electrification Board (REB). Among these the biggest and mother organization is Bangladesh Power Development Board (BPDB). Also there are some small private establishments. The forecast of maximum demand for FY 2011 was 6,765 MW<sup>13</sup>. Demand is increasing fast due to enhanced economic activities in the country with sustained GDP growth. At present electricity demand growth is about 10% which is expected to be more in coming years.

## II. Methodology

### A. Load Factor and Load Management

Electricity Demand in the system varies throughout the day and night. The maximum demand occurs during 5 pm to 11 pm termed as 'peak hour'. The extent of this variation is measured in terms of load factor, which is the ratio of average and maximum demand. For economic reasons, it is desirable to have a high load Factor, as this would permit better utilization of plant capacity. The cost of energy supply during peak hour is high as some relatively costlier power plants are required to put in operation during peak hour. There are certain categories of consumers who can avoid or reduce electricity consumption during peak hour. As such, effort is being made to discourage those consumers not to use electricity during peak hour. Attempt has also been made to apply two-part tariff by which consumers of certain categories are billed at higher rate for their consumption during peak hour, which would motivate them to consume less electricity at peak hour and more electricity during off peak hour. Market & Shopping malls remain closed after 8.00 PM to reduce electricity consumption in the peak

hour as DSM measures. Holiday staggering for industries is being done to mitigate load-shedding problem in the country.

**B. Installed Capacity**

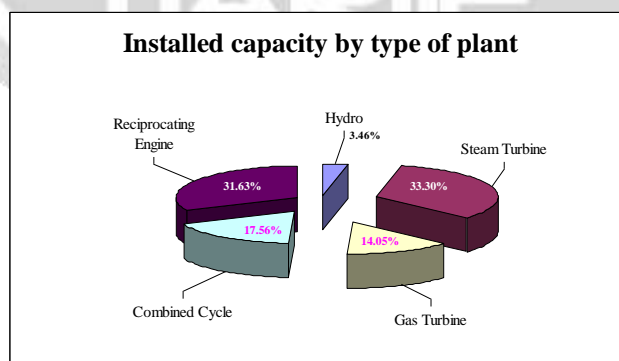
Total Installed capacity is 6,639 MW, out of which 4863 MW production depends on gas. But the maximum peak generation is 4,890 MW (FY 2010-11). The reasons for lower actual peak generation are (1) Operation for maintenance, rehabilitation & overhauling of some plants, (2) Derating of capacity of some plant due to aging and (3) Gas shortage. Bangladesh Power Development Board generates electricity mainly using Gas, Furnace oil, Diesel, Hydrostatic Pressure and coal. Since Bangladesh has its own Gas field therefore maximum generation depends on Gas. Out of total production 6,639 MW, 4863 MW produces by using Gas. Second largest production depends on Furnace and third largest on Diesel.

The Generation Capacity mix shown in table 4.1

**Table 1: Installed Capacity by Plant & Fuel Type<sup>13</sup>.**

By Type of Plant		By Type of Fuel	
Hydro	230 MW (3.46%)	Gas	4863 MW (73.25%)
Steam Turbine	2211 MW (33.30%)	Furnace Oil	671 MW (10.11%)
Gas Turbine	932 MW (14.05%)	Diesel	655 MW (9.87%)
Combined Cycle	1166 MW (17.56%)	Hydro	230 MW (3.46%)
Reciprocating Engine	2100 MW (31.63%)	Coal	220 MW (3.31%)
<b>Total =</b>	<b>6,639 MW (100%)</b>	<b>Total =</b>	<b>6,639 MW (100%)</b>

A graphical representation of installed plant by type of plant is shown in figure 4.1. It shows that the majority of the plant type is Steam Turbine and it is 33.30% of total production. On the other hand the least production comes from Hydroelectric Power Plant which is 3.46% of total production.



**Figure 1: Installed capacity by type of plant.**

A graphical representation of installed plant by fuel type is shown in figure 4.2. It shows that 73.25% of total production depends on Gas and only 3.46 % of total production on Hydrostatic Pressure. 3.31% production comes from Coal.

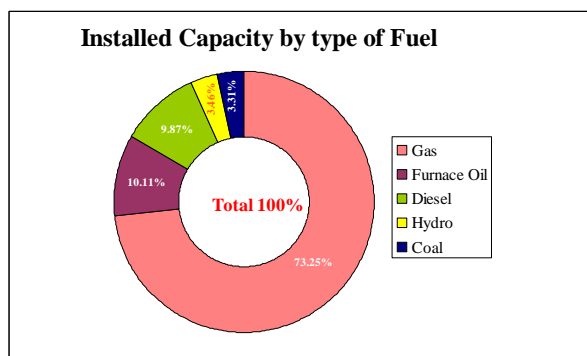


Figure 2: Installed capacity by type of fuel.

