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Center for Environment  
Office of Energy, Environment and Technology

In Collaboration with:  
**THE PUBLIC UTILITIES REGULATORY COMMISSION, GHANA**

**GHANA TARIFF REVIEW**

**ANALYSIS OF ELECTRIC PRICE IMPACTS  
FOR  
SELECTED BUSINESS ENTITIES**

October 1999

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## **SECTION 1- EXECUTIVE SUMMARY**

### **1.1 Introduction**

This report is the fourth and final item of the “Ghana Tariff Review” project initiated in June 1999, with funding by USAID. The overall purpose of the project is to provide the Public Utilities Regulatory Commission (PURC) of Ghana with the knowledgeable assistance of outside consultants in initiating its process and methods of electric tariff ratesetting. The outside consulting team employed consisted of utility regulatory and financial experts from PricewaterhouseCoopers LLP, Resources Management International (Navigant Consulting), and Bechtel Technology & Consulting.

In addition to assessing the potential impacts of the new ratemaking approaches of the Commission on selected industries using significant amounts of energy in Ghana as discussed in this report the consulting team has also provided the PURC with assistance in three other related areas:

- Review of the “Guidelines” proposed for the Commission’s ratesetting process,
- Analysis and comment on regulatory and ratemaking “Issues” identified by the Commission, and
- Establishment of an electric price forecast “model” based on the new ratemaking methods.

Each of these tasks have been completed by the consulting team and provided to the PURC in separate reports.

This report provides the results of the team’s efforts to examine the potential of harmful impacts to selected businesses in Ghana resulting from the overall electric price increases expected under the new ratesetting process. As detailed in the following sections, this analysis is based on using the methods for ratesetting outlined in the PURC’s “Guidelines” to develop a near-term forecast of expected price changes ( see report on price forecast “model”), and the data provided by the businesses to the PURC, as well as industry information available to the team.

### **1.2 Business Entities Addressed**

At the initiation of the consulting team’s work the PURC expressed its concerns on the potential impact for a number of consumer sectors. The initial listing of customer sectors to be reviewed included:

- Residential (low, medium, and high income users)
- Manufacturers (Unilever, Nestle, Steel, Glass)
- Mines
- Hotels

Water Authority  
Retail Stores

In subsequent discussions with the PURC, and based upon available information, the areas to be addressed were refined, to concentrate primarily on larger business entities, representing enterprises which have previously expressed concerns about prices and provided data.

The businesses supplying addressed in the team's analysis and in the report are:

- Gold Mining – Ashanti Goldfields
- Steel Production – Wahome Steel, Ltd. (Tema Steel and Ferro Fabric)
- Aluminum Products – Aluworks

### **1.3 Approach and Methodology**

The project team's analysis of the impacts of rate increases on the business sectors has been limited to a review of the materials presented to it by the business entities responding to a letter from the PURC. The letters were sent on July 15, 1999 to a number of businesses, the following businesses provided responses:

- Ashanti Goldfields Company Limited
- Wahome Steel Company Limited
- Aluwoks Ghana Limited

A copy of the letter sent by the PURC to businesses is included as Appendix I.

The analysis of each entities electricity costs reviewed the historical cost of electricity as a cost of production and the energy efficiency of the operations to the extent that the data supplied or readily available allowed. The analysis also used the result of the price forecast created by the team (see Tariff Forecast Model Report) to indicate the significance of expected price changes occurring under adoption of the new ratesetting process outlined by the PURC (see Guidelines report).

The forecast from this model predicted that the average system end-user price would rise from its present level of 194 cedis/ kWh to 261cedis/ kWh by the year 2001, a 35 % overall increase.

## 1.4 Findings

### **Ashanti Goldfields Company Limited**

Ashanti's utilization of energy appears to be quite reasonable in comparison to other mines in Ghana. During 1998 other operating cost savings by Ashanti substantially offset the significant increases in electricity prices. The total operating costs per ounce were \$254 per ounce in January and \$220 per ounce in December. This significant decrease in total operating costs resulted from significant efforts to improve other cost factors, particularly materials.

Based on Ashanti's costs of power per ounce of gold produced, the forecasted electricity price increases are necessary to implement the new ratemaking process (through year 2001) will raise its costs of production by only \$0.15 per oz., which is less than an increase of 0.04% in the average price Ashanti received on gold in 1998.

