



# GHANA WHOLESALE ELECTRICITY MARKET BULLETIN

## MARKET WATCH

Monthly Market Data Analysis

ISSUE NO. 25: 1<sup>st</sup> January 2018 to 31<sup>st</sup> January 2018

This Bulletin covers major developments in the Wholesale Electricity Market (WEM) of Ghana from 1<sup>st</sup> January, 2018 to 31<sup>st</sup> January, 2018. It analyses the performance of the key WEM indicators against their benchmarks, and examines the likely implications of any discernable trends in the market. This edition contains electricity supply information for the 20 MW BXC Solar power plant and presents the Electricity Supply Plan (ESP) for 2018.

The Electricity Market Oversight Panel Secretariat would very much appreciate and welcome comments from readers on the Bulletin. Reasonable care has been taken to ensure that the information contained in this Bulletin is accurate at the time of publication, nevertheless, any errors, omissions or inaccuracies therein are regretted.

### HIGHLIGHTS OF THE MONTH

#### Overview of the Month

Electricity supply increased marginally in January 2018 from 40.48 GWh per day in December 2017 to 43.85 GWh per day in January 2018. This is attributable to the increase in supply from the hydro power plants from 12.36 GWh in December 2017 to 13.65 GWh in January 2018. The generation from the Akosombo GS increased by 9.5%, Kpong GS by 6.3% and the Bui GS by 22.7%. Consequent to the increase in generation, the Akosombo GS had an increase in its rate of drop in the water level from 0.036 feet per day in December 2017 to 0.05 feet per day in January 2018. Likewise, the Bui GS had an increase in the rate of drop of its water level from 0.074 feet per day in December 2017 to 0.109 feet per day in January 2018. Contrary to the increase in generation by the hydro power plants, thermal generation reduced marginally from 27.78 GWh per day in December 2017 to 27.51 GWh per day in January 2018. This was attributable to the decline in generation of the, TAPCO, TICO and SAPP power plants by 22.8%, 9.5% and 16% respectively due to maintenance works, grid demands and fuel supply challenges respectively.

There were reduction in natural gas supply from both the WAGP and the AGPP. Gas supply from the WAGP reduced from 38.89 MMSCFD in December 2017 to 32.62 MMSCFD in January 2018. Likewise, the natural gas supply from the AGPP reduced from 103.19 MMSCFD in December 2017 to 93.53 MMSCFD in January 2018. LCO consumption reduced from about 44,000 bbls

Table 1 Projected and Actual Outturn of electricity demand and supply in December 2017 and January 2018

|                                  | January 2018 |                | December 2017 |                |
|----------------------------------|--------------|----------------|---------------|----------------|
|                                  | Projected    | Actual Outturn | Projected     | Actual Outturn |
| Total Supply (GWh)               | 1,327.6      | 1,280.5        | 1,344.0       | 1,254.9        |
| Source by Power Plants (GWh)     |              |                |               |                |
| AKOSOMBO                         | 326.0        | 314.2          | 279.0         | 286.9          |
| KPONG                            | 51.0         | 58.6           | 55.0          | 55.1           |
| BUI                              | 57.0         | 50.5           | 69.0          | 41.1           |
| Sunon Asogli                     | 118.0        | 137.4          | 151.0         | 163.6          |
| TAPCO                            | 89.0         | 88.4           | 158.0         | 97.7           |
| TICO                             | 174.0        | 170.4          | 176.0         | 220.7          |
| TT1PP                            | 60.0         | -              | -             | 15.5           |
| CENIT                            | -            | -              | -             | -              |
| TT2PP                            | -            | -              | -             | -              |
| MRP                              | -            | -              | -             | -              |
| Karpowership                     | 287.0        | 258.6          | 145.0         | 195.1          |
| AMERI                            | 92.0         | 89.2           | 140.0         | 82.6           |
| KTPP                             | -            | -              | -             | 2.0            |
| Trojan Power                     | -            | -              | -             | -              |
| CENPOWER                         | -            | 0.3            | -             | -              |
| ARSA                             | 71.0         | 108.6          | 161.0         | 83.9           |
| BXC Solar                        | 2.2          | 2.2            | 2.7           | 2.3            |
| VRA Solar                        | 0.4          | 0.2            | 0.2           | 0.4            |
| Total Generation (GWh)           | 1,327.6      | 1,278.6        | 1,356.9       | 1,246.8        |
| Imports (GWh)                    | -            | 1.9            | 10.0          | 8.1            |
| Total Supply (GWh)               | 1,327.6      | 1,280.5        | 1,344.0       | 1,254.9        |
| Deficit (GWh)                    | -            | (47.1)         | -             | (89.1)         |
| Ghana Coincident Peak Load (MW)  | 2,263.0      | 2,139.0        | 2,140.0       | 2,127.7        |
| System Coincident Peak Load (MW) | 2,306.0      | 2,172.3        | 2,313.0       | 2,134.9        |

## HIGHLIGHTS OF THE MONTH

in December 2017 to about 4,600 bbls in January 2018. On the contrary, HFO consumption increased in January 2018 compared to December 2017 by 27.8%.

There was a marginal increase in the System Peak Load in January 2018 compared to December 2017 by 37.4 MW from 2,134.9 MW in December 2017 to 2,172.3 MW. Likewise, the Ghana Peak Load increased by 11.3 MW to 2,139 MW in January 2018 from 2,127.7 MW in December 2017.

### Electricity Demand and Supply

#### Electricity Demand

The System Peak Load increased to 2,172.3 MW in January 2018 from 2,134.9 MW in December 2017. Similarly, the Ghana Peak Load increased by 11 MW to 2,139 MW in January 2018 from 2,127.7 MW in December 2017. Hydro generation contributed 46.3% of the System Peak Load and 38.2% of the Ghana Peak Load while thermal generation contributed the rest. The System Load Factor, increased from 78.8% in December 2017 to 79.1% in January 2018. Likewise, the System Capacity Utilization Factor for January 2018 increased to 39.1% from 38.3% in December 2017.

#### Electricity supply

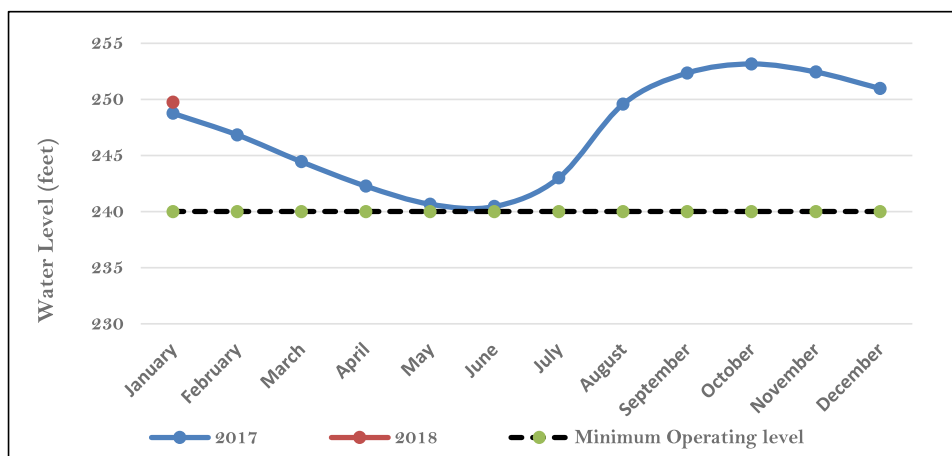
Electricity supplied in January 2018 increased to 1,280.52 GWh from 1,254.49 GWh in December 2017. Hydro supply in the total electricity supplied increased from 30.54% in December 2017 to 33.01% in January 2018. The total electricity supplied in January 2018 was 1,280.33 GWh consisting of 1,278.59 GWh from domestic generation and 1.92 GWh of imports from La Cote D'Ivoire (CIE). The total supply of electricity in January 2018 was 48.83 GWh lower than the 1,327 GWh projected under the Electricity Supply Plan (ESP) developed for the year 2018. This represents a 3.7% deviation between the outturn and the projection.

