



# GHANA WHOLESALE ELECTRICITY MARKET BULLETIN

## MARKET WATCH

### Monthly Market Data Analysis

ISSUE NO. 28: 1<sup>st</sup> April 2018 to 30<sup>th</sup> April 2018

This Bulletin covers major developments in the Wholesale Electricity Market (WEM) of Ghana from 1<sup>st</sup> April, 2018 to 30<sup>th</sup> April, 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 of the WEM bulletin continues with the series on the financial sustainability of the Power Sector for April 2018.

The Energy Commission (EC) would very much appreciate and welcome comments from readers on the Bulletin. Reasonable care has been taken to ensure 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 April 2018 from 44.84 GWh per day in March 2018 to 47 GWh per day representing a 4.83% increase in supply primarily due to increase generation from the hydro sources. Generations from hydro sources increased in April 2018 from 12.89 GWh per day in March 2018 to 16.32 GWh per day representing a 26.61% increase in generation. Generation from Akosombo GS and Kpong GS increased marginally by 1.6% and 9.0% respectively and that from the Bui GS increased significantly by 89%. The rate of drop in water level for the hydro power plants increased correspondingly due to the increase in generation. The water level dropped from 0.033 feet per day in March 2018 for the Akosombo GS to 0.046 feet per day in April 2018 and from 0.086 feet per day in March 2018 for the Bui power plant to 0.147 feet per day in April 2018. Average generation from thermal sources decreased from 31.55 GWh per day in March 2018 to 30.25 GWh per day in April 2018. With the exception of the TICO, TT1PP, Genser and Ameri power plants which recorded increases in their supply, all other thermal plants recorded decrease in generation in April 2018. The TICO, Genser and Ameri power plants recorded 8.7%, 4.5% and 43.9% increases in generation respectively with the TT1PP recording an increase of over 1 fold.

Liquid fuel consumption decreased in April 2018 by 26.42% from 555,777 barrels in March 2018 to 408,913 barrels in April 2018 due to the

Table 1. Projected and Actual Outturn of electricity demand and supply in March 2018 and April 2018

	April 2018		March 2018	
	Projected	Actual Outturn	Projected	Actual Outturn
Total Supply (GWh)	1,396.0	1,410.0	1,337.2	1,391.5
Source by Power Plants (GWh)				
AKOSOMBO	302.3	348.5	311.7	299.6
KPONG	49.2	65.7	51.1	60.3
BUI	55.5	75.3	57.4	39.9
Simon Asogli	117.8	171.1	117.8	185.4
TAPCO	57.6	53.2	54.7	67.5
TICO	195.6	224.4	202.4	206.5
TT1PP	-	61.6	59.5	30.5
CENT	32.3	-	-	-
TT2PP	-	-	-	-
MRP	-	-	-	-
Karpowership	207.8	217.3	228.6	313.9
AMERI	49.0	59.9	56.3	41.6
KTTP	61.2	-	-	0.8
Trojan Power	-	-	-	-
CENPOWER	104.0	-	107.5	-
AKSA	101.3	86.4	87.6	98.1
BXC Solar	2.1	2.8	2.2	2.9
VR Solar	0.3	-	0.4	0.2
Genser	-	33.5	-	32.1
Total Generation (GWh)	1,396.0	1,399.8	1,337.2	1,379.2
Imports (GWh)	-	10.2	-	12.3
Total Supply (GWh)	1,396.0	1,410.0	1,337.2	1,391.5
Deficit (GWh)	-	14.0	-	54.3
Ghana Coincident Peak Load (MW)	2,426.0	2,265.8	2,211.0	2,202.7
System Coincident Peak Load (MW)	2,509.0	2,432.9	2,384.0	2,268.7

## HIGHLIGHTS OF THE MONTH

increase in natural gas supply from the WAGPCo and AGPP. Natural gas flow rate from AGPP increased significantly from 69.22 MMSCFD in March 2018 to 94.04 MMSCFD in April 2018. Similarly, natural gas flow rate from the WAGP to Tema increased from 56.45 MMSCFD in March 2018 to 67.84 MMSCFD in April 2018. There was however no flow of Natural gas from the WAGP to the Aboadze power enclave in April 2018. Also, 8,643 tonnes of LPG was consumed in April 2018.

The System Peak Load and Ghana Peak Load both recorded marginal increments of 6.79% and 1.78% respectively. The System Peak Load increased from 2,278.20 MW in March 2018 to 2,432.90 MW in April 2018 while the Ghana Peak Load increased from 2,226.20 MW in March 2018 to 2,265.80 MW in April 2018.

There was a significant increase in export of electricity by over 1.5 folds from 0.91 GWh per day in March 2018 to 2.66 GWh per day in April 2018. Export during peak hours reached a maximum of 165 MW and 130 MW to CIE and CEB respectively. On the contrary, imports of electricity reduced by 16.68% from 0.40 GWh per day in March 2018 to 0.34 GWh per day in April 2018.

### Electricity Demand and Supply

#### Electricity Demand

The System Peak Load continued to increase in April 2018 from 2,278.20 MW in March 2018 to 2,432.90 MW in April 2018, representing a 6.79% increment. The increase in the System Peak Load was primarily due to the increase in export to CIE and CEB. At the System Peak Load, export to CIE and CEB was 108 MW and 112 MW respectively. The Ghana Peak Load also witnessed a marginal increment from 2,226.20 MW in March 2018 to 2,265.80 MW in April 2018 representing a 39.6 MW increment. Generations from Hydro sources made up 36.29% and 43.78% of the System Peak Load and Ghana Peak Load respectively. Generations from thermal sources constituted the rest.

