

Sugar Industry: A cheap and easy source of Electricity. (A case study of District Mandi Bahauddin)

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Abstract

Energy crises especially electricity crises has badly shaken the economy of Pakistan. The ratio of economic progress has fallen from 8% to 3.6 % in just few years. This situation has particularly affected the industry and ultimately has caused large scale unemployment in the country. This alarming situation is becoming more severe day by day. In this bad situation some private sectors like sugar mills have capacity to generate surplus electricity and decrease the poverty rate in Pakistan. The sugar mill in District Mandi Bahauddin can easily sell the surplus electricity to public grid at cheap rates up to 6 months. The electricity produced during the winter season is particularly vital for utilities because of lack of rain and snowfall in the northern areas and water level in hydroelectric dams touch to the bottom level. The Phalia Sugar Mill can't generate surplus electricity while Shah Taj Sugar Mill can generate 19.72 MW in the crushing season of sugarcane for 4 months and 32.22 MW in the off season for 2 months as surplus electricity. This electricity could be a broom light for the people of District Mandi Bahauddin. The prices of these units are up to Rs.7.33 / unit. Such low price electricity would be inhaler for low breathing people.

KeyWords: - Energy Crises, Sugar Industry, Electricity

1. Introduction

Recent energy crises have entangled Pakistan into a really very obnoxious situation. According to Bashar (2000), the Chairman WAPDA claimed that: "It is ironical that the majority of the consumers cannot afford electricity while the capacity of generating has increased considerably compared to an enhanced demand and the electric power is becoming a non-economic input for power industry." With lapse of time, the discrepancies between demand and supply of power have been multiplying a great deal.

"The products from petroleum and electricity have huge impact economically. The effect of electricity singularly is quite important." [Rehana Siddiqui (2004)]. The economic prosperity depends heavily on the increase of supply of power energy at cheaper and affordable prices. The problem of demand and supply of energy not only is for present generation but also has inexcusable significance of the prosperity of coming generation.

Poverty rate can be reduced to a large extent by using energy strategically as proposed by two greats Lemech and O' Sullivan (2002). "The Poverty Reduction Strategy of Pakistan" has also emphasized the production of energy to reduce large scale poverty in the country. [Pakistan (2001)]. Thus a desperate and immediate remedy is required. The traditional means of production of electricity are no longer adequate. Therefore new ways should be sought and looked on urgent bases.

According to Alternative Energy Development Board (AEDB), Pakistan has potential of producing 3 lacks Mega Watt (MW) of electricity through wind.[AEDB (2011)]. Like wise Sugar Industry can provide cheap and easy electricity to the common consumers on local level as well as to the industry to some extent. From this we not only can make a rapid progress in economy but can overcome the

problem of unemployment to great extent.

A careful and thorough analysis of the available officially recorded statistics discloses that by 2010, the United States used 7 GW of total of 35 GW of electricity generated from bio energy installation globally. In Brazil, biomass is the third most way of electricity. Japan and Germany also paying heed to this inevitable technique (**World Energy Resources and Consumptions**). India is very rich in biomass (bagasse) and has potential of 5000 MW (Bagasse cogeneration). Brazil Sugar Industry produces 700 MW of electricity through bagasse from which industry uses itself 600 MW and the remaining surplus electricity is available for sale. Nicaragua (the country in Central America) gets 10% of its total supply of electricity from its Sugar Industry .

Different reports reveal that ethanol from Sugar Industry generates 8 to 9 units for each setup while in comparison other biomass can only produce 1.34 unit of energy.

In this paper, our objective is to examine the alternative resources of energy (sugar industry and electricity) in Pakistan. The main objective of the studies is to bring into work the wastage (bagasse) of "The Sugar Industry" to generate cheaper, easy available and environmental favorable electricity and also decrease the difference between demand and supply of electricity on local level with possible available alternative means of electricity. This study is case of District Mandi Bahauddin, Punjab, Pakistan.

2. Methodology

Case Study of District Mandi Bahauddin

District Mandi Bahauddin which is 250 Km away from the capital of Punjab, Lahore is a fascinating fertile land. The District contains two sugar mills. One is Shah Taj Sugar mill which lies 8 Km north to Mandi Bahauddin city while other lies to south of the city 12 Km away from Phalia city. The case for cheap and easiest source of electricity was studied in the two sugar mills in the District Mandi Bahauddin.

3. Results

Production of Sugar Cane In District

Total cultivated area of sugarcane in District Mandi Bahauddin comprised 78000 acre in 2010-11 which increased 9% in 2011-12 with total cultivated area reached up to 85000 acre. The recent statistics data showed 550 tons / acre production of sugarcane. This considerable increase in the production of sugarcane is mainly because of good price rate in the market with favorable weather condition for the crop. (**Statistical Agriculture Office Mandi Bahauddin**)

Both these sugar mills are provided with sugarcane not only by the local farmers of the District but also a big quantity is supplied from the suburbs of District Sargodha.