### **Wahome Steel Company Limited**

For the first 6 months in 1998, the Wahome reported that it used an average of 376 kwh/ton, as compared with 350 kwh/ton in 1997 when power supply outages were not as prevalent. The MOME report however, issued in Feb. 1999, reported the "Specific Energy Consumption" (SEC) of Wahome to be 807 kwh/ton, much above the "efficient" plant profiles of 350 kwh/ton it measured in Germany and Japan.

Based on the data obtained and the projected overall rate increases necessary to establish prices at levels corresponding to the PURC's ratesetting "Guidelines", as forecasted by the team, Wahome's costs of production would rise by 5% over the two year period (2000-2001). Thus, if it were to be using energy as "efficiently" as it reports, its energy costs would be approximately 18% of total costs in the year 2001, after the forecasted overall necessary increases from the team's price production model.

### **Aluworks Company Limited**

In 1998 Aluwork's costs of electricity and water were 1,579,285(¢000), compared with expenses of 626,687 (¢000) in 1997, a 150% increase, while overall production was essentially constant (16,821 metric tons in 1998, 16,827 metric tons in 1997). The cost of utilities (electricity and water) amounted to 2.0% operating costs in 1998, compared to 0.9% in 1997.

If increases were imposed on the electric prices as forecasted in our model to implement the new ratesetting process, and all other costs remained constant, the cost of electricity as a portion of total operating costs would rise to be approximately 3% by year 2001.

## **SECTION 2 – BUSINESS ENTITY ANALYSIS**

### **2.1 Introduction**

This section contains a more detailed discussion of the electric energy use and costs of the three industrial sectors analyzed by the team. These three entities are those which responded to PURC's letter sent to elicit information on the use of electricity in operations and on the effect of the two electricity increases made in 1998. These were in the Gold Mining, Steel Manufacturing and Aluminium Producing sectors of the economy.

### **2.2 Gold Mining Sector- Ashanti Goldfields Company Limited**

The analysis of the gold mining industry's vulnerability to harmful impacts of the forecasted increases in price has utilized information provided by Ashanti Goldfields Co., Ltd., and other published data.

Ashanti has six producing gold mines in Africa, in three countries; Ghana, Guinea and Zimbabwe. The largest mine (Obuasi) is located in Ghana, which provided almost 900,000 ounces of production in 1998, out of Ashanti's total 1,550,000 ounces from all its mines. Obuasi has primarily underground mining for production. Three other of Ashanti's mines are also located in Ghana: Ayanfuri which has marginal lower grade deposits, Iduapriem, which is reaching the end of its economic life in 1999, and Bibiani, a new mine commissioned in early 1998, producing approximately 200,000 ounces. Obuasi contains over 50% of the company's proven and probable gold reserves. The over 900,000 ounces of production by Ashanti in Ghana was approximately ½ of the total production of the country for 1998.

The cost of electric power for Ashanti's gold mining operation in Ghana increased very significantly in 1998, as the PURC implemented necessary rate increases. At the outset of 1998 the electricity price was approximately 41 cedis/kwh, which increased in February to 80 cedis/kwh and again in December to a level of 170 cedis/kwh (\$.07/kwh U.S.). This four-fold increase in per unit cost resulted in the proportion of electricity's cost to total operating cost rising from 7% to 18%. At Ashanti's principal mine, Obuasi, power cost per ounce of gold produced rose from (\$19U.S.) to (\$43U.S.) over this period.

During 1998 other operating cost savings by Ashanti substantially offset the significant increases in electricity prices. The total operating costs per ounce were \$254 per ounce in January and \$220 per ounce in December. This significant decrease in total operating costs resulted from significant efforts to improve other cost factors, particularly materials.

Ashanti's utilization of energy appears to be quite reasonable in comparison to other mines in Ghana. According to the Ministry of Mines, and Energy's

(MOME) recent report from the "Electricity Demand Management Project" (Feb. 1999), Ashanti (Obuasi) used 6.3 kwh/ton of ore processed. Other mines, according to the MOME Report varied from 5.8 to 21.8 Kwh/ton. The MOME report concluded, based on the variations shown, that- "it appears that a scope for improvement exists in the surface mines through the employment of processing methods that will require less energy". It noted, however, that other factors can effect the apparent efficiencies and each mine should be treated on its own merit.

While it may not be accurate to over generalize from Ashanti's recent experience, it appears that savings from other operational costs can significantly offset power cost increases. In addition, it must also be noted that the price of gold has been at significantly depressed levels as witnessed by Ashanti's reported ability to forward hedge over 30% of its reserve position of 23 million ounces at an average price of U.S. \$390/oz., compared with current prices below U.S. \$300/oz.

