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Better Energy Utilization: A Solution of Power Crisis in Bangladesh

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Abstract

Bangladesh in these days encountered a severe power crisis. Due to less amount of fossil fuel, many alternative sources of energy are implemented in different forms. Although it does not assist in order to fulfill power requirement. On the other hand, proper use of existing energy can be means of power crisis solution. In this paper, an attempt has been made to unlock some way of proper management of our limited energy. Firstly, optimum uses of home appliances specially lighting, heating and cooling ones. Secondly, changing people lifestyle, in particular, early going bed and waking up from bed. Finally, early bird office time analysis is also reviewed. Taken together, a huge amount of energy can be saved. Consequently, the difference of demand and production of power is minimized by implementing the findings of the paper.

Keywords: Power, renewable energy, optimum utilization, early bird office schedule.

1. Introduction

Power is a very important factor in developing the economy and the standard of living of a country. It must be generated using the national resource of that country. Bangladesh largely depends on natural gas and hydro power stations to generate major portion of power. The country lags behind than its expected production capacity. Though many power generation units have been added to the national grid to solve the power crisis issue, it is not enough. High demand and increasing need of power have created challenge for the power stations to meet the demand. In our country, a major portion of total population still does not have the access to electricity. Only 10% of the rural households have electricity connection and there are some parts of Bangladesh which will not get the access of electricity connection from the national grid within next 30 years [1]. To solve energy crisis, we can use different form of renewable energy to generate power, optimum utilization of home appliances, change the sleeping time and also change or modified the office time. By creating new idea about power generation like foot step power generation, power generated from the speed breaker the crisis of energy also can be reduced.

1.1 Overview of power stations in Bangladesh

At present, BPDB operates 45 power stations (Including IPP) with a total installed capacity of 5823 MW. The information about power stations is shown in Table 1[2].

Table 1. Installed capacity of the different power stations in Bangladesh

Public sector		
Name of power station	Number of unit	Installed capacity (MW)
Total (East)	33	2982
Total (West)	17	737
Total (Public sector)	50	3719
Private Sector		
Total (East)	30	1799
Total (West)	8	305
Total (Private sector)	38	2104
Grand total	**88**	**5823**

From the above table it is proved that there is slightly sufficient power producing unit in Bangladesh by utilizing the existing energy.

1.2 Hypothetical demand and production curve for Bangladesh

From the rate of demand of power and production of power, a hypothetical curve for future in Bangladesh is shown in the figure 1.

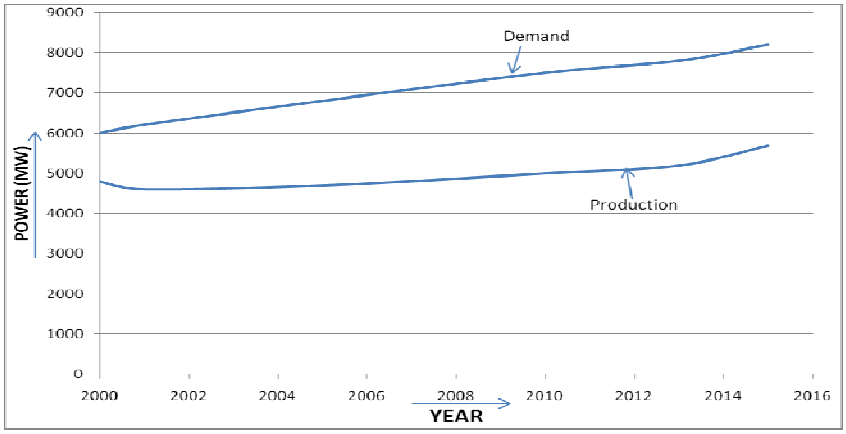

Fig.1. Yearly hypothetical demand and production curve of power

1.3 Challenge and solution of power utilization

Bangladesh lags behind than its expected production capacity. In Bangladesh, 90 million of the populations out of 140 million do not have direct access to electricity and remaining 50 million people have access but reliable and quality power is still beyond their reach [3, 4]. In order to achieve the growth rate, availability of a reasonable priced and reliable source of electricity is a prerequisite. High demand and increasing need of power have created challenge for the power stations to meet the demand. So to meet the demand all of us have to take some necessary steps.

