



(RESEARCH ARTICLE)



## Role of Ashuganj Power Station Company limited to increase capacity development and energy efficiency of Bangladesh

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### Abstract

Bangladesh is gradually marching towards a severe energy crisis, what with an ever-increasing demand of energy overstepping its supply. Bangladesh as a developing country, the demand of energy is increasing with a higher ramp rate than many other countries of the world. To meet up the increasing demand of this country, Ashuganj Power Station Company Limited (APSCL) has taken a lot of development projects and many are in pipeline. As we all know, Bangladesh is running out of indigenous natural gas, Government of Bangladesh (GOB) to think about alternative sources of fuel in near future. In this regard coal and renewable energy can be the best solution to meet energy crisis in long term. Considering the facts Ashuganj Power Station Company Limited is also stepping ahead to increase its capacity while keeping the generation maximum by proper operation, maintenance and overhauling the existing units.

**Keywords:** APSCL; Power Sector Master Plan; Power Division; Energy Efficiency; Obstacles of Renewable Energy in Bangladesh

### 1. Introduction

Ashuganj, besides its natural beauty has become very important and lucrative for businessmen and industrialists when natural gas became available along with its rail, road and river communication. As a consequence, with the help of German Government, a German company started construction of 2×64 MW units by the river of Meghna in 1968. In 1970 these two steam-based power generation units commissioned and came into operation which played a very important role in developing war-torn Bangladesh after liberation war. Discovering the necessity of electricity and its growing demand, expansion of power station has become very important which results expansion of Ashuganj Power Station Complex (APSC) very rapidly. As a part of the power sector development and reformation program of the Government of Bangladesh (GoB), Ashuganj Power Station Complex has been incorporated as Ashuganj Power Station Company Limited (APSCL) under the Companies Act 1994 on June 28, 2000. Ashuganj Power Station Complex (APSC) (with its assets and liabilities) had been transferred to the APSCL through a provisional vendor's agreement signed between Bangladesh Power.

Development Board (BPDB) and APSCL on May 22, 2003. All the activities of the company started formally on June 1, 2003. According to the Memorandum and Articles of the Association of the company most of total shares are held by Bangladesh Power Development Board (BPDB) and rest of the shares distributed among Ministry of Finance, Ministry of Planning, Power Division, Ministry of Power, Energy & Mineral Resources (MoPEMR) & Energy Division.

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## 2. Vision and Mission

To become the leader in power generation in Bangladesh in line with the government's target to provide electricity to all. Empowering Bangladesh by expanding the company's power generation capacity to meet the growing demand of the country through efficient and effective management of facilities and acquisition of capabilities for providing quality electricity.

## 3. Present Status of APSCCL

Ashuganj Power Station Company Limited is one of the largest power stations in Bangladesh having capacity of about 17.82% (as on 01 November, 2016) of total electricity generation capacity in the public sector of the country. At present the total capacity of its ten (10) units is 1480 MW.

**Table 1** Capacity of plants at present in APSCCL. [10, 11]

Name of the Units	Year of Commissioning	Installed Capacity (MW)	Present (De- rated) Capacity (MW)	Efficiency
Unit-1	1970	64	50	24.59%**
Unit-2	1970	64	52	30.86%
Unit-3	1986	150	140	35.62%
Unit-4	1987	150	150	36.25%
Unit-5	1988	150	140	36.04%
GT-2	1986	56	40	22.58%**
50 MW GE	2011	53	51	40.17%
225MW CCPP	2015	225	223	50.65%***
Ashuganj CCPP 450 (S)	2016	373	360	57.72%
200 MW Modular	2016	195	195	48%
Total		1480	1401	

\*Ashuganj CCPP 450 (N) is in simple cycle mode as on April 25, 2017. \*\*As on Monthly Operating Data (MOD) of September, 2013[5].  
\*\*\*Efficiency obtained by calculation using data of 16 February, 2017[12].

During the last five years APSCCL has undertaken some mega projects to meet the power crisis of Bangladesh and to improve the quality of electricity. One of them is Ashuganj 450 MW CCPP (North) which is already running in simple cycle with a capacity of 280 MW and very soon it is expected to come in operation with capacity of 383 MW. Because of these additional cost APSCCL lost net profit every year but it's capacity of increased with rapid pace.