#### Electricity supply

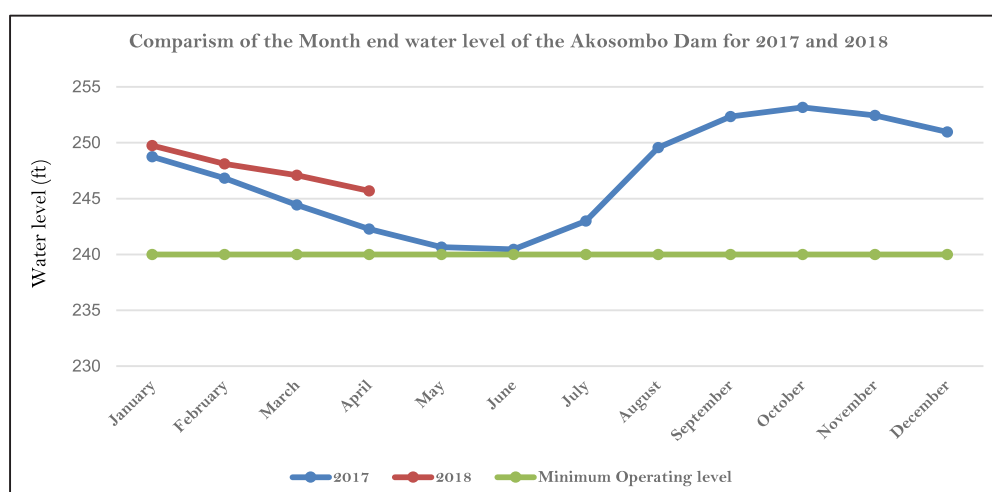
Electricity supplied in April 2018 increased marginally by 5% from 44.84 GWh per day in March 2018 to 47.01 GWh per day in April 2018. Total electricity generated increased marginally from 1,359.50 GWh in March 2018 to 1,410.24 GWh in April 2018. Electricity generated from hydro sources constituted 34.71% of total electricity supplied, an increment over the 29.41% recorded in March 2018. Of the total 1,410.24 GWh supplied, 1,400 GWh was generated from domestic sources with 10.24 GWh imports from La Cote D'ivoire (CIE). The total electricity supplied in April 2018 was 14.24 GWh more than the 1,396 GWh projected under the 2018 ESP, a 1.02% deviation from the actual.

### Hydro Dam Levels

#### Akosombo Dam Water Level continued to decline in April 2018

The rate of drop in the water level of the Akosombo GS increased from 0.033 feet per day in March 2017 to 0.046 feet per day in April 2018. The increased rate of drop was due to increased generation by the Akosombo GS as a result of the increase in electricity exports. The water level at the beginning of the month of April 2018 of 247.09 feet, reduced by 1.39 feet to 245.7 feet at the end of the month. The water level was 5.7 feet above the minimum operating level of 240 feet and was 3.43 feet higher than the water level recorded for the same period in 2017.

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



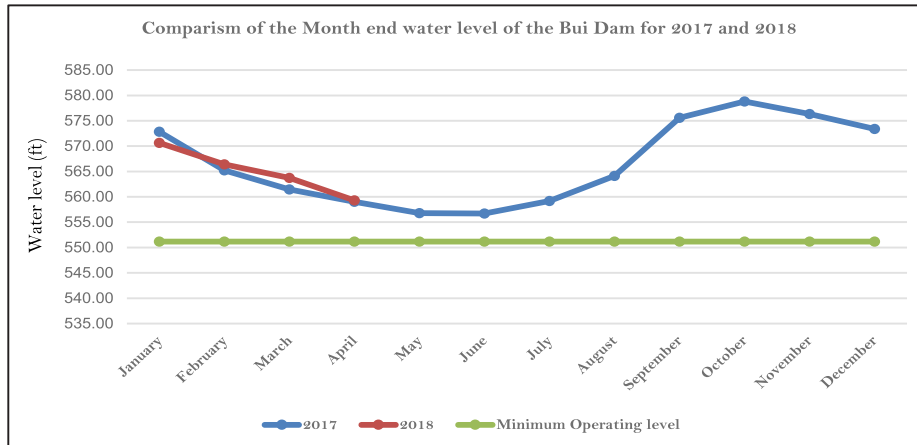
# HIGHLIGHTS OF THE MONTH

## Bui Dam Water Level continued to decline in April 2018

The Bui dam water level dropped at an increasing rate, from 0.086 feet per day in March 2018 to 0.147 feet per day in April 2018. The water level reduced by 4.42 feet in April 2018 to a water level of 559.31 feet from 563.73 feet at the beginning of the month. The end of month water level was 8.13 feet higher than the minimum operating water level of 551.18 feet and was 5.9 feet lower than the water level recorded for the same period in 2017.

Figure 2 shows comparative end of month trajectory of the level of water in the Bui dam from January 2017 to April 2018.

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

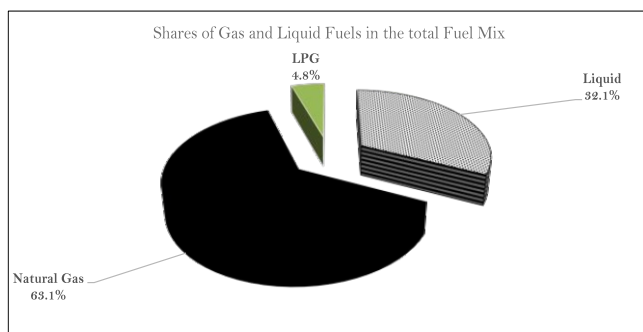


## Fuel Supply for Power Generation

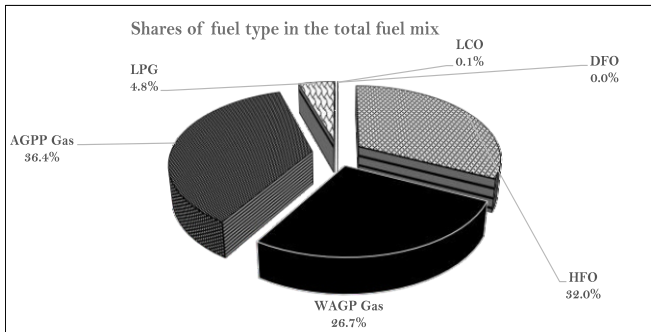
Natural gas consumption accounted for 63% of the total fuel consumed in April 2018, a marginal increase in natural gas share in the total fuel mix from the 55% recorded in March 2018. Share of natural gas supply from WAGPCo in the total fuel supply decreased from 28% in March 2018 to 27% in April 2018. On the contrary the share of natural gas from the AGPP in the total fuel mix increased from 27% in March 2018 to 36% in April 2018. Liquid fuel share in the total fuel mix continued to decrease in April 2018 from 41% recorded in March 2018 to 32% in April 2018. The shares of HFO consumed further decreased from the 41% recorded in March 2018 to 32% in April 2018. DFO consumed also decreased from 0.12% to no consumption in April 2018. Also, 0.1 of total fuel consumed was LCO a marginal increase from the zero consumption recorded in March 2018. LPG constituted 5% of the total fuel consumed in April 2018 as compared to 4% recorded in March 2018.

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 increased marginally in April 2018

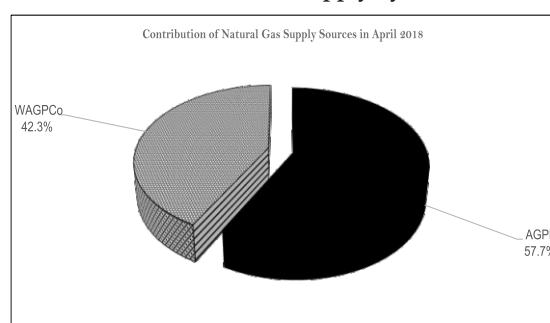
Natural gas flow rate from WAGP to Tema and Kpone continued to experience an increase from the 56.45 MMSCF per day in March 2018 to 67.84 MMSCF per day in April 2018. The increase in the flow of natural gas is evident in the increased generation from the TT1PP. The total natural gas consumed in April 2018 was 2,087.45 MMSCF. Natural gas from WAGP constituted 42.3% of total natural gas consumed and 26.7% of total fuel mix in April 2018.