### Hydro Dam Levels

#### Akosombo Dam Water Level continued to drop at an increasing rate in January 2018

The water level at the beginning of the year 2018 was 251.31 feet, 0.84 feet higher than the water level recorded at the same period in 2017. The water level of the Akosombo dam dropped at an increasing rate of 0.05 feet per day in January 2018 from 0.036 feet per day recorded in December 2017 due to the increase in electricity generation by the power plant at an average of 9.6% per day in January 2018 compared to December 2017. The water level reduced by 1.56 feet in January 2018 to reach 249.75 feet at the end of the month from 251.31 feet at the beginning of the month. The end of month water level for the Akosombo dam was 0.99 feet, higher than the water level recorded for the same period in 2017 and was 9.75 feet higher than the minimum operating level of 240 feet. Figure 1 shows comparative end of month trajectory of the level of water in the Akosombo dam from January 2017 to January 2018.

Figure 1: Month-End Water Level for Akosombo Dam from January 2017 to January 2018

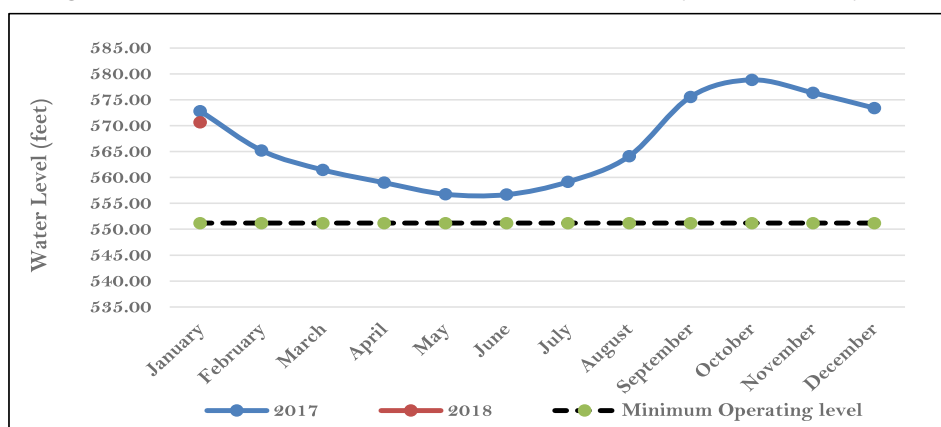


#### Bui Dam Water Level rate of drop increased in January 2018

The water level of the Bui dam at the beginning of the year stood at 574.03 feet, which was 2.82 feet lower than the water level recorded for the same period in 2017. The Bui dam water level in January 2018 reduced at an increasing rate of 0.109 feet per day from 0.074 feet per day in December 2017 due to the increase in electricity generation by the power plant at an average of 22.5% per day in January 2018 compared to December 2017. This is attributable to the 22.7% increase in generation in January 2018 compared to December 2017. The water level dropped by 3.38 feet in January 2018 to reach a month end water level of 570.65 feet. The end of month water level of 570.65 feet is 2.16 feet lower than the water level recorded the same time in 2017 but it is 19.47 feet above the minimum operating level of 551.18 feet. Figure 2 shows comparative end of month trajectory of the level of water in the Bui dam from January 2017 to January 2018.

## HIGHLIGHTS OF THE MONTH

Figure 2: Month-End Water Level for Bui Dam from January 2017 to January 2018

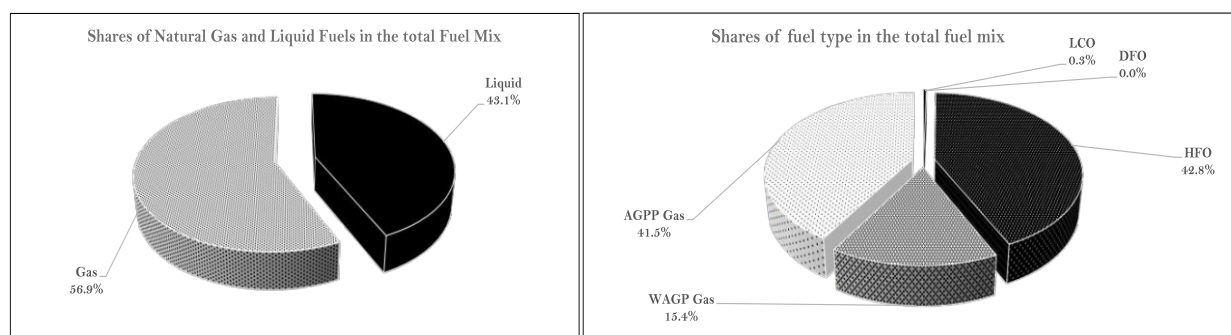


### Fuel Supply for Power Generation

Natural gas consumption accounted for 57% of the fuel consumed in January 2018, a marginal reduction in natural gas share in the total fuel supply mix from 64% recorded in December 2017. Consequently, liquid fuel share increased from 36% in December 2017 to 43% in January 2018. Share of natural gas supply from the WAGPCo in the total fuel supply decreased in January 2018 to 15% from 17% recorded in December 2017. Likewise, natural gas supply from the AGPP decreased to 42% in January 2018 from 47% in December 2017. The shares of HFO consumed in January 2018 increased to 42% of the total fuel supply mix from 33% in December 2017 while the LCO consumption reduced to 1% in January 2018 from 3% in December 2017.

Figure 3a and Figure 3b shows the shares of sources of fuel and fuel type in the generation fuel mix for electricity generation respectively.

Figure 3a: Shares of sources of fuel in total fuel mix for power generation Figure 3b: Shares of fuel type in the generation fuel mix power generation



### Natural gas flow rate from WAGPCo declined marginally in January 2018

Natural gas flow rate from Nigeria through the WAGP to Tema and Kpone decreased marginally to 32.62 MMSCF per day in January 2018 from 38.89 MMSCF per day recorded in December 2017. Total gas consumption from the Tema-Kpone enclave decreased from 1,154.74 MMSCF in December 2017 to 1,008.77 MMSCF in January 2018, representing a 12.6% reduction. The natural gas consumption at the Tema and Kpone accounted for 27% of the total natural gas consumed in January 2018.