**Table 2** Generation & Financial Condition of the year 2011-12 to 2015-16. [1, 2, 3]

Operating Performance	2015-16	2014-15	2013-14	2012-13	2011-12
Generation ( GWh)	4393.40	3985.52	3708.94	4243.12	3900.42
Revenue (BDT in Million)	8413.06	7094.70	6971.02	7537.81	7302.15
Cost of Sales (BDT in Million)	6803.41	5573.00	5457.22	5750.59	5505.57
Gross Profit (BDT in Million)	1609.65	1521.70	1513.81	1787.22	1796.99
Operating Profit (BDT in Million)	717.91	552.86	750.39	1135.79	1296.22
Net Profit (BDT in Million)	240.62	367.63	681.18	718.59	618.49

## 4. Government's Development Plan in Power Sector

The world faces a surge in demand for electricity that is driven by such powerful forces as population growth, extensive urbanization, industrialization and the rise in the standard of living. Considering this issue as prime focus the present government did not drag its feet on what it had been promising since 2009 and went ahead with mega power projects. The signing of Bangladesh's ever biggest \$12.65 billion investment proposal for the construction of Rooppur Nuclear Power Plant (NPP) has done in 2015. On March 2016, the Government of

Bangladesh inked a \$2500 million agreement with CMC (a state-owned China power company) in order to construct a 1320MW coal-based power plant at Paira in Patuakhali district. In April 2016, the Government of Bangladesh signed a \$217 million financing agreement with the World Bank to upgrade a unit in the Ghorashal power station, which will increase the unit's existing electricity generation capacity by more than double. In addition to these, the Government is going to implement various power plants under ECA (Export Credit Agency) Financing Project and First Track Project.

Apart from mega power projects having been set in motion, the country's power generation capacity has also increased by 1357 MW in the fiscal year 2015-2016 while the ever-highest generation marked 9036 MW as on June 30, 2016. Its total installed power generation capacity touches a new milestone of 15,200 MW (as on 31<sup>st</sup> October, 2016).

**Table 3** In general overview of achievements in past few years. [6, 8, 9]

Description	January, 2009	January, 2017	Achievements
Number of power plants	27	108	(+81)
Power Generation Capacity	4942	15351*	(+10409)
Maximum power generation (MW)	3268	9036	(+5768)
People under electricity facility (%)	47%	80%	(+33%)
Per capita generation (kwh)	220	407*	(+187)
Overall system loss (%)	16.85%	13.10%	(-4.35%)

\* Captive power is included with the whole power generation.

Moreover, the government is putting its emphasis on the transmission and distribution line of the electricity. At present 78% of the population has the access to electricity which was only 47% in seven years back. On August-2016, Honorable Prime Minister has inaugurated 100% electrification in six Upazila and it is expected that 100% electrification in all 465 Upazila will be attained by December-2018.

In this year 2016, Bangladesh India launched exchange of electricity and bandwidth, a very new venture of its nature. In this year, Bangladesh exported 10 Giga Bite Per Second (GBPS) bandwidth from its Cox's Bazar to Tripura's capital Agartala while India started supplying of the 100 MW power from its north-eastern Tripura state to bordering Comilla of Bangladesh. Such power connectivity with the neighbor country added another successful chapter to the existing bilateral cooperation in the power sector.

In parallel with the implementing of the mega power plant projects, the government has also paid its attention on the maintenance & overhauling of the existing plants, ensuring energy security & efficiency, renewable energy, reducing system loss, expanding the transmission & distribution line, digitalization in the power sector and so on. Accordingly, it has allocated Tk. 13,062 crore in this sector in the budget 2016-17. [6, 8, 9]

## 5. Future Projects

Currently, many of power plants in Bangladesh cannot generate electricity as specified in terms of power, thermal efficiency etc. for each unit. Daily shortage of power does not allow to stop facilities and to undertake periodical maintenance in a planned way. Legal framework does not stipulate preventive maintenance works as an obligation for plant owner. Low financial soundness of public generating companies due to low electricity tariff does not permit to purchase in advance necessary spare parts. In order to secure a stable electricity supply, we need to find out solutions to all of these issues and to establish a comprehensive institutional framework.

The Government of Bangladesh declared its intention to develop the country in order to become one of the advanced countries by 2041 as the key goal of VISION2041. To achieve the Vision, this master plan defines the intended goal and "five key viewpoints" that are to be kept in mind by all the members who are involved in the realization of the goal.

The five key points are:

- Enhancement of imported energy infrastructure and its flexible operation
- Efficient development and utilization of domestic natural resources (gas and coal)

- Construction of a robust, high-quality power network
- Maximization of green energy and promotion of its introduction
- Improvement of human resources and mechanisms related to the stable supply of energy.