## Natural gas flow rate from GNGC increased marginally in April 2018.

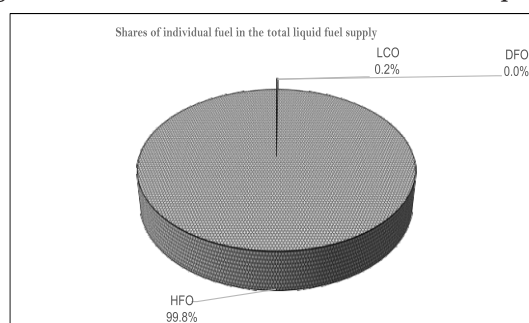
The natural gas flow rate from the AGPP to the Aboadze Power Enclave increased significantly from 69.22 MMSCF per day in March 2018 to 94.04 MMSCF per day in April 2018. The total natural gas supplied from AGPP increased from 2,145.86 MMSCF in March 2018 to 2,632.18 MMSCF in April 2018, representing a 22.7% increment in supply from the AGPP. The share of natural gas supply from AGPP in the total natural gas consumed in April 2018 was 57.7% and 36.4% of the total fuel mix in April 2018 from the 26.7% recorded in March 2018.

## HIGHLIGHTS OF THE MONTH

**Figure 4a: Contribution of Natural Gas Supply by sources**



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



### Liquid Fuel

Liquid fuel consumption decreased in April 2018 by 26% from 555,777 barrels in March 2018 to 408,913 barrels in April 2018. The Share of DFO in total liquid fuel consumed reduced from 0.3% in March 2018 to 0% in April 2018. The share of HFO in total liquid fuel consumed continued to increase marginally from 99.70% in March 2018 to 99.8% in April 2018. There was a slight increase in LCO consumption from no consumption in March 2018 to 0.1% of total liquid fuel mix in April 2018.

### Plant by Plant Highlights

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

Generation by the Akosombo GS increased marginally in April 2018. The Akosombo GS recorded an increase in average electricity generation from 9.66 GWh per day in March 2018 to 11.62 GWh per day in April 2018. Similarly, total electricity generated from the Akosombo GS increased by 16.34% from 299.58 GWh in March 2018 to 348.52 GWh in April 2018. The contribution of electricity generated by the Akosombo GS to the total electricity generated increased from 22.04% in March to 24.71% in April 2018. The Akosombo GS generated 46.52 GWh more than the projected 302 GWh under the 2018 ESP. The power plant contributed 571 MW to the System Peak Load and 579 MW to the Ghana Peak Load, representing 23.47% and 25.55% to the System Peak Load and the Ghana Peak Load respectively.

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

Average electricity generation from the Kpone GS increased marginally in April 2018 from 1.94 GWh per day in March 2018 to 2.19 GWh per day in April 2018. Total generation from the Kpone GS increased from 60.29 GWh in March 2018 to 65.74 GWh in April 2018. The Kpong GS contributed 4.66% of the total electricity supplied in April 2018. The electricity generated of 65.74 GWh was 34.16% higher than the 49 GWh projected in the 2018 ESP. The Kpone GS contributed 107 MW to the System Peak Load and 109 MW to the Ghana Peak Load which makes up 4.40% and 4.81% of the System Peak Load and Ghana Peak Load respectively.

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

There was a significant increase in generation from the Bui GS for April 2018. The average generation from the Bui GS increased by 86.92% from 1.3 GWh per day in March in 2018 to 2.51 GWh per day in April 2018. Total generation from the Bui GS of 75.32 GWh constituted 5.34% of the total electricity supplied in April 2018 from the 2.9% recorded in March 2018. The total electricity generated by the Bui GS was 25.65% more than the 56 GWh projected under the 2018 ESP. The Bui GS contributed 205 MW to the System Peak Load and 304 MW to the Ghana Peak Load constituting 8.43% of the System Peak Load and 13.42% of the Ghana Peak Load.

#### Generation by the Sunon Asogli Power Plant's (SAPP) reduced marginally in April 2018

The Sunon Asogli Power Plant recorded reductions in electricity production for the month of April 2018. Average electricity generation decreased marginally from 5.89 GWh per day recorded in March 2018 to 5.70 GWh per day in April 2018. The SAPP generated a total of 171.11 GWh of electricity which represents 12.13% of the total electricity supplied in April 2018. The SAPP generation of 171.11 GWh was 7.70% lower than the 185.38 GWh generated in March 2018. The Power plant generated 53.11 GWh more than the 118 GWh projected under the 2018 ESP. The SAPP contributed 274.20 MW to meet the System Peak Load and 341.60 MW to meet the Ghana Peak Load representing 11.27% and 15.08% of the System Peak Load and the Ghana Peak Load respectively. The power plant consumed 1,364.46 MMSCF of natural gas and 771 barrels of LCO to produce the 171.11 GWh of electricity at an estimated heat rate of 7,878.36 Btu/kWh, a marginal improvement in its heat rate over the 7,902.85 Btu/kWh recorded in March 2018.

#### CENIT Power Plant's continued to be offline in April 2018

The CENIT Power Plant remained offline in April 2018. The power plant was projected to produce 32 GWh under the 2018 ESP.

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

The Ameri power plant recorded a marginal increase in electricity generation in April 2018 from 1.34 GWh per day in March 2018 to 2.0 GWh in April 2018. Total electricity generated by the Ameri Power Plant increased by 43.92% from 41.62 GWh in March 2018 to 59.90 GWh in April 2018. The total electricity generated by the power plant constituted 4.25% of total electricity supplied in April 2018. The 59.90 GWh of electricity generated by the Ameri Power Plant was 10.9 GWh more than the 49 GWh projected under the 2018 ESP. The Ameri contributed 95.50 MW to meet the System Peak Load which constituted 3.93% of the System Peak Load. The power plant made no contributions to the Ghana Peak Load. The Ameri consumed 523.22MMSCF of natural gas to produce the 59.90 GWh of electricity at a heat rate of 10,140.25 Btu/kWh a reduction in its heat rate from the 10,108.09 Btu/kWh recorded in March 2018.

#### Kpong Thermal Power Plant's (KTPP) was offline in April 2018

The KTPP was offline in April 2018 due to system demand and Low levels of LCO. The power plant was correctly projected to be offline under the 2018 ESP.