Phalia Sugar Mill

The capacity to crash the sugar cane of Phalia Sugar Mill is 6000 tons per day. Bagasse and Juice with ratio of 28: 72 is produced 70 tons/hour. The energy produced from sugarcane in the form of ethanol is very useful. When bagasse is burnt, it emits sufficient heat to run turbines which eventually produce electricity to run the mill. By burning all the available bagasse, a steam pressure of 24 Kg/cm² is achieved which can move two turbine generators of 2 MW and 5 MW capacity and results in generating electricity 1.45 MW and 3.7 MW respectively. In this way 5.5 MW of electricity is produced which meet the needs of the mill itself. (**Table 1**)

Table. 1

Estimated Co-Generation @ 6000 Tons per day Cane Crushing rate

Cane crushing rate	250 Tons per hour
Available bagasse @ 28 %	70 Tons per hour
Process house steam required @ 45 %	112.5 Tons per hour

Exhaust Steam & Electric Generation

T.G. No.	Type	Electric Generation (MW)
T. G. 1 (2MW) Steam Pressure 24kg/cm ²	Back pressure at 1.5 kg/cm ²	1.45
T. G. 2 (5MW) Steam Pressure 24kg/cm ²	Extraction at 1.5 kg/cm ²	3.15
	For Condenser	0.55
Total		5.15

Electric Balance

Total Generation	5.15 MW
In House Consumption	5.15 MW
Surplus available for sale	0 MW

Shah Taj Sugar Mill

This mill stays in the top 10 of ranking of 84 sugar mills of Pakistan in its production. This process of generating energy supports ethanol units to be self sufficient in electricity and even can sell to the public grid. Currently extraction of 288 MJ of electricity is achieved from 1 ton of bagasse. The industry’s self use is 180 MJ. In larger view the expansion of this process can have surplus electricity to utilities. (Table 2, 3)

Table 2

Estimated Co-Generation @ 9600 Tons per day Cane Crushing rate

Cane crushing rate	400 Tons per hour
Available bagasse @ 28 %	112 Tons per hour
Process house steam required @ 45 %	180 Tons per hour

Exhaust Steam & Electric Generation

T.G. No.	Type	Steam consumption rate (kg/kwh)	Electric Generation (MW)	Exhaust steam (Tons per hour)
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T.G.1 (15MW) Steam Pressure 65kg/cm ²	Back pressure at 1.5 kg/cm ²	6.40	10.90	70.00
T.G.2 (15MW) Steam Pressure 65kg/cm ²	Extraction at 1.5 kg/cm ²	6.40	9.20	59.00
	For Condenser	4.10	1.46	6.00
T.G.3 (15MW) Steam Pressure 65kg/cm ²	Extraction at 1.5 kg/cm ²	6.40	9.20	59.00
	For Condenser	4.10	1.46	6.00
Total			32.22	200.00

Electric Balance

Total Generation	32.22 MW
In House Consumption	12.50 MW
Surplus available for sale	19.72 MW

Bagasse Balance

Total Bagasse available	112.00 Tons per hour
Total Bagasse required to generation 200 Tons steam @ 2.2kg steam/kg bagasse	90.90 Tons per hour
Surplus Bagasse	21.10 Tons per hour

Note: With the available bagasse 32.22 MW of electricity can be produced for six (6) months. During the crushing season of sugarcane for four (4) months, 19.72 MW would be available as surplus for sale and in the off-season 32.22 MW would be available for two (2) months.

Shah Taj Sugar Mill is generating 32.22 MW of electricity with the help of its 3 turbines which have 15 MW capacity of generating electricity each. Shah Taj uses its own generated electricity up to 12.5 MW and the remaining 19.72 MW electricity is available to sell for the 4 months. After crashing season the remaining bagasse have a capacity to generate 32.22 MW. This is available to sell for the next two months to different sectors on very cheep rates which is Rs.7.33/ kwh. **(Table 2)**

Investment on this sort of projects is probably half of the price referred by the World Bank. A rough calculation shows that energy production from wastage burning is from 30 to 110 MW which vary with the use of technology. While higher statistics can be achieved by replacing machinery and by use of different bio energy sources.

Table 4

ELECTRICITY GENERATION COST BY DIFFERENT SOURCES.

Sources	Cost Rs. / kwh
R.F.O	14.84
Coal	3.12
High Speed Diesel	18.31

Gas	3.89
Nuclear	1.12
Wind	9.12
Hydral	0.16
Iran	8.65
Sugar Industry	7.33

Source: - National Electric Power Regulatory Authority (NEPRA)

The comparison between the electricity generated from various sources and the electricity generated from Sugar Industry encourages investment of capital in the Sugar Industry. **(Table 4)**

CURRENT DEMAND AND SUPPLY CONDITION OF ELECTRICIY IN DISTRICT MANDI BHAUDDIN.