### Natural gas flow rate from GNGC declined marginally in January 2018

Natural gas flow rate from the AGPP to the Aboadze Power Enclave decreased to 93.53 MMSCF per day in January 2018 from 103.19 MMSCF per day recorded in December 2017. Consequently, total gas consumption at the Aboadze Power Enclave decreased to 2,636.69 MMSCF in January 2018 from 3,050.74 MMSCF in December 2017, an 11.1% decrease in consumption. Natural gas supply from the AGPP accounted for 73% of the total natural gas consumption in January 2018. Of the total natural gas supplied in January 2018 from the Aboadze enclave, 28.8% was used by the Ameri Power Plant for electricity generation, 44.7% was used by TICO Power Plant while the remaining 26.5% was used by the TAPCO Power plant.

## HIGHLIGHTS OF THE MONTH

Figure 4a: Contribution of Gas Supply by sources

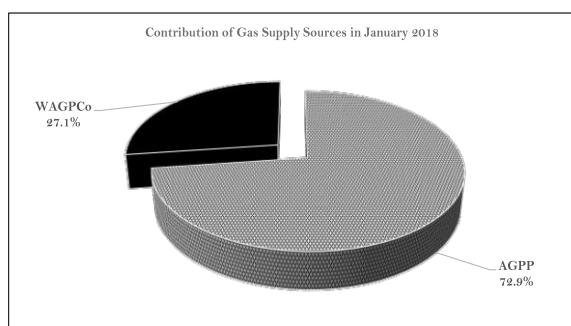
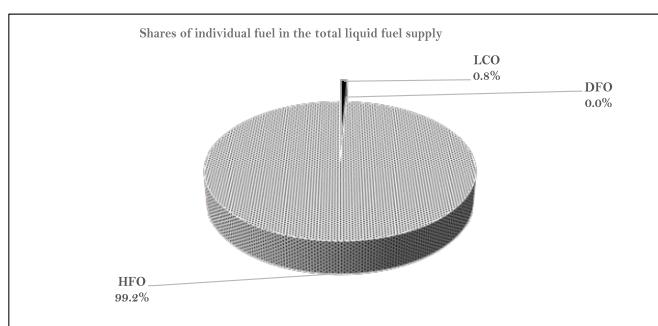


Figure 4b: Contribution of individual fuel in the liquid fuel supply



### Liquid Fuel

Liquid fuel consumption increased marginally by 14.4% from 435,791 barrels in December 2017 to 498,705 bbls in January 2018. HFO's share of the total liquid fuel consumption increased from 90% in December 2017 to 99.2% in January 2018 while LCO's share decreased from 9% in December 2017 to 0.8% in January 2018.

### Plant by Plant Highlights

#### Electricity Generation at the Akosombo Generation Station (GS) increased in January 2018

The average Akosombo GS generation increased marginally by 9.6% from 9.25 GWh per day in December 2017 to 10.14 GWh per day in January 2018. Consequently, the Akosombo GS share of the total electricity supply in January 2018 increased to 24.58% from 22.91% in December 2017. Total electricity generation increased from 286.87 GWh in December 2017 to 314.23 GWh in January 2018. The Akosombo GS generated 3.6% lower than the 326 GWh projected under the 2018 ESP. The Akosombo GS contributed 672 MW to meet the System Peak Load and 524 MW to meet the Ghana Peak Load in December 2017 which represented 30.9% of the System Peak Load and 24.5% of the Ghana Peak Load.

#### Electricity supply by Kpong Generation Station (GS) increased marginally in January 2018

The average generation from the Kpong GS increased marginally by 6.3% from 1.78 GWh per day in December 2017 to 1.89 GWh per day in January 2018. Consequently, Kpong GS's share of the total electricity supply increased to 4.6% in January 2018 from 4.4% in December 2017. Total generation also increased from 55.11 GWh in December 2017 to 58.59 GWh in January 2018. The generation from the Kpong GS was 7.59 GWh higher than the 51 GWh projected for January 2018 under the 2017 ESP. The Kpong GS contributed 105 MW to meet the System Peak Load and 70 MW to meet the Ghana Peak Load in January 2018 representing 4.8% of the System Peak Load and 3.3% of the Ghana Peak Load.

#### Electricity supply by the Bui Generation Station (GS) increased significantly in January 2018

The generation from the Bui GS plants increased significantly by 22.6% in January 2018 to 1.63 GWh from 1.33 GWh in December 2017. Total electricity supplied by the Bui GS increased by 22.7% in January 2018 from 41.13 GWh in December 2017 to 50.47 GWh in January 2018. Consequently, Bui GS's share in the total electricity supply increased from 3.3% in December 2017 to 3.9% in January 2018 but the power plant generated 11.5% lower than projected for January 2018 under the 2018 ESP. The Bui power plant contributed 229 MW to meet the System Peak Load and 223 MW to meet the Ghana Peak Loads which represents 10.5% of the System Peak Load and 10.4% of the Ghana Peak Load.

#### Generation by the Sunon Asogli Power Plant (SAPP) dropped significantly in January 2018

Generation from the Sunon Asogli Power Plant (SAPP) dropped significantly from 5.28 GWh per day in December 2017 to 4.43 GWh per day in January 2018. The Sunon Asogli Power Plant (SAPP) generated a total of 137.4 GWh in January 2018, which was 16% lower than the 163.57 GWh generated in December 2017. The Power Plant contributed 10.7% of the total electricity supplied in January 2018, lower than the 13.2% supplied in December 2017. The SAPP's generation in January 2018, nevertheless, was 16.4% higher than the estimated generation of 118 GWh in the 2018 ESP. The SAPP contributed 158.5 MW to meet the System Peak Load and 177.2 MW to meet the Ghana Peak Load which represented 7.3% of the System Peak Load and 8.3% of the Ghana Peak Load. The SAPP consumed a total of 1,008.77 MMSCF of natural gas and 4,600.13 bbls of LCO at an estimated heat rate of 8,003.34 Btu/kWh, a reduction in fuel efficiency compared to the heat rate of 7,684.76 Btu/kWh, recorded in December 2017.

#### CENIT Power Plant continued to be offline in January 2018

The CENIT Power Plant was offline for the whole of January due to the low levels of Light Crude Oil (LCO) stocks at the Tema Power Enclave and system demands. The Power Plant was also correctly projected to be offline in January 2018 under the 2018 ESP.

#### Ameri Energy Power Plant's generation increased marginally in January 2018

Electricity generation from the Ameri Energy Power Plant increased marginally to 2.88 GWh per day in January 2018 from 2.66 GWh per day in December 2017. Likewise, the total electricity generation in January 2018 of 89.24 GWh was 8% higher than the generation recorded in December 2017 of 82.61 GWh and 3% lower than was projected for January 2018 under the 2018 ESP. The total electricity generated by the Ameri Power Plant in January 2018 represented 7% of total electricity supplied in the month. The Ameri Power Plant consumed 782.44 MMSCF of natural gas, to generate the 89.24 GWh of electricity at an estimated average heat rate of 10,178.76 Btu/kWh, marginal reduction in the fuel efficiency from the 10,103.9 Btu/kWh recorded in December 2017. The Ameri Power Plant did not contribute to the System Peak Load but contributed 211.8 MW to meet the Ghana Peak Load in January 2018, representing 9.9% of the Ghana peak Loads.