#### The Karpowership Power Plant's generation decreased in April 2018

The average generation by the Karpowership reduced significantly by 30.80% from 10.3 GWh per day in March 2018 to 7.24 GWh per day in

## HIGHLIGHTS OF THE MONTH

April 2018. The total electricity generated by the Karpowership decreased from 313.88 GWh in March 2018 to 217.30 GWh in April 2018 which constitutes 15.41% of the total electricity generated in April 2018. Reduced generation from the Karpowership was due to low stocks of HFO from the 10th April 2018 to 23rd April 2018. Electricity supplied by the Karpowership of 217.30 GWh was 50.7 GWh lower than the 268 GWh projected under the 2018 ESP. The power plant contributed 455.10 MW to the System Peak Load and 454.40 MW to the Ghana Peak Load. These make up 18.71% and 20.05% of the System Peak Load and Ghana Peak Loads respectively. The Karpowership consumed 291,016 barrels of HFO to generate the 217.30 GWh of electricity at a heat rate of 8,102.31 Btu/kWh, a marginal improvement over the 8,110.57 Btu/kWh recorded in March 2018.

### AKSA Power Plant's generation reduced in April 2018

The AKSA power plant average electricity generation reduced marginally in April 2018 from 3.17 GWh per day in March 2018 to 2.88 GWh per day in April 2018. Total electricity generation from the AKSA power plant of 86.42 GWh constituted 6.13% of the total electricity supplied in April 2018. The total electricity generation of 86.42 GWh was 11.72 GWh lower than 98.14 GWh generated in March 2018 due to the low level of HFO stock. The power plant generated 4.1 GWh per day from 1st to 13th April and 2 GWh per day from the 14th to 30th of April 2018. The power plant was projected to generate 101 GWh under the 2018 ESP, a 14.44% deviation from the actual. The AKSA power plant contributed 189.10 MW to meet the System Peak Load and 53.80 MW to meet the Ghana Peak Load making up 7.77% and 2.37% of the System Peak Load and Ghana Peak Load respectively. The Power plant consumed 117,126 barrels of HFO at a heat rate of 8,199.68 Btu/kWh an improvement in fuel efficiency over the 8,207.08 Btu/kWh recorded in March 2018.

### Takoradi International Company (TICO) generation increased marginally in April 2018

There was a marginal increase in electricity generation by the TICO power plant in April 2018. The power plant recorded an average generation of 7.48 GWh per day in April 2018 from the 7.24 GWh per day in March 2018. Total electricity generation of 224.40 GWh was 8.68 GWh more than the 206.49 GWh recorded in March 2018. The total generation constituted 15.91% of the total electricity supplied in April 2018. The TICO power plant was projected to generate 196 GWh of electricity in April 2018 under the ESP for 2018. This figure is 14.49% lower than the actual generation of 224.40 GWh. The power plant contributed 326 MW to meet the System Peak Load and 332 MW to meet the Ghana Peak Load, which constitutes 13.40% and 14.65% of the System Peak Load and Ghana Peak Load respectively. The power plant consumed 1,561.72 MMSCF of natural gas to generate the 224.40 GWh of electricity at a heat rate of 7,258.87 Btu/kWh, an improvement in fuel efficiency over the 7,424.24 Btu/kWh recorded in March 2018.

### Takoradi Power Company (TAPCO) Plant's generation decreased in April 2018

The generation from the TAPCO power plant decreased from 2.18 GWh per day in March 2018 to 1.77 GWh per day in April 2018. Total electricity generated by the TAPCO power plant decreased by 21.24% from 67.48 GWh in March 2018 to 53.15 GWh in April 2018. The power plant contributed 3.77% of the total electricity supplied in April 2018 and was 4.85 GWh lower than the 58 GWh projected under the 2018 ESP. TAPCO contributed 106 MW and 110 MW to the System Peak Load and the Ghana Peak Load respectively, constituting 4.36% of the System Peak Load and 4.85% of the Ghana Peak Load. The TAPCO power plant consumed 547.24 MMSCF of natural gas at an average heat rate of 10,738.26 Btu/kWh a marginal improvement in fuel efficiency over 10,990.73 Btu/kWh recorded in March 2018.

### Tema Thermal 1 Power Plant's (TT1PP) increased in April 2018

The TT1PP average generation increased by over 1 fold from 0.98 GWh per day in March 2018 to 2.05 GWh in April 2018. Total generation increased from 30.48 GWh in March 2018 to 61.61 GWh in April 2018. The increase generation by the TT1PP was enabled by the increase in natural gas supply from the WAGPCo. The TT1PP contributed 4.37% of the total electricity supplied in April 2018. The TT1PP was projected to be offline under the 2018 ESP. The power plant contributed 104 MW to both the System Peak Load and the Ghana Peak Load constituting 4.27% and 4.59% to the System Peak Load and the Ghana Peak Load respectively. The power plant consumed 722.99 MMSCF of natural gas at an average heat rate of 11,558.87 Btu/kWh a reduction in fuel efficiency over the 11,484.72 Btu/kWh recorded in March 2018.

### Trojan Power Plant's continued to be offline in April 2018

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

### Genser Power Plants

The Genser power thermal plant runs on Liquefied Petroleum Gas in the generation of electricity. It has 3 plant sites, Chirano (30MW), Damang (25 MW) and Tarkwa (40 MW). The Chirano plant was offline in April 2018, the Damang plant generated 10.6 GWh while the Tarkwa plant generated 22.93 GWh. The power plant generated a total of 33.53 GWh in April 2018 as compared to 32.11 GWh in March 2018. Total generation from the power plant constituted 2.38% of the total electricity supplied in April 2018. There was no projection made for the power plant under the 2018 ESP. The Power plant generated the 33.53 GWh of electricity at an average heat rate of 10,994.82 Btu/kWh an improvement over the 11056.82 Btu/kWh recorded in March 2018.

### BXC Solar average generation decreased in April 2018

The BXC Solar Power plant recorded a marginal decrease in electricity generation for April 2018. Total generation by the power plant decreased from 2.94 GWh in March 2018 to 2.77 GWh in April 2018. The power plant contributed 0.2% of the total electricity supplied in April 2018. The Power plant was projected to generate 2.1 GWh in April 2018 under the 2018 ESP which is 0.67 GWh lower than the 2.77 GWh generated.

### VRA Navrongo Solar generation increased in April 2018

The total electricity generated by VRA Solar increased from 0.21 GWh in March to 0.23 GWh in April 2018 with a Capacity Utilization Factor of 12.78%. The power plant contributed 0.02% of total electricity supplied in April 2018. The power plant was projected to generate 0.3 GWh of electricity in April 2018, representing a 23.33% deviation of the projected from the actual.