Keeping the key factors in mind APSCCL as an organization of government has also set a plan to achieve within 2030. The masterplan has a goal to achieve up to 6931 MW by this time span.

**Table 4** Generation Master Plan of APSCCL (2011 to 2030). [7]

Year	Installed Capacity (MW)	Retired (MW)	New Installed Capacity (MW)	Enhanced capacity (MW)	Total Generation (MW)
2011-2015	777	90	418	328	1105
2016-2020	1105	334 (56+128+150)	1323 (Including 100 MW Solar Park)	989	2094
2021-2025	2094	300 (150+150)	2970 (1320+1200+450)	2670	4764
2026-2030	4764	53	2220 (1320+450+450)	2167	6931

To achieve the master plan APSCCL has undertaken various mega projects which include coal- based power plants, solar parks etc.

- Ashuganj 450 MW CCPP (North)
- Ashuganj 400 MW CCPP (East)
- 2×660 MW Patuakhali Super Thermal Power Plant
- 2×600 MW Super Thermal Power Plant (On the bank of Jamuna river)
- Ashuganj 450 MW CCPP Dual Fuel Plant
- 100 MW Peak Grid Tied Solar Park, Kishoregonj

While the amount of deposits of indigenous natural gas discovered is decreasing, the limited resources must be utilized to the maximum by developing an efficient development structure. Necessity of new plants over old power plants considering the capacity, efficiency and fuel consumption can be described by the following table:

**Table 5** Comparison between old plants and replaced new plants.

New Installed Units (N.U)		225 MW CCPP	Ashuganj 450 MW (South)	Ashuganj 450 MW (North)**	400 MW CCPP (East)***
Replaced Units (R.U)		GT-1 & GT-2*	GT-1 & GT-2*	GT-1 & GT-2*	GT-1 & GT-2*
Capacity (MW)	N.U	223	360	244	
	R.U	80	N/A	85	150
Fuel Consumption (sm <sup>3</sup> /kwh)	N.U	0.23	0.18	0.26	
	R.U	0.92	N/A	0.33	0.29
Efficiency (%)	N.U	50.65	57.72	37.20	
	R.U	22.60	N/A	30.86	35.62
Reliability Factor (%)	N.U	85.02	98.61		
	R.U	100	N/A	74	98.7
Availability Factor (%)	N.U	82.07	96.98		
	R.U	65.32	N/A	23.60	82.40

\*Data taken from Monthly Operation Data (MOD) September. 2013 [4, 5]

\*\*Ashuganj 450 MW CCPP (North) is under commissioning period. After commissioning the capacity is expected to 383 MW and efficiency to be 57.99%.

\*\*\*400 MW CCPP (East) is in tender evaluation process.

## 6. Energy Efficiency Initiatives

Energy is an obligatory effort for economic growth and human development which leads a strong both-way correlation between economic development and energy utilization. To attain sustainable GDP growth 6% and above till 2030 & beyond, it is of deem necessary to meet the essential energy needs. Demand for power is increasing day by day. Moving towards energy sustainability will require development not only in the way energy is supplied, but in the way it is used as well. Reducing the amount of energy required to deliver various goods or services is also essential in this regard. Energy efficiency and renewable energy are said to be the twin pillars for sustainable energy.

The improvement of energy efficiency will be having primarily two-fold impact: (i) improvement of energy security, (ii) efficient environmental management. Through this campaign the diffusion of efficient energy utilization movement will lead in to more output from equal quantity of primary energy subsequently low carbon emission from the efficient utilization of that primary energy in Bangladesh.

There was no institutional framework for renewable energy before 2008, when the renewable energy policy was adopted by the government. According to the policy an institution, Sustainable & Renewable Energy Development Authority (SREDA), was to be established as a nodal agency for the promotion and development of sustainable energy, comprising of renewable energy, energy efficiency and energy conservation. Recently SREDA start functioning. Government is promoting innovative mechanism to ensure energy efficiency and conservation at industries, residential and commercial buildings and in service-sector. Power Division and SREDA organizing seminar and workshop on it in regular basis to create awareness among relevant stakeholders prevailing Energy Efficiency and Energy Conservation activities

Government stated a vision in sixth Five Year Plan (2011-2015) to save 10% energy in planned period through efficient use of primary and secondary energy and conservation at user level for sustainable energy security including low carbon emission.