### C. Chronology of Installed Capacity

Year wise installed capacity, peak generation and load shedding information for last twelve years is listed in Table 4.2. From the table it is seen that though the actual installed capacity is 7,264 MW but due to derating of the machines the actual installed capacity has reached 6,639 MW. But due to various reasons it is not possible to achieve the production as installed capacity. The maximum peak production in financial year 2010-11 was 4,890 MW.

Table 2: Installed Capacity, Maximum Peak Generation and Maximum Load Shedding<sup>13</sup>.

Year	Installed Capacity (MW) <sup>1</sup>	Installed Capacity (Derated) (MW) <sup>1</sup>	Maximum Peak Generation (MW)	Maximum Load Shedding (MW)
1999-00	3,711.00	2,665.00	2,665.00	536
2000-01	4,005.00	3,033.00	3,033.00	663
2001-02	4,230.00	3,217.50	3,217.50	367
2002-03	4,680.00	3,428.00	3,428.00	468
2003-04	4,680.00	3,592.10	3,592.10	694
2004-05	4,995.00	3,720.80	3,720.80	770
2005-06	5,245.00	3,782.10	3,782.10	1,312
2006-07	5,202.00	3,717.80	3,717.80	1,345
2007-08	5,201.00	4,130.00	4,130.00	1,049
2008-09	5,719.00	5,166.00	4,162.10	1,269
2009-10	5,823.00	5,271.00	4,606.00	1,459
2010-11	7,264.00	6,639.00	4,890.00	1,335

#### (1) Installed capacity as of June of the year.

A graphical representation of Maximum Peak Generation and Maximum Load Shading is shown in Figure 4.3 from financial year 2006-07 to 2010-11. It shows that the peak generation and Maximum Load shading more or less the same.

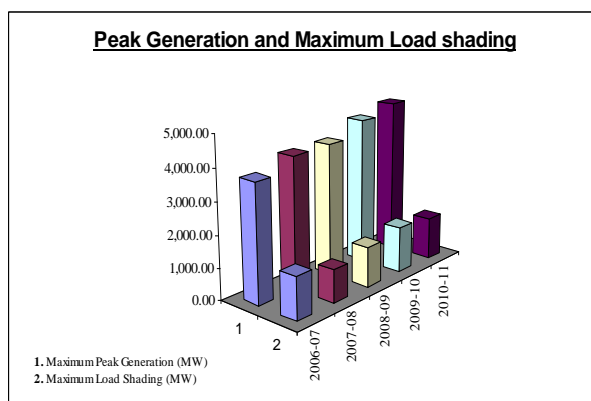


Figure 3: Pear generation and maximum load shading

#### D. Per Capita Consumption

Consumption of electricity is a vital indicator of development. As we see in the developed country we can see the per capita power consumption is very high compared to our country. As per report of BPDB per capita consumption of financial year 1999-2000 was 95.85 and per capita generation was 119.71 kWh. After twelve years in 2010-2011, per capita consumption was only 180.08 kWh which was 170.27 kWh in previous year. Though it is increasing but it is steel very low. Table 3 shows the increasing pattern of our per capita power consumption scenario for last twelve year.

Year	Total Generation (GWh)	Total Population (in million)	Total Sale (Million kWh)	Per Capita Generation (kWh)	Per Capita Consumption
1999-00	15,563	130	12,461	119.71	95.85
2000-01	16,255	132	14,003	123.14	106.08
2001-02	17,445	134	15,243	136.02	113.80
2002-03	18,458	133	16,332	138.36	122.43
2003-04	20,302	135	18,024	149.94	133.11
2004-05	21,408	137	19,196	155.78	139.68
2005-06	22,978	139	20,954	164.73	150.22
2006-07	23,268	141	21,181	164.75	149.97
2007-08	24,946	143	22,622	174.45	158.20
2008-09	26,533	145	23,937	183.26	165.32
2009-10	29,247	146	24,860	200.32	170.27
2010-11	31,355	148	26,652	211.86	180.08

A graphical representation of Per Capita Generation and Per Capita Consumption for last twelve year is shown in Figure 4.4. It is seen that the per capita generation in fiscal year 1999-2000 was 119.71 kWh. In fiscal year 2010-2011 it was increased to 211.86 kWh. In fiscal year 1999-2000 per capita consumption 95.85 kWh and in 2010-2011 it was increased to 180.08 kWh. Though both the figure is almost double, but in real sense it is very

insufficient. Bangladesh is a developing country. As a developing country we need to develop fast. Therefore we need the production of electricity very quick. But the reality is that this process is steady but very slow. We need to make it faster.