### Electricity Exchange – Imports decreased while Exports increased significantly in April 2018

The average electricity import from La Cote D'ivoire continued to decrease from 0.40 GWh per day in March 2018 to 0.34 GWh per day in April 2018. Total electricity import of 10.24 GWh constituted 0.73% of the total electricity supplied in April 2018. Electricity imported made no contribution to both the System Peak Load and the Ghana Peak Load in April 2018.

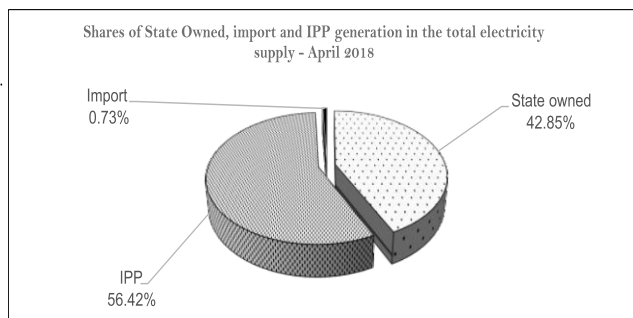
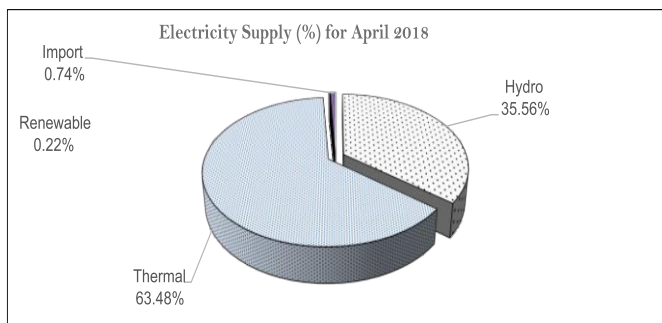
Electricity export to CIE and CEB increases significantly from 28.15 GWh in March 2018 to 79.89 GWh in April 2018. Average export increased by close to 2 folds from 0.91 GWh per day to 2.66 GWh per day in April 2018. Total electricity exported was 32.89 GWh more than the 47 GWh projected under 2018 ESP, representing a 69.98 % deviation from the actual. Ghana was a net exporter of electricity in April 2018

## OPERATIONAL FACT SHEET

<b>Peak Electricity Supply - April 2018</b>			
Source of Supply	Generation at System Peak Load of April 2018 (MW)	Generation at Ghana Peak Load of April 2018 (MW)	Electricity Supply (GWh)
AKOSOMBO	571.00	579.00	348.52
KPONG	107.00	109.00	65.74
BUI	205.00	304.00	75.32
SAPP	274.20	341.60	171.11
TAPCO	106.00	110.00	53.15
TICO	326.00	332.00	224.40
TT1PP	104.00	104.00	61.61
CENIT	-	-	-
TT2PP	-	-	-
MRP	-	-	-
KARPOWER	455.10	454.40	217.30
AMERI	95.50	-	59.90
KTPP	-	-	-
Trojan Power	-	-	-
CENPOWER	-	-	-
AKSA	189.10	53.80	86.42
BXC Solar	-	-	2.77
Safisana	-	-	-
VRA Solar	-	-	0.23
Genser	-	-	33.53
IMPORT	-	-	10.24
Export to CEB	108.00	10.00	69.39
Export to CIE	112.00	112.00	10.50
System Coincident Peak Load	<b>2,432.90</b>	-	-
Ghana Coincident Peak Load	-	<b>2,265.80</b>	-
Total Supply	-	-	<b>1,410.24</b>
Total Supply without export	-	-	<b>1,330.35</b>

<b>Ghana Electricity Demand</b>		
		<b>Apr-18</b>
Maximum System Peak Load	MW	<b>2,432.9</b>
Minimum System Peak Load	MW	<b>2,113.2</b>
Average Peak Generation	MW	<b>2,281.8</b>
System Base Load	MW	<b>1,238.1</b>
Total Electricity	GWh	<b>1,410.2</b>
Load Factor (LF)	%	<b>78.4</b>

# OPERATIONAL FACT SHEET



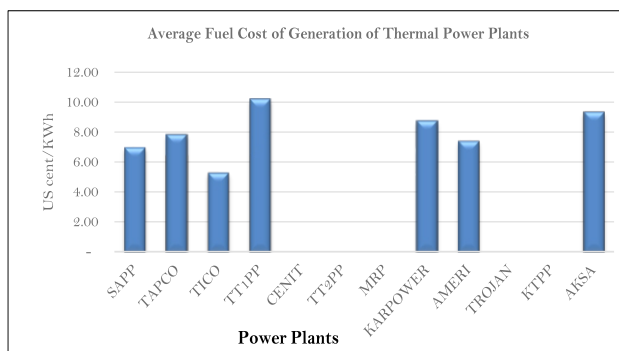
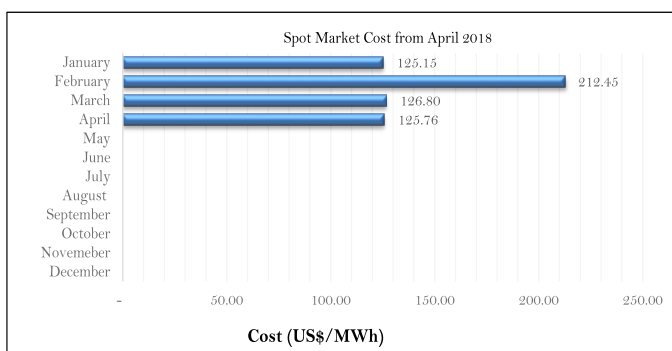
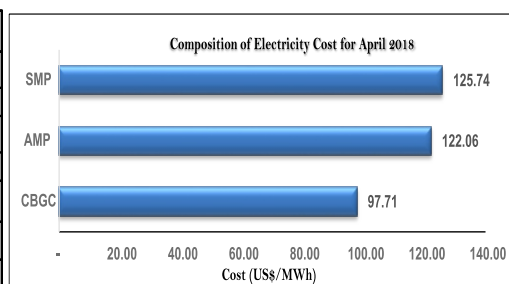
Power Plant Data for April 2018								
	Installed Capacity (MW)	Plant Capacity Utilization (%)	Electricity Generation (GWh)	Natural Gas Consumption (MMBtu)	LCO Consumption (MMBtu)	DFO Consumption (MMBtu)	HFO Consumption (MMBtu)	LPG Consumption (MMBtu)
Akosombo	1,020.00	47.46	348.52	-	-	-	-	-
Kpong	160.00	57.07	65.74	-	-	-	-	-
Bui	400.00	26.15	75.32	-	-	-	-	-
SEAP	560.00	42.44	171.11	1,343,995.30	4,081.17	-	-	-
TAPCO	330.00	22.37	53.15	570,770.54	-	-	-	-
TICO	340.00	91.67	224.40	1,628,874.41	-	-	-	-
TT1PP	126.00	67.91	61.61	712,141.84	-	-	-	-
CENIT	126.00	-	-	-	-	-	-	-
TT2PP	49.50	-	-	-	-	-	-	-
MRP	-	-	-	-	-	-	-	-
KARPOWER	470.00	64.21	217.30	-	-	-	1,760,643.76	-
AMERI	250.00	33.28	59.90	607,411.09	-	-	-	-
TROJAN	56.00	-	-	-	-	-	-	-
KTPP	220.00	-	-	-	-	-	-	-
AKSA	320.00	37.51	86.42	-	-	-	708,614.83	-
Genser	95.00	49.02	33.53	-	-	-	-	368,656.48
<b>Total</b>	<b>4,522.50</b>	<b>42.90</b>	<b>1,397.01</b>	<b>4,863,193.19</b>	<b>4,081.17</b>		<b>2,469,258.59</b>	<b>368,656.48</b>