## HIGHLIGHTS OF THE MONTH

### **Kpone Thermal Power Plant (KTPP) was offline in January 2018**

The KTPP did not operate in January 2018 due to system demand. The power plant was also projected to be offline in January 2018 under the 2018 ESP.

### **The Karpowership Power Plant generation increased significantly in January 2018**

The Karpowership's generation increased significantly to 8.34 GWh per day in January 2018 from 6.29 GWh per day in December 2017. Consequently, the total generation from the Karpowership increased by 32.6% from 195.05 GWh in December 2017 to 258.61 GWh in January 2018. The total in January 2018 was 9.9% higher than the 287 GWh projected to be generated by Karpowership under the 2018 ESP. The Power Plant contributed 20.2% of the total electricity supplied in January 2018, which is higher than its contribution of 15.5% in December 2017. The Karpowership also contributed 462 MW to meet the System Peak Load and 462.1 MW to meet the Ghana Peak Load in January 2018 representing 21.3% of the System Peak Load and 21.6% of the Ghana Peak Load. The Karpowership Power Plant consumed 347,089 barrels of Heavy Fuel oil (HFO) to generate the 258.61 GWh in January 2018 at an average heat rate of 8,119.89 Btu/kWh which is an improvement in fuel efficiency over the 8,308.22 Btu/kWh recorded in December 2017.

### **AKSA Power Plant's generation increased significantly in January 2018**

The AKSA power plant's electricity generation increased significantly in January 2018 to 3.5 GWh per day from 2.71 GWh per day. The AKSA Power Plant generated a total of 108.55 GWh in January 2018, which was 29.4% higher than the 108.55 GWh generated in December 2017 and significantly higher than the 71 GWh projected for January 2018 under the 2018 ESP. The Power Plant supplied 8.5% of the total electricity supplied in January 2018, which was higher than the 6.7% it supplied in December 2017. The Power Plant contributed 212.8 MW to meet the System Peak Load and 219.9 MW to meet the Ghana Peak Load in January 2018 representing 9.8% of the System Peak Load and 10.3% of the Ghana Peak Load. A total of 147,016 barrels of HFO was consumed by the AKSA Power Plant at an average heat rate of 8,193.85 Btu/kWh.

### **Takoradi International Company (TICO)'s generation dropped significantly in January 2018**

The TICO Power plant's electricity supply in January 2018 dropped significantly to 5.5 GWh per day from 7.12 GWh per day in December 2017 due to system demand. The total electricity generated by TICO Power Plant was 22.8% higher in January 2018 compared to the 220.74 GWh it generated in December 2017 and was 2.1% higher than the 174 GWh projected for TICO Power Plant for January 2018 in the 2018 ESP. The TICO power plant supplied 13.3% of the total electricity supplied in January 2018, which is lower than 17.6% recorded in December 2017. The TICO Power Plant in January 2018 contributed 333 MW to meet the System Peak Load and 119 MW to meet the Ghana Peak Load, representing 15.3% of the System Peak Load and 5.6% of the Ghana Peak Load. The Power Plant operated on natural gas consuming about 1,214 MMSCF of natural gas to produce the 170.4 GWh of electricity at an estimated average heat rate of 7,650.66 Btu/kWh, an improvement in fuel efficiency over the 7,907.28 Btu/kWh recorded in December 2017.

### **Takoradi Power Company (TAPCO) Plant's generation dropped significantly in January 2018**

The TAPCO Power Plant's generation decreased significantly to 2.85 GWh per day in January 2018 from 3.15 GWh per day in December 2017 due to routine maintenance works. TAPCO's total generation decreased to 88.41 GWh in January 2018 from 97.73 GWh in December 2017. The power plant contributed 6.9% of the total electricity supplied in January 2018, lower than the 7.8% it contributed in December 2017. The power plant generation was 0.7% lower than the 89 GWh projected to be generated by the TAPCO Power Plant for January 2018 under the 2018 ESP. The TAPCO Power Plant in January 2018 did not contribute to the System Peak Load but contributed 149 MW to meet the Ghana Peak Load, representing a 7% of the Ghana Peak Load. The Power Plant operated on natural gas in January 2018 consuming about 640.23 MMSCF to produce 88.41 GWh of electricity at an estimated average heat rate of 7,776.35 Btu/kWh, a marginal drop in the fuel efficiency over the 7,760.95 Btu/kWh recorded in December 2017.

### **Tema Thermal 1 Power Plant (TT1PP)'s generation was offline in January 2018**

The TT1PP did not operate in January 2018 due to low volumes of natural gas and low levels of LCO in the Tema Power Enclave. The Power Plant was however projected to generate 60 GWh in January 2018 under the 2018 ESP.

### **Trojan Power Plant continued to be offline**

The Trojan Power Plants in both Tema and Kumasi have been offline since July 2017 and continued to be offline in January 2018 due to fuel supply challenges.

### **BXC Solar generation decreased marginally in January 2018**

The BXC Solar Power Plant is a 20 MW grid tied embedded solar power plant located in Gomoa Onyeadze near Winneba. The power plant is the largest solar power plant in Ghana and is a privately owned by BXC Ghana Limited. The Power Plant began to feed into the national grid in November 2015, and fed a total of 2.58 GWh in 2015. The Power Plant also fed 23.9 GWh in 2016. The BXC Solar Power Plant supplied 25 GWh in 2017 which was 0.2% of the total electricity supplied in 2017. A total of 2.16 GWh of electricity was supplied by the power plant in January 2018 which was 0.2% of the total electricity supplied in January 2018.

### **Safisana Waste to Energy Power Plant**

The Safisana is a 0.1 MW embedded waste to energy power plant (Biogas) located in Ashaiman. The Power plant has been operational since September 2016. The power plant supplied 0.035 GWh in 2016, 0.207 GWh in 2017 and 0.0177 GWh in January 2018.

### **VRA Navrongo Solar Power Plant**

The VRA Solar Power Plant is a 2.5 MW Solar Plant located at Navrongo in the Upper East Region. The power plant generated 2.66 GWh of electricity at an average Capacity Utilization Factor (CUF) of 12.1%. The power plant generated 0.164 GWh in January 2018 at a CUF of 8.8%.

### **Electricity Exchange - Imports and exports of electricity**

Electricity imports from La Cote D'Ivoire decreased significantly to 0.06 GWh per day in January 2018 from 0.26 GWh per day in December 2017. The total electricity import of 1.97 GWh in January 2018 was significantly lower than the 8.07 GWh imported in December 2017. No electricity import was projected in January 2018 under the 2018 ESP. Daily peak import in January 2018 reached a maximum of 21 MW and did not contribute in meeting the System Peak Load and Ghana Peak Load.

