

PRIVATE ENTERPRISE FOUNDATION

EXECUTIVE SUMMARY

STUDY ON

THE IMPACT OF POWER OUTAGES
ON MANUFACTURING INDUSTRIES
INGHANA

Prepared by

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1. INTRODUCTION

This Report is in response to an invitation from the Private Enterprise Foundation, PEF, to submit a technical proposal to provide consulting services for the study on the *Impact of Power Outages on Manufacturing Industries in Ghana*. This assignment was undertaken as part of PEF's key strategic objective to maintain a close relationship with private sector business organizations and as a lead organization that plays an advocacy role in influencing policies and regulations of government.

The consultants namely, Dr. Kwasi Diawuo and Mr. E. K. Anto both of the Department of Electrical and Computer Engineering and Mr. M. Bawa Amadu, Department of Planning, all of the Kwame Nkrumah University of Science and Technology (KNUST), Kumasi, constituted the team that executed the assignment. The three consultants have the requisite expertise in many activities related to the study. Their expertise put together cover the various areas described in the assignment. Indeed, each of them has variously undertaken similar assignments previously. The team is thus uniquely acquainted with the processes involved in the assignment and for achieving the objectives stated for the project.

2. BACKGROUND TO THE POWER SUPPLY SITUATION IN GHANA

Electricity demand in Ghana had grown from 3651.6 GWh in 1978 to 5540.6 GWh in 1992. Its consumption is 10% of total energy consumed in Ghana. Its consumption has been growing at 13% per annum since 1991. In 1998, the Energy Foundation, the brainchild of the Private Enterprise Foundation, was established to *inter alia* cover the promotion of energy efficiency and conservation, sustainable development of energy and the protection of the consumer from the inefficiencies of the utilities. Lighting systems, electrical maximum demand management control and power factor correction are all necessary for industrial consumers. Also, an efficient supply to all electric energy consumers is critical. It is more so for the manufacturing sector.

A study commissioned by the Private Enterprise Foundation (PEF) in 2003 on electricity services delivery to the private sector in Ghana revealed that there were some constraints on the delivery of electricity services by Electricity Company of Ghana Volta River Authority and the other power generation and distribution companies. The constraints included the low level of water in the Akosombo Dam, technical problems with the Takoradi Thermal Plant as well as transmission and distribution bottlenecks.

Power outage emerged as the most complained about shortcoming in service delivery to the private sector. While most private sector businesses interviewed (64%) expressed their dissatisfaction with the supply of electricity services, as high as 89% singled out power outage as a major bottleneck in the services

delivered to the private sector. The study is therefore important to reveal the causes and effects of such a situation.

3. PURPOSE AND OBJECTIVES OF STUDY

Among the strategic objectives of the Private Enterprise Foundation (PEF) is the policy to maintain a close relationship with private sector business organizations and to be the lead organization that plays an advocacy role in influencing policies and regulations of government. The Foundation also relates to other internal and external bodies for the creation of an enabling economic environment that ensures that private businesses in Ghana could increasingly contribute to national development.

In furtherance of this policy, PEF undertakes macroeconomic and policy analyses to develop information for enhanced advocacy and public-private sector dialogue. In order to do this, PEF facilitates the gathering of relevant data to equip the private sector to dialogue effectively. With government and its agencies as well as with other institutions that provide services to the private sector.

The elements of the assignment carried out were specified in the TOR to include:

1. Survey the background and evaluate the status of the manufacturing sector in Ghana.
2. Evaluate the current state of power outages to the manufacturing sector in Ghana
3. Identify the causes of these outages with reference to the following:
4.
 - (i) The technology in use
 - (ii) Infrastructure
 - (iii) Manpower requirements
 - (iv) Institutional arrangement
5. Assess the impact of power outages on plant capacity utilisation, productivity, turnover, performance, product quality, maintenance, etc., and cost of doing business in general.
6. Identify other relevant operational issues that cause power outage to the manufacturing sector in Ghana.
7. Make recommendations to forestall power outages.

4. METHOD AND APPROACH TO THE STUDY

The study employed a combination of quantitative and qualitative methods to assess the Impact of Power Outages on Manufacturing Industries in Ghana. A questionnaire was designed and administered by the team. Even though the

questionnaire was comprehensive, it served, in most cases, as an interview guide and many more probing questions were asked. In the cases where management could not meet the team, the questionnaire served well.