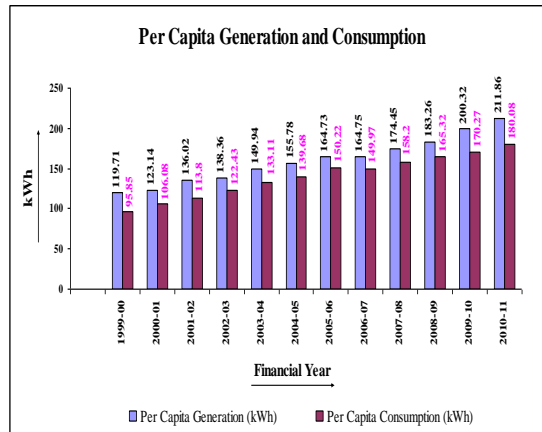


Figure 4: Per Capita Income and consumption graph.

**E : Number of Consumer**

Bangladesh Power Development Board (BPDB) is the biggest and oldest power generation and distribution authority in the country. They had 20,67,338 retail consumer at the end of FY 2011 which was 4.5% higher than that of previous year.

**F: Fuel Price and Tariff**

The price of natural gas was BDT 79.82/1000Cft and coal was BDT 6400/Ton in FY 2011. The price of High Speed Diesel (HSD) was BDT 46.00/Liter. And the latest price of Furnace Oil was BDT 42.00/Liter (FY 2010-11)

The average billing rate for rental consumers of BPDB was 3.81 per kWh during the financial year 2010-11.

**G: Consumption Pattern of the Country**

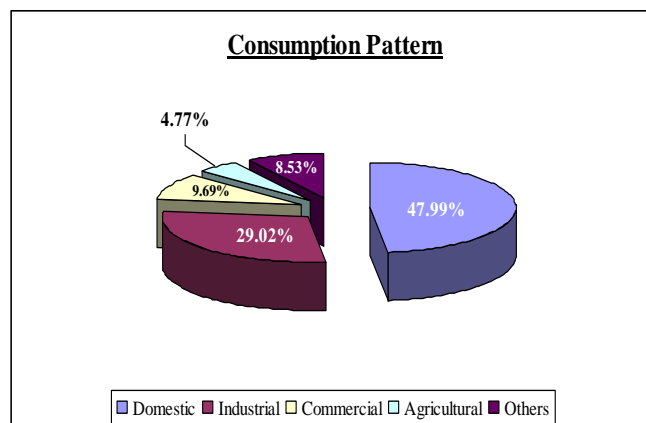
Power is the most essential think for the development of the country. It is also very important element for socio-economic development. Every sector of the country needs electricity. Electricity not only necessary for industrial sector, it also necessary for agricultural, commercial and domestic use also. Table 4.4 shows the pattern of electricity consumption by various sectors.

H: Table 4: Consumption Pattern of the Country<sup>13</sup>.

Sl. No.	Sector	Percentage of Consumption
1	Domestic	47.99%
2	Industrial	29.02%
3	Commercial	9.69%
4	Agricultural	4.77%
5	Others	8.53%

Figure 5 shows a graphical representation of the consumption of the country. The total consumers are divided into five sectors. This sectors are Domestic, Industrial, Commercial, Agricultural and other. From this graph it is clear that the Domestic sector consume the maximum power, in figure it is 47.99% of total consumption. Second highest consumption is in Industrial sector which is 29.02% of total consumption. For proper development of the country development of industrial sector is very much important. But we can not make the industrial sector the biggest consumer.





**Figure 5: Consumption Pattern.**

### **J:Relationship Between GDP and Generation of Electricity**

The supply of electricity has a great positive impact on GDP and GDP is one of the key indicators to measure the economy of a country. Power crisis is slowing the pace of GDP growth rate. Therefore, it is to increase the GDP growth rate, available supply of electricity should be ensured. The economy of Bangladesh is mainly depending upon agriculture, industrial, commercial and other economic development. On the other hand, these developments directly and indirectly depend upon the fluent supply of electricity. A decreasing rate of electricity generation has resulted in the lower GDP growth. Therefore, it is difficult to achieve the target of GDP growth with the current generation of electricity.



Figure 6: Kaptai Hydroelectric Power Plant, the only Hydroelectric Power Plant in Bangladesh.

### **III. Government Planning**

The government has prepared Power System Master Plan (PSMP)-2010 covering a plan period of 20 years (2010-2030) to realize the goal to provide access to electricity to all. The generation addition plans are being reviewed incorporating latest changes in power demand, technology and financial market. Government has also prepared short-term, mid-term and long term least cost generation expansion plan. The plan projects are at various stages of implementation.

### **IV. Conclusion**

Bangladesh is a developing country. It needs more power for its development. It has a great shortage of electricity. The demand of electricity is increasing day by day. Due to the shortage of electricity the proper development of the country is hampering. Power crisis is slowing the GDP growth rate. Power generation is fully under the control of Bangladesh Power Development Board (BPDB) is the only organization producing. Bangladesh has a hydro power plan in Kaptai. Bangladesh government has prepared a master plan for a period of 20 years with a view to provide electricity to all.

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