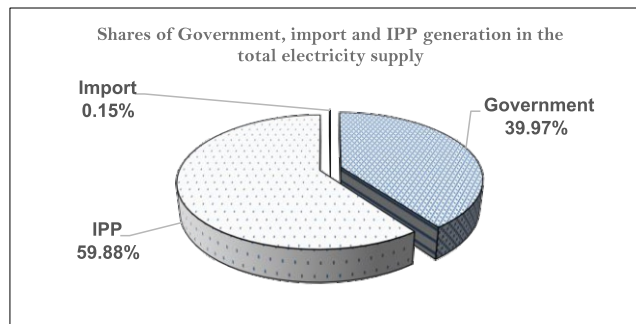
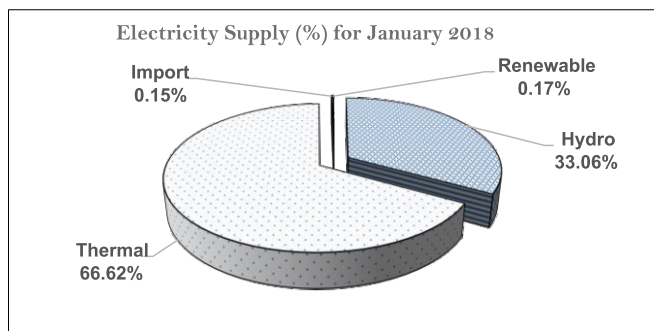
Electricity export increased significantly to 0.63 GWh per day in January 2018 from 0.39 GWh per day in December 2017. A total of 19.57 GWh of electricity was exported in January 2018 which was significantly lower than the 26 GWh projected under 2018 ESP. Ghana was a net exporter of electricity in January 2018.

## OPERATIONAL FACT SHEET

| <b>Peak Electricity Supply - January 2018</b> |  |   |                                 |
|---|--|---|---------------------------------|
| <b>Source of Supply</b>                       | <b>Generation at System Peak Load of January 2018 (MW)</b> | <b>Generation at Ghana Peak Load of January 2018 (MW)</b> | <b>Electricity Supply (GWh)</b> |
| <b>AKOSOMBO</b>                               | 672.00   | 524.00  | 314.23                          |
| <b>KPONG</b>                                  | 105.00   | 70.00   | 58.59                           |
| <b>BUI</b>                                    | 229.00   | 223.00  | 50.47                           |
| <b>SAPP</b>                                   | 158.50   | 177.20  | 137.40                          |
| <b>TAPCO</b>                                  | -  | 149.00  | 88.41                           |
| <b>TICO</b>                                   | 333.00   | 119.00  | 170.40                          |
| <b>TT1PP</b>                                  | -  | -   | -                               |
| <b>CENIT</b>                                  | -  | -   | -                               |
| <b>TT2PP</b>                                  | -  | -   | -                               |
| <b>MRP</b>                                    | -  | -   | -                               |
| <b>KARPOWER</b>                               | 462.00   | 462.10  | 258.61                          |
| <b>AMERI</b>                                  | -  | 211.80  | 89.24                           |
| <b>KTPP</b>                                   | -  | -   | -                               |
| <b>Trojan Power</b>                           | -  | -   | -                               |
| <b>CENPOWER</b>                               | -  | -   | 0.34                            |
| <b>AKSA</b>                                   | 212.80   | 219.90  | 108.55                          |
| <b>BXC Solar</b>                              | -  | -   | 2.16                            |
| <b>Safisana</b>                               | -  | -   | 0.02                            |
| <b>VRA Solar</b>                              | -  | -   | 0.16                            |
| <b>IMPORT</b>                                 | -  | -   | 1.92                            |
| <b>Export</b>                                 | -  | 17.00   | 19.57                           |
| <b>System Coincident Peak Load</b>            | <b>2,172.30</b>  | -   | -                               |
| <b>Ghana Coincident Peak Load</b>             | -  | <b>2,139.00</b>   | -                               |
| <b>Total Supply</b>                           | -  | -   | <b>1,280.52</b>                 |
| <b>Total Supply without export</b>            | -  | -   | <b>1,260.95</b>                 |

| <b>Ghana Electricity Demand</b> |            |                |
|---------------------------------|------------|----------------|
|                                 |            | <b>Jan-18</b>  |
| <b>Maximum System Peak Load</b> | <b>MW</b>  | <b>2,172.3</b> |
| <b>Minimum System Peak Load</b> | <b>MW</b>  | <b>1,837.2</b> |
| <b>Average Peak Generation</b>  | <b>MW</b>  | <b>2,076.1</b> |
| <b>System Base Load</b>         | <b>MW</b>  | <b>1,265.4</b> |
| <b>Total Electricity</b>        | <b>GWh</b> | <b>1,280.5</b> |
| <b>Load Factor (LF)</b>         | <b>%</b>   | <b>79.2</b>    |

# OPERATIONAL FACT SHEET



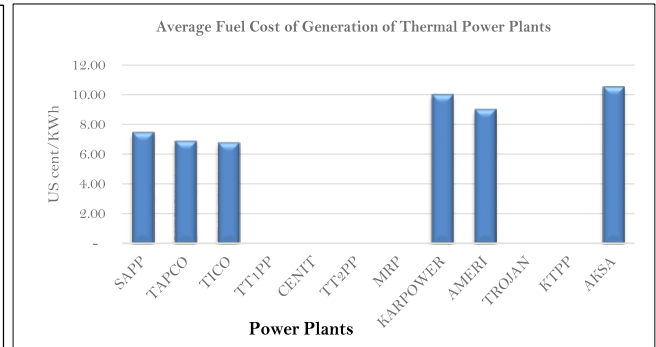
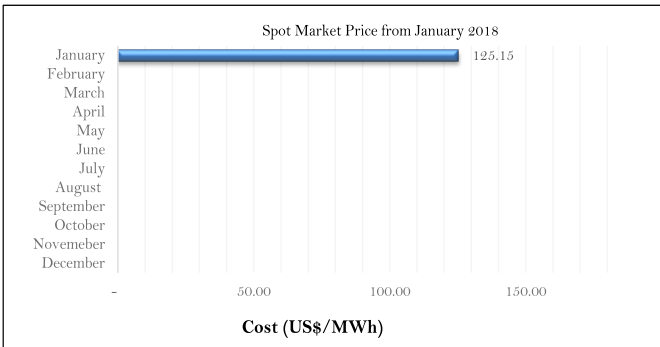
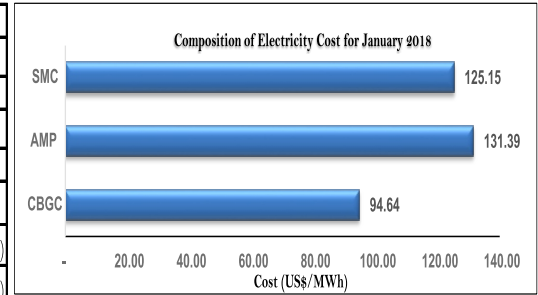
| Power Plant Data for January 2018 |                          |                                |                              |                         |                         |                         |                         |
|-----------------------------------|--------------------------|--------------------------------|------------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
|                                   | Dependable Capacity (MW) | Plant Capacity Utilization (%) | Electricity Generation (GWh) | Gas Consumption (MMBtu) | LCO Consumption (MMBtu) | DFO Consumption (MMBtu) | HFO Consumption (MMBtu) |
| <b>Akosombo</b>                   | 1,020.00                 | 41.41                          | 314.23                       | -                       | -                       | -                       | -                       |
| <b>Kpong</b>                      | 160.00                   | 49.22                          | 58.59                        | -                       | -                       | -                       | -                       |
| <b>Bui</b>                        | 400.00                   | 16.96                          | 50.47                        | -                       | -                       | -                       | -                       |
| <b>SEAP</b>                       | 560.00                   | 32.98                          | 137.40                       | 1,075,351.01            | 24,334.70               | -                       | -                       |
| <b>TAPCO</b>                      | 330.00                   | 36.01                          | 88.41                        | 687,499.19              | -                       | -                       | -                       |
| <b>TICO</b>                       | 340.00                   | 67.36                          | 170.40                       | 1,303,651.59            | -                       | -                       | -                       |
| <b>TT1PP</b>                      | 126.00                   | -                              | -                            | -                       | -                       | -                       | -                       |
| <b>CENIT</b>                      | 126.00                   | -                              | -                            | -                       | -                       | -                       | -                       |
| <b>TT2PP</b>                      | 49.50                    | -                              | -                            | -                       | -                       | -                       | -                       |
| <b>MRP</b>                        | 80.00                    | -                              | -                            | -                       | -                       | -                       | -                       |
| <b>KARPOWER</b>                   | 470.00                   | 73.96                          | 258.61                       | -                       | -                       | -                       | 2,099,887.87            |
| <b>AMERI</b>                      | 250.00                   | 47.98                          | 89.24                        | 908,352.76              | -                       | -                       | -                       |
| <b>TROJAN</b>                     | 56.00                    | -                              | -                            | -                       | -                       | -                       | -                       |
| <b>KTPP</b>                       | 220.00                   | -                              | -                            | -                       | -                       | -                       | -                       |
| <b>AKSA</b>                       | 290.00                   | 50.31                          | 108.55                       | -                       | -                       | -                       | 889,444.22              |
| <b>Total</b>                      | <b>4,477.50</b>          | <b>38.30</b>                   | <b>1,275.91</b>              | <b>3,974,854.54</b>     | <b>24,334.70</b>        |                         | <b>2,099,887.87</b>     |

