

COMPARATIVE COST ANALYSIS OF ENERGY UTILIZATION FROM PHCN AND CAPTIVE POWER GENERATORS: - CASE OF A BEVERAGE INDUSTRY

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ABSTRACT

Energy and its effective utilization are of paramount importance especially in this era of ever increasing demand for energy coupled with incessant interruption of power supply from the national grid. This study investigated the financial implications of incessant power outages by Power Holding Company of Nigeria PHCN.

In this survey work, 7up bottling company Ilorin was used as a case study. For fair assessment, data on energy used for three consecutive years i.e. 2004, 2005 and 2006 were collected. The sources of energy used were identified and evaluated. Specifically, the study compared the use of diesel through the use of 3 captive power generators and electricity supplied by PHCN. The data collected was processed and analysed. The cost of obtaining electrical energy from each source of supply was also calculated.

From the study, it was found out that, the percentages of PHCN to diesel energy used for years 2004, 2005 and 2006 were 61 %, 70.76 % and 76.08 % respectively. In the similar manner, the corresponding values obtained for percentage energy supplied by captive power generators (diesel) were 39 %, 29.4 % and 23.92 % for 2004, 2005 and 2006 respectively. The study also revealed that, the average cost of the product using electricity supplied by PHCN and diesel during outages is ₦1.66 per litre of the products, while energy cost per litre of the product without interruption in supply by PHCN is ₦0.625. However, if the company had relied on diesel alone, the cost of product per litre would have been ₦2.498.

The study concluded that, though, electricity supplied by PHCN is cheaper, the company would have lost about 47.86 % of its expected profit, if the company had depended solely on the power supplied by PHCN due to incessant interruption in her supply.

Keywords: - Diesel, Electricity, Energy, Power Outage

INTRODUCTION

Energy is very vital for the development of any nation, including Nigeria. As rightly noted by Megbowon and Adewale (2002), energy and its utilization constitute the transforming agent, which has taken mankind from its primitive start to the present state civilization. The demand for energy for domestic and industrial application keeps on increasing at a fast rate. Expectedly, the cost of energy is also increasing at a rate which has become a source of worry to energy managers, users and engineers (Adegoke and Akintunde, 1997). The energy situation in the country is pathetic and proactive measures must be taken to rescue the situation. For example, there are incessant hikes in prices of petroleum products in Nigeria, especially for the past ten years. Wood, in form of twigs and charcoal, accounts for about 51 % of the total annual energy consumption. The other sources of energy include natural gas (5.2 %), hydroelectricity (3.1 %) and petroleum products (4.13 %), (Akinbami, 2001).

There is a cause for alarm as far as the hydropower generation in Nigeria is concerned. The total hydropower generation in the country is less than 3000 MW and on May 2, 2008, it was reported that the

generation dropped from 3000 MW to as low as 875 MW (FRCN, 2008).

In Nigeria, the generation, transmission, distribution and marketing of electricity are managed by Power Holding Company of Nigeria. There are the national grid and rural electrification schemes. However, the supply is anything but reliable. There are incessant power outages by PHCN, which translated into unavailability and unreliability of electrical supply and this constitutes a major energy problem to our industries. This had led to capacity under-utilization of equipment and machineries and in some cases; it had led to dearth of many small and medium-scale industries. Therefore, most manufacturing and processing industries still rely on captive power generators for their electrical energy needs. The need for the management of energy therefore arises and this involves the measurement of energy consumed by the various subunits of a system. This becomes imperative in order to obtain useful information for controlling energy usage within prescribed boundaries and to determine relative efficiencies of machine (Alabe, 1994).

A few researchers had worked on the energy situation in Nigeria. For example, Megbowon and Adewale (2002) investigated on the effects of failure

of NEPA electricity on the finance of small and medium-scale industries in Nigeria, where they concluded in their study that, 30 % of the expenditure on electricity would be saved, if there were no perennial power cuts by PHCN. Alabe (2003) noted that the perennial power cuts, which translate into unavailability and unreliability of electricity supply, constitute a major energy problem. The study concluded that, the energy cost which contributes as much as 25 % of the total expenses could be brought to a lower value, if companies could properly manage their energy usage to counteract the effect of perennial power cuts by PHCN.

Okoye (2003), not only indicted PHCN for perennial power cuts, but also blamed the company for poor power quality, which has negative impact on electrical and electronic equipment. However, he went further to blame consumers and culprits (through a large scale illegal connection, vandalization) for the mess we were experiencing with PHCN.

Jekayinfa (2004) collected historical data on petrol, diesel and electricity consumption and used it to determine the general trend of energy utilization patterns in relation to palm-kernel oil industry in selected oil mills in Osun and Oyo States of Nigeria. The study concluded that, electrical energy consumption in each of the mills investigated is lower than thermal energy due to irregularity and decline in electricity supply from the national grid.