### 6.1. The government has taken a number of initiatives for efficient energy use and reduced consumption of energy, which are as follows:

- Government prepared an Action Plan to ensure Energy Efficiency & Conservation both at supply and demand side, where number of interventions has been identified for implementation with a time-frame work.
- Energy Efficiency and Conservation Master Plan is in preparation stage.
- Declare Country Action Plan for Clean Cook Stove with a vision to replace 30 million inefficient traditional cook stoves by Clean Cookstoves by 2030.
- Introduction of Energy Audit System in the large designated consumers is in process.
- Program initiated for the gradual replacement of inefficient Brick Kiln to efficient Brick Kiln.
- Government took targeted program to convert gas driven simple cycle power stations into combine cycle power station.
- Steps have been taken to revise the 'Building Code' inserting energy efficiency and solar energy issues.
- Program initiated to replace Inefficient Rice Per-Boiling Systems by Improved Rice Per-Boiling System.
- Initiatives have been taken in order to build awareness amongst the students, by incorporating Energy Efficiency and Renewable Energy issues in the academic curricula of schools, madrasas and colleges.
- Program launched to install solar photovoltaic (PV) system in government, semi government and autonomous organization's rooftop within 3 years.
- Encourage to use CFL/LED bulb and T5 tube light in all ministries and power sector entities.
- Conventional street-lights to be replaced by LED and solar lights subsequently.
- Promote public awareness program for energy conservation.
- The gradual discontinuation of incandescent bulb and electric heater.
- Limiting the use of air conditioners, or keeping temperature 25 degrees Celsius and above.
- Introduction of energy Star Labelling Program in the electrical appliances through BSTI.
- Discouraging the use of neon sign in the markets and shopping malls at night.
- Closing of markets and shopping malls within 8 p.m.

### 6.2. APSCCL authority has also undertaken a lot of initiatives to use energy in more efficient way which are:

- Replacing old and inefficient power plants by new plants in order to achieve more efficiency.
- Keeping auxiliary consumptions below 5% of total generation in every power plant.
- Installing capacity of 72 kw solar photovoltaic cell in housing to reduce demand from grid in those areas.

- Using CFL/LEB bulbs and T5 tube light instead of using tube lights in plant areas, offices and housing.
- Keeping air conditioner's temperature 25 degree Celsius and above in office areas.

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## 7. Alternative Energy

For Bangladesh, which is susceptible to climate change, the development of low-carbon energies is extremely desirable, not simply from the aspect of the international trend, recommending renewable energies and energy diversification, but from the point of improving energy access for rural people. Therefore, development of domestic renewable energies is indispensable. However, there is a limit to the introduction of renewable energies on a large scale in Bangladesh due to the availability of appropriate land. Importing power from neighboring countries using hydroelectric power generation has much greater possibility than supplementation programs for the limited degree of renewable energy introduction in Bangladesh.

To become one of the high-income nations by 2041, the country needs to achieve continuous economic growth of 7.4% annually for the period from 2016 to 2020 to initially reach the standard of the medium to high income nations. With this economic growth, the demand for primary energy, in particular in the industrial sector and the transport sector, is expected to increase sharply under both the Business as Usual (BAU) and the energy efficiency scenario. To meet up this increasing demand Bangladesh govt. has initiated a plan to increase coal power to 20,000 MW by the year 2030 where Ashuganj Power Station Company Ltd. will produce 3840 MW.

As mentioned above, development of an infrastructure for the economical and efficient use of gas and development and implementation of the system are necessary. Since the produced indigenous coal is of a high quality and the reserves are abundant, the future development of an economical domestic coal development structure is important. Since domestic coal development has a serious impact on the surrounding environment and society and requires a long period of time, the necessary actions must be taken sufficiently in advance in anticipation of VISION2041 by the governing body related to environment.

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## 8. Conclusion

Bangladesh is one of the most land hungry countries on earth. Despite looking for land to generate clean energy, power sector of Bangladesh is also putting emphasizes on the increasing of efficiency of the fossil-fuel based units so that by burning the same amount of fuel it can meet more demand thus reducing carbon emission. Ashuganj Power Station Co. Ltd. is playing an important and constantly helping to achieve the apex of target set by the government.

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## Compliance with ethical standards

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### *Disclosure of conflict of interest*

We certify that there is no actual or potential conflict of interest in relation to this article.

### *Statement of informed consent*

Information about any individual e.g. case studies, survey, interview etc., is not taken/considered in this paper.

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