| Average Gas flowrate January 2018 |                 |
|-----------------------------------|-----------------|
| Location                          | Monthly Average |
| <b>Etoki</b>                      | <b>40.15</b>    |
| <b>Tema WAGPCo</b>                | <b>32.62</b>    |
| <b>Aboadze WAGPCo</b>             | <b>0.00</b>     |
| <b>Aboadze GNGC</b>               | <b>93.53</b>    |

| Water Level January 2018 |                      |                |                       |
|--------------------------|----------------------|----------------|-----------------------|
|                          | Beginning month (ft) | End month (ft) | Change in water level |
| <b>Hydro Dam</b>         |                      |                | <b>(feet)</b>         |
| <b>Akosombo</b>          | 251.31               | 249.75         | -1.56                 |
| <b>Bui</b>               | 574.03               | 570.65         | -3.38                 |
|                          |                      |                |                       |
|                          | Beginning month (ft) | End month (ft) | Change in water level |
| <b>Hydro Dam</b>         |                      |                | <b>(feet)</b>         |
| <b>Akosombo</b>          | 250.47               | 248.76         | -1.71                 |
| <b>Bui</b>               | 576.85               | 572.82         | -4.03                 |

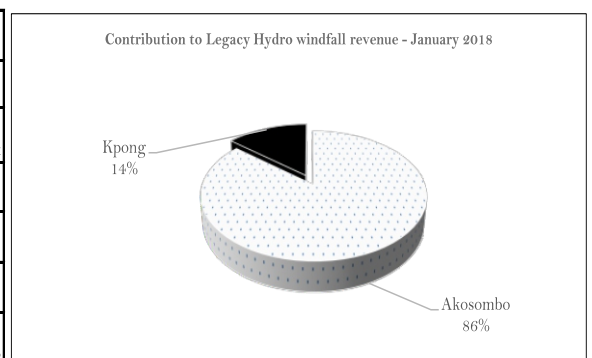
# ECONOMIC FACT SHEET

|   |          | Jan-18  | Dec-17 | Change  |
|---|----------|---------|--------|---------|
| Average Market Price (AMP)              | US\$/MWh | 131.39  | 95.04  | 36.35   |
| System Marginal Cost (SMC)              | US\$/MWh | 125.15  | 103.49 | 21.66   |
| Composite Bulk Generation Charge (CBGC) | US\$/MWh | 94.64   | 94.64  | -       |
| Deviation of AMP from CBGC              | US\$/MWh | (36.75) | (0.40) | (36.35) |
| Deviation of SMP from CBGC              | US\$/MWh | (30.51) | (8.85) | (21.66) |



| Jan-18      |              |             |            |                  |
|-------------|--------------|-------------|------------|------------------|
|             | Average Cost | Average SMP | Difference | Windfall Revenue |
| Power Plant | US\$/MWh     | US\$/MWh    | US\$/MWh   | US\$/MWh         |
| Akosombo    | 26.60        | 125.15      | 98.55      | 30,969,110.97    |
| Kpong       | 45.86        | 125.15      | 79.29      | 4,645,943.68     |
| Total       | 72.46        | -           | -          | 35,615,054.65    |

| Average Fuel Prices |            |                |
|---------------------|------------|----------------|
|                     |            | Jan-18         |
| Fuel Type           | Unit       | Delivered Cost |
| Natural Gas         | US\$/MMBtu | 9.02           |
| LCO                 | US\$/BBL   | 79.08          |
| HFO                 | US\$/Tonne | 437.68         |
| DFO                 | US\$/Tonne | 707.70         |





### 1. The 2017 Electricity Supply Plan (ESP)

The Ghana Grid Company (GRIDCo) coordinated the development of the 2018 Electricity Supply Plan (ESP) that involved key stakeholders of the power sector. The committee was made up of representatives from GRIDCo, Energy Commission, Volta River Authority (VRA), Bui Power Authority (BPA), Electricity Company of Ghana (ECG) and Northern Electricity Development Company (NEDCo).

The 2018 ESP provides an outlook of power demand and supply for 2018 taking into consideration all the firm additional new projects and existing generation sources. The subsequent editions of the Market Bulletin in 2018 will make reference and comparison of actuals with the projections of the 2018 ESP.

#### 1.2 Demand and Supply outlook for 2017

Peak demand for 2018 is projected under the 2018 ESP to grow by 15.11% while's consumption is projected to increase by 15.01% due to the following reasons:

- a. VALCO increasing consumption from one pot line (75 MW) to two pot lines (150 MW);
- b. Increase export to SONABEL (Burkina Faso) from 9.2 MW in 2017 to 50 MW in the first half of the year and to 100 MW in the second half of the year;
- c. Expansion of electricity coverage by ECG and NEDCo including rural electrification;
- d. Increased demand by the Enclave Power Company by 30 MW; and
- e. Increase demand by the introduction of a new mining company by 5 MW.