The methodology was grounded in an analysis of the structure of the power sector in Ghana and a review of the literature on the general power situation from documented sources including studies carried out for PEF.

The specific questions that this study attempted to answer are:

1. How frequent and long are these outages to industries and consumers in general?
2. What are the direct and indirect causes in terms of technical, policy, /institutional and regulatory frameworks as well as organizational structure?
3. How do these outages affect the manufacturing sector
4. What can be done to bolster the existing capacity and improve the efficiency in supply?

5. MAIN FINDINGS AND RECOMMENDED STRATEGIES FOR DIALOGUE

5.1 Summary of Findings

The industries studied included those for food processing, alcoholic beverages, non-alcoholic beverages, pharmaceuticals, metals processing, textiles manufacturing, cement production, wood processing and petroleum products. The main findings that are presented here are the result of responses from these industries and from documented sources.

5.1.1 High Electricity Consumption

All the industries indicated that electricity is one of the most important inputs in their production processes. Large amounts of it are required, most especially by the metal and cement industries. The study revealed that it costs between ten million cedis and two billion cedis a month to industries on electricity consumption. The total power rating of the major equipment of the industries ranged from 15.20 kW to as high as 13.75MW.

5.1.2 Unreliable Power Supply

All the industries studied indicated that they regard the electric power supply for their production processes as largely unreliable. This is because outages occur too frequently and are unannounced and these are disruptive of production. Both planned and unplanned outages have serious effects on industrial production.

5. 1. 3 Frequency and Duration of Power Outages

The study revealed that power outages were frequent and lasted long. Close to 43% of industries experienced outages 0– 5 times per month, 48% experienced outages 6– 10 times per month, whilst about 9% experienced outages more than 10 times per month.

On the duration of the outages, approximately 35% of industries experienced outages lasting 0 – 1 hour, 56% experienced outages lasting between 2 and 4 hours, whilst about 9% experienced outages lasting for more than 5 hours.

5.1.4 Causes of Power Outages

A number of fault types and reasons account for power outages. The study revealed that about 73% of the outages were unplanned, whilst 27% were planned outages for several reasons. As regards the causes, the study revealed that the highest percentile number (23%) of outages were attributable to earth faults. On the other hand, the causes of 19% of the faults were unknown.

5. 1.5 Effects of Power Outages

It was found that electricity supply has effects on plant capacity utilisation, industrial productivity, turnover performance, product quality, plant maintenance and the general cost of doing business.

a) Damage to Equipment

Due to power outages, close to 83% of industries surveyed experienced damage to equipment, the cost of which ranged annually between eight million cedis and five billion cedis, depending on the type of industry.

b) Damage to Materials in Process

As a result of power outages, approximately 70% of industries surveyed experienced damage to materials in process, equivalent in cost between three million cedis and five billion cedis per annum.

c) Monthly Loss in Income

The loss in income experienced by the manufacturing industries due to power outages ranges monthly between two million cedis and whopping nine billion cedis.

d) *Loss in Production*

During periods of power interruptions, especially those which last to the extent that the relatively low-capacity standby supplies are unable to sustain the power demand, productivity is seriously affected. Machines and labour are forced to remain idle, and the productivity of these is reduced.

The loss in production was quantified in terms of hours per month (ranging between 2 hours/month and 24 hours/month) and tons per month (ranging between 1.41 tons/month and 210 tons/month).

e) *Capacity Utilization*

Capacity utilization in all the industries is below installed plant capacity, mainly due to market size constraints but also electricity interruptions.

f) *Reduced Turnover Performance*

Industries did not in general provide information on turnover performance. However, given the indispensability of power to most of them, turnover performance has a tendency to be lowered with power outages, unless additional efforts and expenditures are undertaken.

g) *Increased Cost of Doing Business*

Points 7.1.5 (a – f) all have the tendency to increase the general cost of doing business in industry.

5.1.6 *Standby Power Supply Systems*

To mitigate the effects of power outages, about 83% of industries surveyed have had to lock up capital in the procurement of standby power supply system, ranging in rating between 250 kVA and 2,800 kVA.