Location	Monthly Average
<b>Etoki</b>	<b>82.33</b>
<b>Tema WAGPCo</b>	<b>67.84</b>
<b>Aboadze WAGPCo</b>	<b>0.00</b>
<b>Aboadze GNGC</b>	<b>94.04</b>

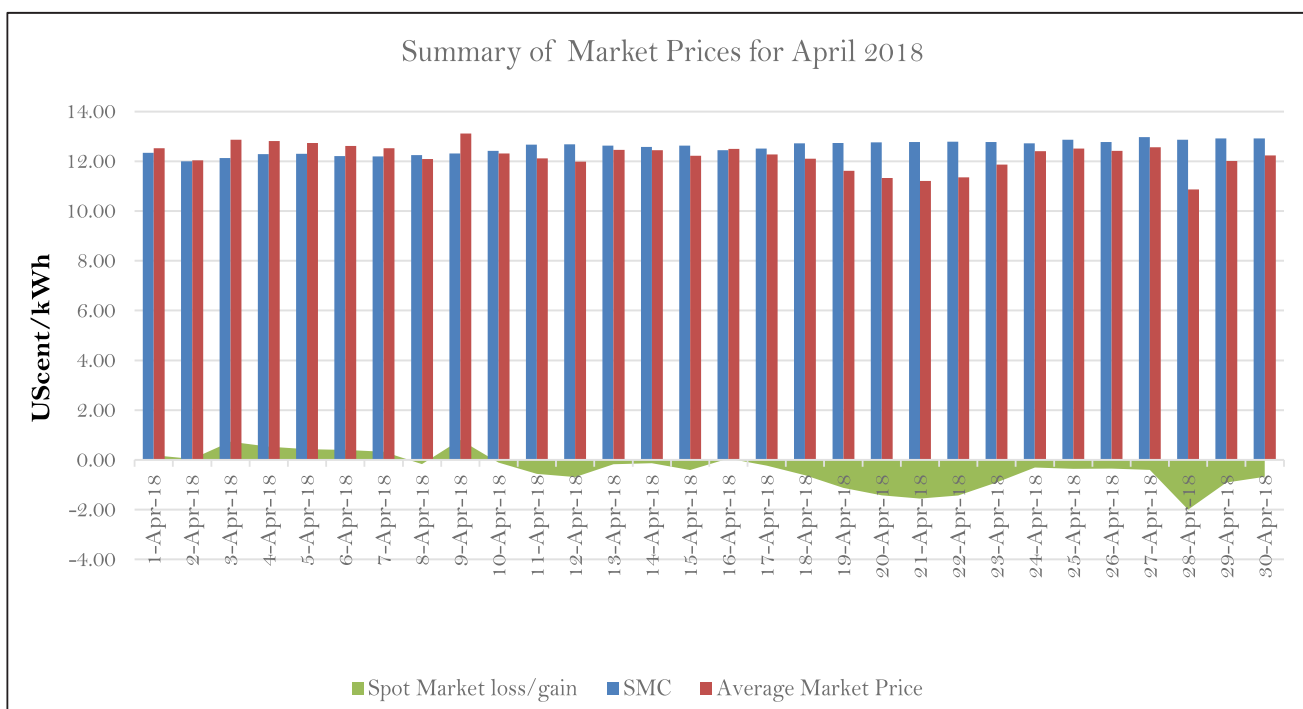
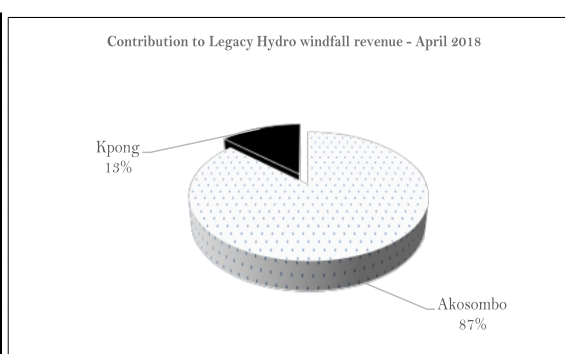
Apr-18			
	Beginning month (ft)	End month (ft)	Change in water level
Hydro Dam			(feet)
<b>Akosombo</b>	247.09	245.7	-1.39
<b>Bui</b>	563.73	559.31	-4.43

# ECONOMIC FACT SHEET

		Apr-18	Mar-18	Change
Average Market Price	US\$/MWh	122.06	131.42	(9.36)
System Marginal Cost (SMC)	US\$/MWh	125.74	126.80	(1.06)
Composite Bulk Generation Charge (CBGC)	US\$/MWh	97.71	97.71	
Deviation of TAC from CBGC	US\$/MWh	(24.35)	(33.71)	
Deviation of SMC from CBGC	US\$/MWh	(28.03)	(29.09)	



Average Fuel Prices		
		Apr-18
<b>Fuel Type</b>	<b>Unit</b>	<b>Delivered Cost</b>
Natural Gas	US\$/MMBtu	8.06
LCO	US\$/BBL	82.16
HFO	US\$/Tonne	386.33
DFO	US\$/Tonne	731.38





## Other Market News and Trends

### 1.0 Financial Sustainability of the Power Sector

#### 1.1 Ability to Recover Cost

##### 1.1.1 Electricity generation unit cost

Cost of electricity generated (fixed cost and variable) cost was adequately recovered in April 2018. The cost of bulk generation for April 2018 reduced significantly from GHp51.99/KWh in March 2018 to GHp42.75/KWh in April due to relative stable supply of natural gas to Tema and Kpone and reduced natural gas cost. The cost of bulk generation was also GHp0.22/KWh higher than the gazetted BGT of GHp42.98/KWh in April 2018. In United state Dollars (USD), average cost of generation reduced from US Cent 11.79/KWh in March 2018 to US Cent 9.7/KWh in April 2018. This was also lower than the US Cent 9.71/kWh gazette by the PURC.