2. Economic strategy of power consumption

For saving power some steps can be taken. Firstly, optimum uses of home appliances specially lighting, heating and cooling. Secondly, changing people lifestyle, in particular, early going bed and waking up from bed. Finally, early bird office time analysis is also reviewed.

2.1 Power consumption of different appliances

Here some home appliances with their power consumption are given in table 2 [5].

Table 2. Home appliances with power consumption

Fixture / Equipment	Wattage	Hours/day	Estimated kwhr use monthly
Cooling Equipment			
Air-conditioning Unit (0.75 HP)	727	12.0	261.72
Air-conditioning Unit (2.0 HP)	1,913	12.0	688.68
Desk Fan 10"	50	8.0	12.0
Stand Fan 16"	80	8.0	19.20
Ceiling Fan, 3-blader	140	8.0	33.60
Fan Box Type	50	8.0	12.00
Air Cooler/Humidifier	65	8.0	15.60
Entertainment Systems			
DVD/VCD Player	300	4.0	36.00
Tape Recorder (Cassette)	50	5.0	7.50
T.V. Set Color, 20"	110	5.0	16.50
T.V. Set Color, 26"	180	5.0	27.00
VHS	45	4.0	5.40
Stereo Component	380	4.0	45.60
VCD	145	4.0	17.40
Household Appliances			
Flat Iron	1,000	3-4 hrs/week	16.00
Clothes Dryer	1,600	3 hrs/week	19.20
Sewing Machine	75	3 hrs/week	0.90
Washing Machine (automatic)	585	1.5	26.33
Floor Polisher (Deluxe)	360	3 hrs/week	4.32
Hair Dryer	320	1.5	14.40
Vacuum Cleaner	400	3 hrs/week	4.80

Water Heater	3,000	8.0	720.00
Lighting Fixtures			
Ceiling Fixtures (3-lamps)	120	3.0	10.80
Fluorescent Lamp, 40 Watts	52	4.0	6.24
Compact Fluorescent Lamp	9	8.0	2.16
Fluorescent Lamp	20	8.0	4.80
	36	8.0	8.64
	40	8.0	9.60
Filament Lamp	25	8.0	6.00
	40	8.0	9.60
	60	8.0	14.40
	75	8.0	18.00
	100	8.0	24.00
Incandescent Bulb	20	4.0	2.40
	40	4.0	4.80
	100	4.0	12.00
Cooking Equipment			
Blender/Grinder/Mixer	300	0.1	0.90
Bread Toaster	600	0.1	1.80
Ranger, 4-burner	8,200	4.0	984.00
Oven (Electronic)	1,450	4 hrs/week	23.20
Microwave Oven	1,200	3 hrs/week	14.40
Turbo Broiler	1,000	1 hr/week	4.00
Rice Cooker, 1.8 liter	650	2.0	39.00
Kitchen Appliances			
Coffee Maker	600	0.5	9.00
Airport	600	4.0	72.00
Water Dispenser (Heater)	550	24.0	396.00
Water Dispenser (Cooler)	90	24.0	64.80
Chest Freezer, 8 cu. ft.	160	14.0	67.20
Chest Freezer, 10 cu. ft.	180	14.0	75.60
Refrigerator, 10 cu. ft.	170	14.0	71.40
Refrigerator, 11 cu. ft. (frost free)	150	14.0	63.00
Upright Freezer, 8 cu. ft.	60	14.0	25.20
Computers			
PC with monitor	225	8.0	54.00
Desk Jet Printer	175	4.0	21.00
Scanner	12	2.0	0.72

By using those carefully and timely switching them on/off it is possible to save a lot of power. The consumption of the power at the different specific appliances is shown in the figure 2.