5.1.7 *Additional {Cost of Running Standby Power Supply*

Due to frequent outages and the crucial role of electric power to their operations, the manufacturing industries are compelled to obtain, run and maintain standby generating units at additional costs. The study revealed that industries spend between fifteen million cedis and seven hundred and seventeen million cedis annually to run their standby power supply systems.

5.1.8 *Problems of the Utility Service Providers (EGG and VRA)*

Part of the problem of supply arises out of the fact that the utility service providers themselves (ECG and VRA) have problems. These are largely those of

finance that results in inadequate infrastructure for generation and distribution, huge losses of electricity produced to non-revenue uses, and other systemic inefficiencies.

5.1.9 Low Power Factors

Some of the companies were operating at average monthly power factors less than 0.90, a situation likely to attract huge power factor surcharges.

5.1.10 Inadequate Information Flow

There is a need for improvement in interaction and communication between customers and the utility providers so as to improve fault reporting.

5.2 Recommended Strategies for Dialogue

5.2.1 Maintain and Upgrade Power Equipment

Many of the outages stem from the fact that equipment used in substations are obsolete and need replacement and/or upgrading. The equipment that was generally recommended for such replacement and upgrading by the utility provider includes the following:

1. Obsolete power station equipment
2. Automatic voltage regulators (for improving voltage to customers)
3. Overloaded primary substations
4. Distribution transformers and networks

5.2.2 Carry out Regular Preventive Maintenance Activities

For effective supply of power, it is strongly recommended that regular or scheduled preventive maintenance on feeders and substation equipment be undertaken. Patrol teams must be established to patrol overhead lines and trim trees and bamboo branches.

5.2.3 Establish Standby Faults and Maintenance Teams

It is suggested that faults and maintenance teams be established to be on constant standby to attend quickly to faults in the field as and when they are reported.

5.2.4 Undertake Closer Monitoring of Faults with SCADA Systems

The incidence of faults must be closely monitored by the installation of Supervisory Control And Data Acquisition (SCADA) systems to improve

responses to faults. In addition to this, regular visits by substation routine maintenance teams must be undertaken. Such visits will be important for quick identification and resolution of potential fault situations in the substations.

5.2.5 *Establish Priority or Dedicated Supply Lines to Industry*

It is suggested that the ECG consider giving the manufacturing industries *dedicated* power lines to cut down the frequency and length of outages.

5.2.6 *Invest in Modern Protection Equipment*

Investment in modern reliable switchgear and circuit breakers, for instance, is suggested in order to quickly isolate faults, reduce incidences of equipment failure or breakdown and thus improve the reliability of the system.

5.2.7 *Reduce Overloads of Transformers*

It is suggested that injection of secondary/distribution substations be considered to reduce the load on overloaded transformers.

5.2.8 *Eliminate Chain Effects of Faults*

Circuit feeders must be designed such that faults from an area do not necessarily affect the operations of other areas.

5.2.9 *EGG to Improve General Services*

It is suggested that the ECG improve its general services by undertaking the following:

1. Introduce favorable off-peak tariffs for industries to encourage a shift in energy usage to such times, in order to reduce transmission losses and demand on generating capacity and resources;
2. Encourage customers to pay bills regularly, desist from illegal connections and promptly report faults;
3. Design and implement effective customer service programmes;
4. Establish regular communication and interaction between them and their customers;
5. Provide timely bills while enforcing regulations on non-settlement of bills; and
6. Undertake intensive educational campaigns on energy savings and minimisation of power usage.

5.2.10 *PURC and Energy Commission to Intensify Oversight Activities*

It is suggested that the PURC and Energy Commission (EC) intensify their oversight activities by:

1. constantly monitoring the operations of the utilities;
2. enforcing the established rules and provisions;
3. encouraging and participating in long term strategic planning for the power sector;
4. assisting in the proper coordination of and soliciting maximum cooperation of all stakeholders;
5. educating the public on the efficient and productive uses of electricity.

5.2.11 *PURC/IECG to Establish Realistic Tariffs*

It is recommended that PURC assist EGG in fixing realistic power tariffs that are economic and acceptable to consumers.

5.2.12 *Government Assistance to EGG and VRA*

It is recommended that the government provide assistance to the power sector by:

1. establishing subsidies to some categories of consumers;
2. supporting EGG to secure loans to improve its network and operations;
3. assisting VRA to secure loans to increase its generation capacity
4. encouraging participation by independent power producers (IPPs)