The consumption of electricity has increased considerably in the last two decades in M.B.Din. The monthly demand of electricity in the whole district is almost 85.6 MW, while the district gets 64 MW from public grid. The shortfall reaches to 21.6 MW nearly. This shortfall is returnable with the help of Shah Taj Sugar Mill. **(Table 5, figure 1)**

Table 5

Period Months	Total Supply (MW)	Total Demand (MW)	Difference Demand-Supply (MW)
07-11	64.5	87.8	23.3
08-11	63.7	85.8	22.1
09-11	67.5	89.7	22.2
10-11	63.5	84.5	21
11-11	65	86.1	21.1
12-11	59.9	79.8	19.9

Source 1: Executive Engineer GEPCO, M.B.Din Division.

Source 2: Executive Engineer GEPCO, Phalia Division.

Note: In the vicinity of Districts Sargodha & Jehlum are also attached with GEPCO Divisions M.B.Din & Phalia.

Fig. 1

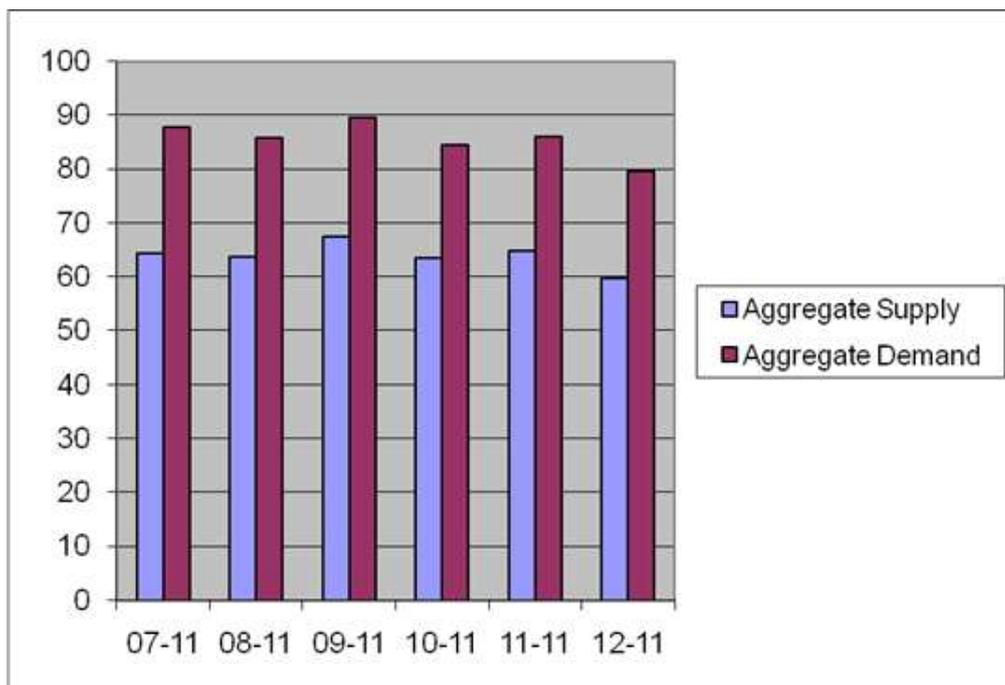


Figure 1 shows that the average shortfall in District M.B.Din is 21.6 MW/month.

Discussion

The case studied for electricity in District Mandi Bahauddin is valuable for the people of this District due to cheap and easiest source.

The electricity available to the District by public grid has the difference of demand and supply approximately is 21 MW. The difference can be lessened or abolished with the help of Sugar industry. District Mandi Bahauddin is an excellent example in this respect. If sufficient cooperation is there from the PEPCO, this duration of electricity production can be maximized to 8 months. This is not only a cheaper way of generating electricity but also environment friendly.

The average cost of 1 kwh of electricity which is available by WAPDA is Rupees 8.84. But in Shah Taj Sugar Mill, this rate has been decreased down to rupees 1.51. Similarly the average cost of 1 kwh of electricity through R.F.O is rupees 14.84 and High Speed Diesel is rupees 18.31 which is almost double to the cost of Shah Taj Sugar Mill. **[NEPRA (2011)]**

The Shah Taj Sugar Mill has capacity to generate surplus electricity for the household and industry of the District Mandi Bahauddin. **(Inaam, Chief Electrical Engineer Shah Taj Sugar Mill).**

The production of electricity is particularly significant in the winter term because there is low water level in dams.

This process of bagasse burning is very useful because it suits the conditions which achieve maximum production at minimum air pollution when compared to coal. There is little sulphur in it and it emits little nitrous oxide as it burns at very low temperature. **[Franke, Tom (2011)]**

Conclusions, Suggestions

The above mentioned discussion and analysis shows if possible measures are taken for the production of electricity within the country by using alternative means we can minimize the power

crises to a large scale. There are more than 80 sugar mills in the country and most of them have the capacity to generate electricity more than their demand and requirement. Through effective measures on local level we can avoid shortfall of electricity by providing electricity to the public grids. This all can be made possible for 4 to 6 months.

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