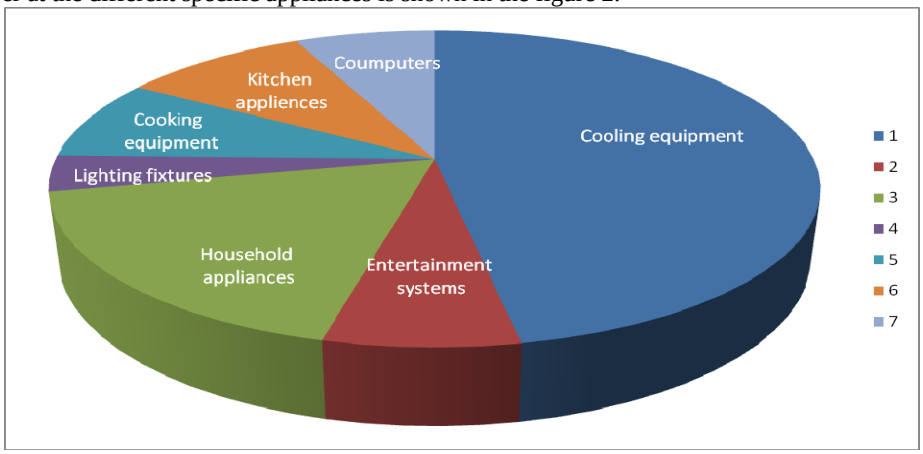

Fig. 2. Amount of power consumption at the different appliances of a middle class family

2.2 Proposed Strategy for saving power

2.2.1 Optimum use of home appliances

2.2.1.1 Light on at people staying room

In our country, it is seen that people put on all the lights in all rooms though they do not stay. This consumes much power which is unnecessary.Thus if only use light at that room where people are available or stay, saves much power like other country such as Australia.

2.2.1.2 Solar facing room design

The home sould be designed such that it will get maximum solar power.The room which needs more daylight should establish in front of sun as daining, reading room or kitchen etc.It saves the power which is used in day time.

2.2.1.3 Computer in Sleep mode

Sometimes computers are stayed on a long period though it is not in used. So if it is used only on sleep mode during the used off period, it saves much power.

2.2.1.4 Clean freeze from unnecessary things

Potato, egg or other less perishable food should out of freeze until good condition, and freezes only those items which will be consumed in very near future. Water cooling also better before 30 - 45 minutes from drinking which saves huge wastage power. Continuous power consumption is required to keep on cool of the food material. Therefore unnecessary foodstuff should be kept out from freezer.

2.2.1.5 Central A/C

In our country, in a single room individuals A/C s are used in many organizations. This consumed huge amount of power. So by using central A/C at the whole organization power is saved.

3. Life Style changing

3.1 Changing of sleeping time

In our country, it is seen that people go to the bed late night in the city and use more power in home appliances. By changing the late sleeping habit a lot of power will be saved.

3.2 Unnecessary lighting in different functions

In our country, it is seen that in marriage, birthday and in other different occasions too much lighting is done which is totally unnecessary. Also in some departmental store, hotels, restaurants, night clubs etc. the same thing is happened. By reducing high use of lighting in these sectors, it is possible to save power.

3.3 Turn off road light immediately just before sun rise

By turning off the road light immediately just before sun rise power will be saved, which is absent in country.

3.4 Early market closing

By closing the markets according to government rules, it is also possible to save power.

4. Early birds office time analysis

4.1 Daylight saving time (DST)

This is another method by which a lot of power will be saved and this is Daylight saving time (DST), is the practice of advancing clocks during the lighter months so that evenings have more daylight and mornings have less. Typically clocks are adjusted forward one hour near the start of spring and are adjusted backward in autumn. If it is done, the office can be started one hour earlier.