Based on Ashanti's costs of power per ounce of gold produced, the forecasted electricity price increases are necessary to implement the new ratemaking process (through year 2001) will raise its costs of production by only \$0.15 per oz., which is less than an increase of 0.04% in the average price Ashanti received on gold in 1998.

### **2.3 Steel Production Sector - Wahome Company Limited**

To assess the impacts of electricity costs on Ghana's steel industry, the team has reviewed information provided to the PURC by Wahome Steel, Ltd. This information was in the form of a report entitled "The Impact of the Energy Crisis on Wahome's Operation"; analyzing the impacts of the 1998 electric price increases and energy supply curtailments. The team also referred to the information on Wahome contained in the MOME Report on the Electricity Demand Management Project (Feb. 1999).

The Wahome steel plant melts scraps to cast and roll steel products, e.g., rebar. It utilizes a power intensive electric arch furnace process augmented by oxy fuel burn-ups for the melting, as well as, motor driven rolling mills for the production of bars of different shapes and sizes. Due to the high intensity, short-cycle, energy use of the arc formed process, the electric usage load factor is low. For the first 6 months in 1998, the Wahome plant reported that it used an average of 376 kwh/ton, as compared with 350 kwh/ton in 1997 when power supply outages were not as prevalent. The MOME report however, issued in Feb. 1999, reported the "Specific Energy Consumption" (SEC) of Wahome to be 807 kwh/ton, much above the "efficient" plant profiles of 350 kwh/ton it measured in Germany and Japan.

The data initially provided by Wahome to the team did not contain the amount (kwh) or cost of electricity on an annual basis. However, assuming an electricity cost of 200 cedis/kwh, and usage of 400 kwh/ton the cost of electricity would approximate 14% of the reported overall cost of production for 1998 (6 months).

Based on the data obtained and the projected overall rate increases necessary to establish prices at levels corresponding to the PURC's ratesetting "Guidelines", as forecasted by the team, Wahome's costs of production would rise by 5% over the two year period (2000-2001). Thus, if it were to be using energy as "efficiently" as it reports, its energy costs would be approximately 18% of total costs in the year 2001, after the forecasted overall necessary increases from the team's price production model.

#### **2.4 Aluminum Product Sector - Aluworks Company Limited**

To further assess the impacts of electricity on the industrial sector, the team received and reviewed data provided by Aluworks Ltd. Aluworks is a manufacturer of primary aluminum products such as flat sheet, corrugated roofing sheet, louvers, and coils. Aluworks is a large electricity consumer served directed by the Volta River Authority (VRA), using approximately 12 Gwh per year. Aluworks produces approximately 16,500 metric tons of products per year with a value (1998) of 92.9 billion Cedis. It sells to both local and export markets. Over 80% of the exports were sold to neighboring African countries. In 1998, approximately 30% of its product were sold in export markets, a doubling of the percent amount sold to such markets in 1997. From 1997 the average costs of goods sold rose by 6% including the accounting for the decline of the cedi against the dollar. In 1998 a pretax profit of 15.7 billion Cedis was achieved, a 62% increase over 1997.

In 1998 the costs of electricity and water were 1,579,285(¢000), compared with expenses of 626,687 (¢000) in 1997, a 150% increase, while overall production was essentially constant (16,821 metric tons in 1998, 16,827 metric tons in 1997). The cost of utilities (electricity and water) amounted to 2.0% operating costs in 1998, compared to 0.9% in 1997.

If increases were imposed on the electric prices as forecasted in our model to implement the new ratesetting process, and all other costs remained constant, the cost of electricity as a portion of total operating costs would rise to be approximately 3% by year 2001.

APPENDIX I

July 15, 1999

The Managing Director  
Aluworks  
Heavy Industrial Area  
P.O.Box 914  
Tema

Dear Sir,

INFORMATION REQUEST TO CARRY OUT IMPACT ANALYSIS OF TARIFF  
INCREASE ON THE SPECIAL LOAD TARIFF CATEGORY

The PURC is currently carrying out a study to assess the impact of the 1998 electricity tariff on the opening cost of the various institutions in the Special Load Tariff (SLT) group.

To enable us carry out a detailed analysis and thus come out with reliable results, we will need your establishment's 1998 annual report and up-to-date information (quantitative or qualitative). On the effect of the increased tariff on the firm's opening expenditure.

We wish to emphasize that your assistance in this exercise is vital, since the outcome of the study will guide PURC in future tariff setting, for consumers in the SLT category.

Your prompt response would be most appreciated.

Counting on your co-operation.

Yours faithfully

Stephen Adu  
Executive Secretary