**Table 1.4.1: 2018 Demand and Supply Balance (GWh)**

| Projected Demand/Supply                                   | Demand/Supply (GWh) |
|---|---------------------|
| Total Domestic  | 14,473              |
| VALCO   | 1,154               |
| Exports (CEB+SONABEL+CIE)                                 | 679                 |
| <b>Total Projected Demand</b>                             | <b>16,305</b>       |
| <b>Projected Supply</b>                                   |                     |
| Total VRA Hydro (Akosombo & Kpong GS)                     | 4,200               |
| Bui GS  | 756.2               |
| <b>Total Hydro</b>  | <b>4,956</b>        |
| <b><i>VRA Existing Thermal &amp; Solar Generation</i></b> |                     |
| TAPCO (T1)  | 1,457               |
| TT1PP   | 353.3               |
| TT2PP/TT2PP-X   | 0                   |
| MRP   | 0                   |
| KTPP  | 369.2               |
| Cenpower  | 1061.2              |
| Solar   | 4.2                 |
| <b>Total VRA Thermal Generation</b>                       | <b>3,245</b>        |
| <b><i>Existing IPP Generation</i></b>                     |                     |
| SAPP I & II   | 1,466               |
| TICO (T2)   | 2,155               |
| CENIT   | 380.9               |
| AMERI   | 797                 |
| Karpower Barge  | 2,708               |
| AKSA  | 559                 |
| Trojan  | 0                   |
| BXC Solar   | 25.5                |
| MIENERGY  | 12.9                |
| <b>Total IPP Thermal Generation</b>                       | <b>8,104</b>        |
| <b>Total VRA Supply</b>                                   | <b>7,445</b>        |
| <b>Total Non-VRA Supply</b>                               | <b>8,860</b>        |
| <b>Import</b>   | <b>0</b>            |
| <b>Total Supply</b>                                       | <b>16,305</b>       |

## Other Market News and Trends

According to the supply plan developed for 2018, a total of 16,305 GWh is projected to be supplied to meet the needs of the economy and for export. The total projected supply of 16,305 GWh represents 15.1% increase in the total electricity supplied in 2017. Hydro generation sources is projected to account for 30.4% of the total supply, 69.3% by thermal sources and 0.3% from solar sources.

Taking planned maintenance and fuel constraints into consideration, the monthly available capacity will range between 2,439 MW and 3,639 MW with the System Peak Demand ranging between 2,306 MW and 2,523 MW. The annual System Peak Demand is estimated to occur in December 2018. There is no projected demand and supply imbalance in 2018 with reserve margins expected to range from 6% to 56%.

**Table 1.4.2 monthly demand and supply projection for 2018.**

|  | January | February | March | April | May   | June  | July  | August | September | October | November | December |
|--|---------|----------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| Demand (MW)                                | 2,306   | 2,338    | 2,402 | 2,509 | 2,497 | 2,416 | 2,339 | 2,342  | 2,415     | 2,487   | 2,513    | 2,523    |
| Available generation capacity (MW)         | 2,749   | 2,489    | 3,209 | 3,259 | 3,209 | 3,309 | 3,639 | 3,639  | 3,639     | 3,479   | 3,479    | 3,639    |
| Import (MW)                                | -       | -        | -     | -     | -     | -     | -     | -      | -         | -       | -        | -        |
| Total Generation capacity with import (MW) | 2,749   | 2,489    | 3,209 | 3,259 | 3,209 | 3,309 | 3,639 | 3,639  | 3,639     | 3,479   | 3,479    | 3,639    |
| Surplus/Deficit with import                | 443     | 151      | 807   | 750   | 712   | 893   | 1,300 | 1,297  | 1,224     | 992     | 966      | 1,116    |
| Surplus/deficit without import (MW)*       | 443     | 151      | 807   | 750   | 712   | 893   | 1,300 | 1,297  | 1,224     | 992     | 966      | 1,116    |
| Reserve Margin with import (%)             | 19      | 6        | 34    | 30    | 29    | 37    | 56    | 55     | 51        | 40      | 38       | 44       |
| Reserve Margin without import (%)*         | 19      | 6        | 34    | 30    | 29    | 37    | 56    | 55     | 51        | 40      | 38       | 44       |
| Domestic Supply (GWh)*                     | 1,327   | 1,218    | 1,337 | 1,396 | 1,413 | 1,328 | 1,335 | 1,356  | 1,334     | 1,407   | 1,398    | 1,456    |
| Import (GWh)                               | -       | -        | -     | -     | -     | -     | -     | -      | -         | -       | -        | -        |
| Total Projected Supply (GWh) with imports  | 1,327   | 1,218    | 1,337 | 1,396 | 1,413 | 1,328 | 1,335 | 1,356  | 1,334     | 1,407   | 1,398    | 1,456    |
| Export to CEB and SONABEL (GWh)            | 26      | 24       | 26    | 47    | 49    | 47    | 76    | 76     | 74        | 76      | 74       | 76       |

\*Author's own analysis based on projected figures

Hydro generation is projected to account for within 25.7% and 37.6% of the available capacity in 2018 while thermal generation accounts for the rest. No electricity is projected to be imported in 2018 under the 2018 supply plan. Electricity supply (GWh) is projected to increase from a minimum of 1,218 GWh in February 2018 to a maximum of 1,456 GWh in December 2018. Solar generation is projected to supply a total of 43 GWh in 2018 which will constitute 0.26% of the total supply and will range within 0.17% and 0.35% of the total monthly supply in 2018. Thermal generation is projected to account for an average of 69.3% of the total supply in 2018. On a monthly basis, thermal generation will constitute within 67.1% and 71.4% of the monthly supply. Electricity export is projected to increase from 24 GWh to 76 GWh, that is, 2% to 5.7% of the total monthly supply would be exported to CEB and SONABEL.

## 2.0 Performance Indicators of Power Plants

### 2.1 Capacity Utilization Factor (CUF)

The Akosombo GS and Kpong GS had below 50% Capacity Utilization Factor (CUF) in January 2018. The Akosombo GS and Kpong GS had a CUF of 41.4% and 49.2% respectively. It is therefore not surprising that the Akosombo GS and Kpong GS generated at an average capacity of 465 MW and 85 MW respectively in January 2018. Likewise, the Bui GS had a CUF of 17% lower than its designed CUF of 25%.

The TICO, Karpowership and AKSA power plant had CUF higher than 50% in January 2018. The other power plants, SAPP, TAPCO and Ameri all had CUF lower than 50% largely due to fuel supply challenges. Karpowership and AKSA power plants, which are HFO fired plants, had a CUF of 74% and 50.3% respectively while TICO had a CUF of 67.4%. The Ameri power plant had a CUF of 48% while SAPP and TAPCO had a CUF of 33% and 36% respectively.

The System Load Factor (LF) also increased from 78.8% in December 2017 to 79.2% in January 2018.

The Plant utilization factors of the various plants are contained in table 2.1.