The aim of this work was to compare energy from electricity generation through the use of captive power generators (diesel) and hydro-power supplied by the national grid.

MATERIALS AND METHODS

In the process of carrying out the study, the industry complex of 7up bottling company was visited several times. Useful information was obtained from records available in the company from relevant authority. Records of generators for ninety days were recorded with a view to calculating the average hours of generators use per day (Table 1). Among other data collected are: (i) The working hours per day (ii) Total product output for three years. (iii) The energy consumption on both hydro-electricity and fuel. (iv) Actual diesel consumptions by generators and (v) PHCN tariff used for industry (vi) Generators' maintenance cost.

The amount of electricity used by the two sources was estimated and the cost of supplying this electricity from PHCN and from generators was calculated. Equivalent energy for the two sources of

supply was determined in accordance with Chand (1999).

RESULTS AND DISCUSSIONS

The results of various calculation made are as presented in Tables 1-4. The existing record from the company showed that the total production hours per annum are 4995 hours out of which 2608.32 hours came from PHCN, while an average of 2386.68 hours was being used for production with captive power generators (diesel) as a source. From the study, it was found that the percentages of energy supplied by PHCN for 2004, 2005 and 2006 were 61 %, 70.76 % and 76.08 % respectively. In the similar manner, the corresponding values obtained for percentage energy supplied by captive power generators (diesel) were 39 %, 29.24 % and 23.92 % for 2004, 2005 and 2006 respectively.

Also, finding showed that, hydro-electricity contributed 12, 2 %, 18.2 % and 16.4 % of the total cost of energy of the company for years 2004, 2005 and 2006 respectively. The results also showed that, average cost of energy per litre of the product produced by the company using electricity supplied by PHCN and energy from captive power generators (diesel) was N1.66 (Table 3) for the 3 years under review, whereas if there were no outages, the average cost per litre of product would had been N0.625 (Table 3). On the contrary, using captive power generators (diesel) as sources of energy without resulting to PHCN, would have attracted an average cost of N2.498 per litre of product (Table 3).

Table 1: Hours of using captive power generators

Hours of using captive power generators in a day (H)	No of days (N)	Total hours (H x N)
0	8	0
2	4	8
3	5	15
4	6	24
5	2	10
6	12	72
7	6	42
8	8	64
9	10	90
10	8	80
11	2	22
12	5	60
13	4	52
14	2	28
15	7	105
16	1	16

$\Sigma N = 90 \text{ days}$ $\Sigma(H \times N) = 688 \text{ hours}$

Table 2: Cost of electricity from PHCN and captive power generators (diesel)

Parameter	Unit	Year		
		2004	2005	2006
Electricity (PHCN)	KW	120,368	548,130	642,299
Cost price per KWH	₦	5.00	6.00	6.00
Total cost of electricity (PHCN)	₦	601,840	3,288,780	3,857,994
Diesel consumption (captive power)	Litre	73,452	216,107	219,079
Cost of diesel per litre	₦	52.00	65.00	85.00
Cost of generators maintenance	₦	465,532	664,000	946,600
Total cost of captive power (diesel)	₦	4,285,036	14,710,995	19,568,315

Table 3: Cost of energy from PHCN and captive power generators (diesel)

Parameter	Unit	Year		
		2004	2005	2006
Product	Crate	588,172	1,141,185	1,320,194
Product	Litre	4,940,040.8	9,585,940	11,809,629.6
Cost of product per litre	₦	85.7	100	100
Cost of energy used per litre using both sources	₦	0.9986	1.8776	2.1124
Cost of energy used per litre using electricity from PHCN without outages	₦	0.233	0.976	0.666
Cost of energy from captive power generators alone	₦	1.479	2.803	3.215
% of electricity (PHCN)	%	61.00	70.76	76.08
% of captive power (diesel)	%	39.00	29.24	23.92

Table 4: Estimated annual profit using both sources of energy

Year	Annual profit using both sources (₦)	Annual profit using PHCN alone (₦)	Annual profit using captive power generators (diesel) alone (₦)
2004	84,682,551.9	44,204,292	40,478,259.9
2005	191,719,080	100,077,360	91,641,720
2006	221,792,592	115,775,733	106,019859

CONCLUSIONS

From the study, the following conclusions can be drawn:

- (1) Incessant power cuts by PHCN had led to rise in production cost, which resulted in reduction in annual profit.
- (2) Comparing the cost of energy per litre of the product, it was discovered that, it is more beneficial to the company to continue to use the two available sources of energy supply.
- (3) Although, electricity from PHCN is cheaper (₦ 0.289/litre), the company stands to lose about 47.86 % of the assumed profit, if it will rely only on electricity from national grid alone.

RECOMMENDATION

The study is recommending to the government that, there is the need to improve the power generation in the country, since the present 3000 MW being generated is grossly inadequate. This must not be left to continue, as this will further worsen the present low capacity under-utilization, which may further lead to dearth of many production and manufacturing companies/industries.

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