Table 1.1.1 shows the comparison between the cost of generation of power plants for March 2018 and April 2018 with the approve BGT tariff by the PURC showing the effect of exchange rate variability on the ability to recover cost. Analysis A presents the BGT in terms of GWh/KWh which is the predominate currency for payment in the regulated market. Analysis B presents the effect of exchange rate of the BGT.

**Table 1.1.1 Comparison between cost of generation and PURC approve tariff for March 2018 and April 2018**

	Mar-18	Apr-18
<b>Analysis A</b>		
Bulk Cost of Generation (GWh/kWh)	51.99	42.75
PURC CBGT (GHp/kWh)	42.98*	42.98
Difference (GHp/kWh)	-9.01	0.22
<b>Analysis B</b>		
Cost of Generation (USCent/kWh)	11.79*	9.70
PURC CBGT (USCent/kWh)	9.71	9.71
Difference (USCent/kWh)	-2.08	0.01
Average Monthly Exchange rate (GHS/US\$)	4.41	4.408

\* Data has changed from what was reported in the March 2018 bulletin due to the fact that new information were obtained on some pricing parameters for March 2018.

#### 1.2 Ability to reliably meet demand

##### 1.2.1 Ratio of installed capacity to Demand and Capacity Factor

The ratio of installed capacity to demand measures the extent to which our installed capacity adequately meets demand. This ratio was adequately met in April 2018. The ratio increased from the 1.99 recorded in March 2018 to 2.32 in April 2018. The relative increase in installed capacity in April 2018 caused the ratio of installed capacity to demand to increase. The ratio was above the average for Sub-Saharan African Countries and OECD countries. It however failed to meet the average for the World and all other economic classes.

The capacity factor of a power system measures the extent to which the supply system is being utilized. The capacity factor for April 2018 was 46%, a marginal increment from the 44% recorded in March 2018. The capacity factor of 46% recorded for April 2018 is marginally higher than the average capacity factor for low income countries but less than the 50% average for the globe, South Sahara African Countries, lower and upper middle income countries.

**Table 1.2.1 Ratio of installed capacity to demand and capacity factor for March 2018 and April 2018**

	Ghana		World	SSA	OECD	High Income Non-OECD	Upper Middle Income	Lower Middle Income	Low Income
	Mar-18	Apr-18							
Ratio of Installed capacity to Demand	1.99	2.32	2.60	2.20	2.30	2.50	2.40	3.10	2.90
Capacity Factor	0.44	0.46	0.50	0.50	0.50	0.50	0.50	0.50	0.40

### 1.2.2 Reserve Margin

The reserve margin of the supply system serves as an indicator in measuring the reliability of a power system. The reserve margin, especially the constrained reserve margin throws more light on the utilization of the installed capacity of the country. Constrained reserve margin takes into consideration planned maintenance, unplanned maintenance and fuel supply difficulties. That is, power plants that are technically available, have fuel available and could come up online when needed within the period under study.

**Table 1.2.2 Average Constrained and Unconstrained reserve margin**

Reserve Margin	Mar-18	Apr-18
<b>Constrained Reserve Margin (%)</b>	23.00	16.00
<b>Unconstrained Reserve Margin (%)</b>	49.88	46.47

The constrained reserve margin saw a significant reduction from an average of 23% in March 2018 to 16% in April 2018. The reduction was as a result of the increase in demand in April 2018 relative to March 2018 as exports increased coupled with fuel supply challenges at Tema and Kpone. The reserve margin falls below the 18% to 25% recommended by the International Energy Agency (IEA) and the Power Sector Reforms. There was an average of about 30% capacity unavailable due to technical and fuel supply challenges.

### 1.3 Ability to make investments

#### 1.3.1 Capacity Annual Growth and Ratio of installed Capacity growth to demand growth

The capacity annual growth indicator measures the annual growth in the installed capacity as a means of our ability to make investment in the power sector. The installed capacity grew by 8.66% between April 2017 and April 2018, compared to 7.85% between March 2017 and March 2018. These measures are considerably higher than the average for SSA, Upper Middle Income; Lower Middle Income and Low Middle Income Countries.

**Table 1.3.1 Capacity annual growth and Ratio of installed capacity growth to demand growth**

	Ghana		SSA	High Income Non-OECD	Upper Middle Income	Lower Middle Income	Low Income
	Mar-18	Apr-18					
<b>Capacity Annual growth (%)</b>	7.85	8.66	3.10	3.10	2.70	3.90	3.40
<b>Ratio of installed capacity growth to demand growth</b>	2.52	1.30	0.20	0.60	0.70	0.30	0.02

A high growth in capacity will be insignificant if it is not able to meet the required demand. The indicator that measures the ability of the growth in capacity to meet the growth in demand is the ratio of the growth in installed capacity to growth in demand. The ratio of installed capacity growth to demand growth for April 2018 reduced to 1.30 as compared to the 2.52 recorded in March 2018. This is as a result of increase in demand for April 2018 compared to growth in capacity. This ratio is however higher than the average for the World, OECD countries and all the Economic Classes of the world.

### 1.4 Ability to operate according to environmental and social norms

#### 1.4.1 Emission factor and Fossil fuel dependency

The month of April experienced an increase in electricity generation from Hydro sources and a consequent reduction in thermal generation.. Fossil fuel dependency in April 2018 experienced a reduction to 64.35% from 70.15% recorded in March 2018. Fossil fuel dependency in April 2018 was higher than the average for low income, lower middle income, SSA, and the World, while it compared favorably with the average for High Income Non-OECD and Upper Middle Income economies.

Emission factor for April 2018 reduced from 0.39 in March 2018 to 0.34 in April 2018. This was due to reduction in generation from thermal sources. The Emission factor for April 2018 was relatively lower than the average for World, SSA and High Income countries. It was however higher than the average for low income economies.

Table 1.4.1 compares Ghana's emission factor and fossil fuel dependency with indicators from economies and region of the world.