4. 2 Proposed Office time

From the above table we see that the average daylight time in summer is near about 13 hour 30 minute and in winter that is 10 hour 40 minute. So for winter and summer office time may be different. The time of sunrise and sunset in Dhaka for the month of June and December is given in table 3 [6].

Table 3. Rising and setting times for the Sun

Season	Date	Sunrise	Sunset	Length of day	Solar noon	Proposed office time
Summer	Jun 27, 2013	5:14 AM	6:49 PM	13h 35m 28s	89.6°	7.30 AM to 5.30 PM
	Jul 3, 2013	5:16 AM	6:49 PM	13h 33m 51s	89.2°	
Winter	Dec 1, 2013	6:24 AM	5:11 PM	10h 47m 02s	44.5°	8 AM to 5 PM
	Dec 10, 2013	6:30 AM	5:12 PM	10h 42m 33s	43.4°	

4. 3 Office time in developed countries

Many countries regulate the work week by law, such as stipulating minimum daily rest periods, annual holidays and a maximum number of working hours per week. Normally in developed countries peoples working 40 hours in a week without overtime. In most of the developed countries like USA, UK etc. working time is 9 am to 5 pm. In USA with the average man employed fulltime for 8.4 hours and woman for 7.7 hours

per working day [7]. From January 1, 2010, Australia enacted the new maximum weekly hour regulation under a new system created by the Fair Work Act 2009. Unless the additional hours are reasonable, the maximum weekly hours of work of a fulltime employee is 38 hours [8]. China enacts a 44hour normal working week and a maximum of 48 hours of work per week [9]. In some countries like UAE, China, and Australia this is more but in day and that is 8 am to 6 pm. They are thinking to come early go early from the office and use the day light as maximum as possible for their office rather than the electricity. This thinking helps to save a lot of power.

4.4 Benefits of early birds office time

Less light using, less fan and air condition required, less traffic jam etc.

5. Steps to overcome power crisis

Reducing system losses play the major role in case of power crisis in Bangladesh. At least 25% of total demand could be fulfilled by reducing system loss. Technical and non technical system loss could be removed by taking the following steps:

5.1 For reducing technical system loss

1. Disconnect the illegal connection of electricity. In that case law enforcing agencies take the initiative. There should be punishment to the charged people.
2. Connect the modern error free meter and implement the meter sealing system.
3. Whole billing system should be under computer net-work and dues should be collected properly.

5.2 For reducing non technical system loss

1. Latest technology should be implemented for the distribution of electricity. Insulated cable may used in the overhead transmission line. It is essential to modernize the distribution line, replace the old set up of the transformers, and switch gear as early as possible. Life time and maintenance of all technical equipments should be ensured properly.
2. Employees of all levels must be responsible for their respective duties. As it is a technical work all employees should have the vast idea in this field. Administration should be ensued severe punishment for the dishonest employees and power station should be close to the load center.

5. 3 Utilization of energy saving lamp

CFL or energy saving lamp can play a vital role to reduce the power crisis. CFL is a glorious energy saving lamp. Average ordinary lamp energy consumes 60 to 100W and tube light 40W. But CFL energy consumes only 9W and its intensity of lumen is higher than ordinary lamp. At present only for lighting load electricity is required more than 600MW. If 80% of the huge demand is brought into under use of CFL, then at least 300MW will be saved this is completely equivalent of set up a generating station of 300MW. To provide CFL at cheapest rate Government should provide tax free import of CFL, customer can get easily and subsidies should be given to encourage local manufacturers of CFL.