**Table 2.1.1: Power Plant Capacity Utilization, Average heat rate and Average Fuel Cost of Generation**

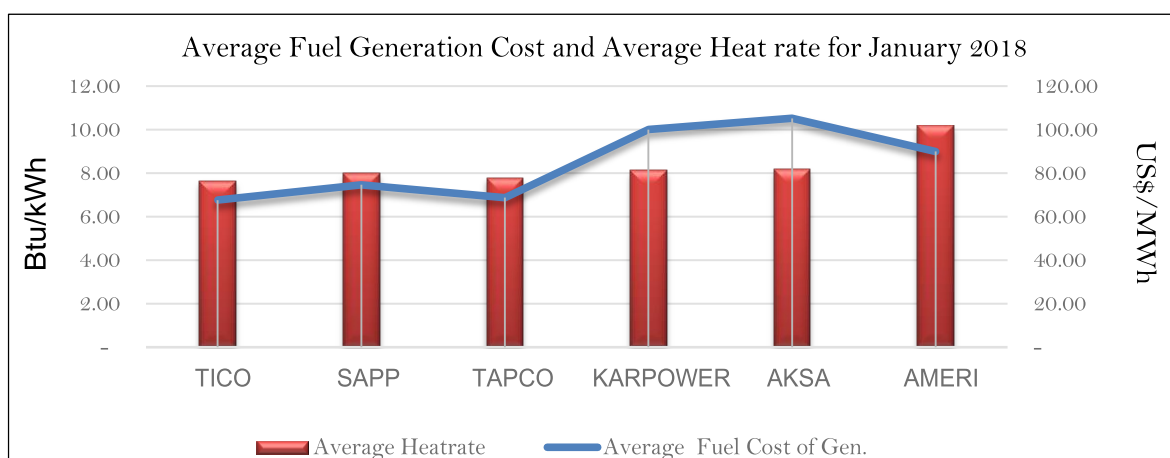
| Power Plant     | Capacity Utilization (%) | Average Heat rate (Btu/KWh) | Average Fuel Cost of Generation (US\$/MWh) |
|-----------------|--------------------------|-----------------------------|--|
| <b>Akosombo</b> | 41.41                    | -                           | -  |
| <b>Kpong</b>    | 49.22                    | -                           | -  |
| <b>Bui</b>      | 16.96                    | -                           | -  |
| <b>SAPP</b>     | 32.98                    | 8,003.34                    | 74.65                                      |
| <b>TAPCO</b>    | 36.01                    | 7,776.35                    | 68.74                                      |
| <b>TICO</b>     | 67.36                    | 7,650.66                    | 67.63                                      |
| <b>TT1PP</b>    | -                        | -                           | -  |
| <b>CENIT</b>    | -                        | -                           | -  |
| <b>TT2PP</b>    | -                        | -                           | -  |
| <b>MRP</b>      | -                        | -                           | -  |
| <b>KARPOWER</b> | 73.96                    | 8,119.89                    | 100.11                                     |
| <b>AMERI</b>    | 47.98                    | 10,178.76                   | 89.98                                      |
| <b>TROJAN</b>   | -                        | -                           | -  |
| <b>KTPP</b>     | -                        | -                           | -  |
| <b>AKSA</b>     | 50.31                    | 8,193.85                    | 105.25                                     |

### 2.2 Fuel Efficiency

Aside the Karpowership and the TICO Power Plant, all the other thermal power plants had a reduction in their fuel efficiency in January 2018 compared to December 2017. The fuel efficiency for the Karpowership Power Plants increased from 41.1% in December 2017 to 42% in January 2018. Likewise, the TICO power plant had a marginal increase in its fuel efficiency to 44.6% in January 2018 from 43.2% in December 2017. On the contrary, the fuel efficiency for the SAPP reduced from 44.4% in December 2017 to 42.6% in January 2018. Similarly, the TAPCO and Ameri power plants had marginal reductions in their fuel efficiency from 44% and 33.8% in December 2017 respectively to 43.9% and 33.5% in January 2018 respectively.

Figure 2.1 shows the ranking of the thermal power plants based on their efficiency levels with their corresponding fuel cost of electricity generation. The chart indicates the effect of fuel prices on the cost of generation of the thermal power plants.

**Figure 2.1: Fuel efficiency ranking of thermal power plants with their respective fuel cost of generation.**



### 2.3 Average Fuel Cost of Electricity Generation

The SAPP average fuel cost of generation reduced from US\$77.73/MWh in December 2017 to US\$74.65/MWh in January 2018 due to the reduction in the LCO consumption in January 2018 compared to December 2017 despite the drop in efficiency. Likewise, the TICO Power plants had a reduction in its fuel cost of generation from US\$69.9/MWh in December 2017 to US\$67.63/MWh in January 2018 due to improvement in its fuel efficiency. On the contrary, the HFO Power Plants, Karpowership and AKSA, despite improvements in their fuel efficiencies had marginal increases in their fuel cost of generation due to high cost HFO compared to natural gas. HFO price averaged US\$12.59/MMBtu compared to US\$9.02/MMBtu for natural gas.

#### **Acronyms**

|   |   |
|---|---|
| <i>AGPP = Atuabu Gas Processing Plant</i>                 | <i>Btu = British Thermal Units</i>                        |
| <i>CBGC = Composite Bulk Generation Charge</i>            | <i>CUF = Capacity Utilization Factor</i>                  |
| <i>DFO = Distillate Fuel Oil</i>                          | <i>EC = Energy Commission</i>                             |
| <i>ECG = Electricity Company of Ghana</i>                 | <i>EMOP = Electricity Market Oversight Panel</i>          |
| <i>ESP = Electricity Supply Plan</i>                      | <i>FPSO = Floating Production, Storage and Offloading</i> |
| <i>GHp = Ghana Pesewa</i>                                 | <i>GNGC = Ghana National Gas Company</i>                  |
| <i>GWh = Giga-watt Hours</i>                              | <i>HFO = Heavy Fuel Oil</i>                               |
| <i>KTPP = Kpone Thermal Power Plant</i>                   | <i>kWh = Kilo-watt hours</i>                              |
| <i>MRP = Mine Reserve Plant</i>                           | <i>LEAP = Long-range Energy Alternative Planning</i>      |
| <i>LCO = Light Crude Oil</i>                              | <i>LI = Legislative Instrument</i>                        |
| <i>LTA = Long Term Average</i>                            | <i>MW = Megawatt</i>                                      |
| <i>MMScf = Million Standard Cubic Feet</i>                | <i>MWh = Mega-watt hours</i>                              |
| <i>NITS = National Interconnected Transmission System</i> | <i>PV = Photovoltaic</i>                                  |
| <i>SAPP = Sunon Asogli Power Plant</i>                    | <i>SMP = System Marginal Price</i>                        |
| <i>SNEP = Strategic National Energy Plan</i>              | <i>TEN = Tweneboa, Enyenra, Ntomme</i>                    |
| <i>TT1PP = Tema Thermal 1 Power Plant</i>                 | <i>TT2PP = Tema Thermal 2 Power Plant</i>                 |
| <i>VRA = Volta River Authority</i>                        | <i>WAGPCo = West African Gas Pipeline Company</i>         |
| <i>WAGP = West African Gas Pipeline</i>                   | <i>WEM = Wholesale Electricity Market</i>                 |

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