5.4 Proper load management

Load management means proper distribution and use of electricity. It could be suggested that for keeping load shedding at a minimum level Government should take the following initiatives:

i. Government should take motivational programs to enhance awareness of the consumers during peak hours. Campaign should be essential to request the consumers through electronic and print media to be rational and economical in electricity use during peak hour by switching off, unnecessary loads like extra lighting, ironing, pumps, air conditioners and welding machines etc.

ii. Industries and large commercial customers like shopping malls should use their own captive generation and Government could transfer holiday in the markets and industrial belts.

iii. Implementation of prepaid metering system will give additional facility.

5. 5 Encourage Independent Power Producers (IPP)

The Government should encourage owner of industry or factory to install their own small electricity generating plants to continue uninterrupted production during the load shedding, help them to supply adequate gas as a subsidized rate and ensure tax free imports spare parts of gas generator, and involve more power producer like Summit power in IPP [10].

5. 6 Expansion of renewable energy program

5. 6. 1 Development in solar energy program

Solar energy program has glorious opportunity in Bangladesh. Government has already been taken a solar energy development program in the Chittagong hill tracts area. This program should expand in the rural areas of the whole country to save power.

5. 6. 2 Expansion of wind energy program

For power generation the average wind speed is 5 m/sec at a height 20-30 m. The average wind speed of some costal area at a height 25 m in Bangladesh is shown in table 4[11].

Table 4. Wind speed in different places of Bangladesh

Area	Max. Speed for some time m/sec	Ave. yearly Speed m/sec
Potenga	15 (8 months)	4.2
Anwara	14 (6 months)	4.1
Teknaf	16 (7 months)	4.6
Feni (Muhuri)	15 (5 months)	4
Kutubdia	16 (9 months)	5
Kuakata	16 (9 months)	5
Char Fassion	16 (6 months)	3.8
St. Martins	20 (9 months)	5.5

From the above it is clear that there is a prospect of wind Energy Program in Bangladesh.

5. 6. 3 Enhance biogas plant for power generation

Biogas plant could be established in the remote area where there is availability of animal, plant and human wastage. For implementing this, Government should encourage IPP to set up bio-gas plant by giving technical and financial support. In that case if the wastage of dairy can be used as raw materials, there is a good prospect of biogas power plant in dairy rich area like Gazipur, Norshingdi, Narayonganj, Savar and Manikganj. There is a bright future for biogas plant in the city corporation area like Dhaka, Chittagong, Khulna, Rajshahi, Sylhet and Barishal where thousand ton of wastage are wasting every day. If these wastages can utilize properly, get power as well as we can save our environment from pollution.

5. 6. 4 Sugar Co-generation projects

Prospects of sugar Co-generation power plant there after installation of as many as 10-15 nos. of generator having 10-15 MW capacity each in the northern zone of Bangladesh where bagasses are available from the sugar mills. Cost will also be economical compared to the cost of generation of electricity by using fuel oil.

5. 6. 5 Implementation of Nuclear Power Plant

There is a huge gap between supply and demand which is increasing day by day. Since maximum power plants are gas based and proven gas reserve is reducing and no new gas reserve has been discovered yet. This huge gap cannot be met by renewable energy. In that case nuclear power may be the alternative option for generating electricity. Nuclear power could be a reality to bridge between the huge gaps between supply and demand.

6. Conclusion

Power is a great phenomena in our day to day life without whose the whole world will become dark .And also power plays a vital role in development of civilization. The advancement of a country is measured in terms of per capital consumption of electrical energy. But Bangladesh faces serious power crisis. It is quite impossible to solve over all power crisis but possible to control load demand by using CFL, transferring holiday, transfer from peak to off-peak hour only through proper planning by load management, encouraging IPP, reducing transmission loss, more utilization of renewable energy sources, modifying the office time, changing the sleeping time etc. Government should give priority to control misuse and corruption in power sector than generation of power and search alternative raw materials for the production or immediate exploration of new gas and mining of coal deposits that are essential to implement the above power generation program. Thus, we can solve this problem not only by installing new power plant or utilizing the different energy sources but also proper management by which produced energy can be utilized to overcome the power problem of Bangladesh.

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