**Table 1.4.1 Emission Factor and Fossil fuel dependency for the April of 2018**

	Ghana		World	SSA	High Income Non-OECD	Upper Middle Income	Lower Middle Income	Low Income
	Mar-18	Apr-18						
<b>Emission Factor (KgCO<sub>2</sub>/kWh)</b>	0.39	0.34	0.60	0.50	0.90	0.70	0.50	0.30
<b>Fossil Fuel Dependency (%)</b>	70.15	64.35	60.70	45.30	84.40	66.40	59.40	40.60

### 1.4 Conclusions

The installed capacity of Ghana for April 2018 was close to twice of our required demand. The ratio of installed capacity growth to demand growth increased to 2.32 in April 2018 from 1.93 recorded in March 2018 due to a relative growth in capacity in April 2018. The capacity annual growth however increased from 7.85% in March 2018 to 8.66% in April 2018. Likewise, the capacity factor increased marginally from 44% in March 2018 to 46% in April 2018 due to relative increase in demand. The emission factor for April 2018 was 0.34kgCO<sub>2</sub>/kWh a marginal reduction from the 0.39kgCO<sub>2</sub>/kWh recorded in March 2018. This value is lower than the average for World, High Income Non- OECD, and SSA and Lower Middle Income countries. The constrained reserve margin for April 2018 of 16% was below the recommended range by IEA and the power sector reform. Ghana in general performed better in April 2018 as almost all of the indicators.

## 2.0 Performance Indicators of Power Plants

### 2.1 Capacity Utilization Factor (CUF)

There was a general increase in the CUF for most of the power plants in April 2018. The Akosombo GS and Kpong GS recorded marginal increases in their CUF from 39.5% and 50.6% respectively in March 2018 to 47.5% and 57.1% respectively in April 2018. The Bui GS recorded a significant increase in its CUF from 13.39% recorded in March 2018 to 26.2% in April 2018. For the thermal power plants, the TT1PP, Ameri and TICO power plants recorded increases in their CUF for April 2018 while SAPP, TAPCO, and Karpowership recorded reductions in their CUF. The Capacity Utilization Factor of TT1PP increased significantly from 32.5% in March 2018 to 67.9% in April. The Ameri and TICO power plants also recorded marginal increases in CUF from 22.38% and 81.6% in March 2018 to 33.3% and 91.7% in April 2018 respectively. The Karpowership power plants recorded significant reductions in its CUF from 89.76% in March 2018 to 64.2% in April 2018. There were marginal reductions in the CUF for SAPP and TAPCO from 44.49% and 27.5% respectively in March 2018 to 36.23% and 22.4% in April 2018. The Genser power plant recorded a CUF of 49.2% in April 2018.

The System Load Factor decreased from 80.2%. to 78.4%.

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**

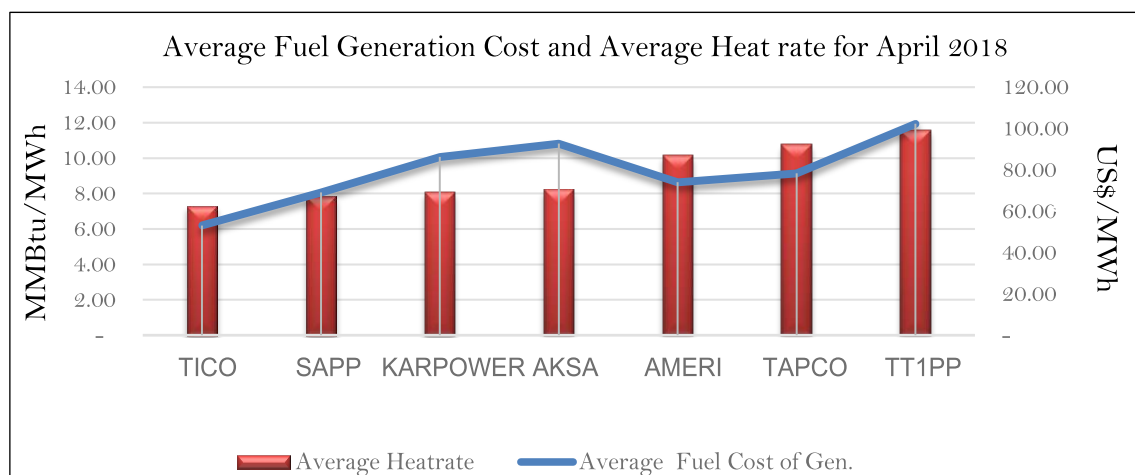
<b>Power Plant</b>	<b>Capacity Utilization (%)</b>	<b>Average Heat rate (Btu/KWh)</b>	<b>Average Fuel Cost of Generation (US\$/MWh)</b>
<b>Akosombo</b>	47.46	-	-
<b>Kpong</b>	57.07	-	-
<b>Bui</b>	26.15	-	-
<b>SAPP</b>	42.44	7,878.36	69.73
<b>TAPCO</b>	22.37	10,738.26	78.28
<b>TICO</b>	91.67	7,258.87	52.92
<b>TT1PP</b>	67.91	11,558.87	102.06
<b>CENIT</b>	-	-	-
<b>TT2PP</b>	-	-	-
<b>MRP</b>	-	-	-
<b>KARPOWER</b>	64.21	8,102.31	87.48
<b>AMERI</b>	33.28	10,140.25	73.92
<b>TROJAN</b>	-	-	-
<b>KTPP</b>	-	-	-
<b>AKSA</b>	37.51	8,199.68	93.40
<b>Genser</b>	49.02	10,994.82	-

### 2.2 Heat Rate (Fuel Efficiency)

There was a general increase in fuel efficiency of most of the thermal power plants with the exception of TT1PP and the Ameri power plant. The fuel efficiency of TT1PP and the Ameri power plant reduced from marginally from 29.7% and 33.8% respectively in March 2018 to 29.5% and 33.6% in April 2018. The SAPP, TAPCO and TICO power plants experienced marginal improvements in their fuel efficiencies from 43.2%, 31.0% and 46% respectively in March 2018 to 43.6%, 31.8% and 46.8% in April 2018. Similarly, the AKSA power plant and Karpowership experienced improvement in their fuel efficiencies from 41.6% and 42.07% in March 2018 respectively to 41.6% and 42.4% in April 2018. Genser power plant recorded a fuel efficiency of 32.9% in April 2018.

Figure 2.1 shows the ranking of the thermal power plants based on their efficiency 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

There was a reduction in the average fuel cost of generation for thermal power plants in April 2018 from an average of US\$95.88/MWh in March 2018 to US\$82/MWh in April 2018, representing a 14.8% decrease in average fuel cost of electricity generation due to the reduction in natural gas prices. All the power plants recorded reductions in their average fuel cost of electricity generation. The SAPP, TT1PP, TAPCO and TICO power plants recorded significant reductions of 2.8%, 1%, 19.37% and 19.06% respectively, from US\$72.71/MWh, US\$105.66/MWh, US\$97.16/MWh and US\$65.33/MWh in March 2018 to US\$69.1/MWh, US\$102.25/MWh, US\$78.34 and US\$53.12/MWh in April 2018. Likewise, the Karpower, Ameri and AKSA power plants recorded reductions of 10.08%, 17.18% and 8.51% respectively from US\$95.92/MWh, US\$89.36/MWh and US\$ 101.30/MWh in March 2018 to US\$86.25/MWh, US\$74/MWh and US\$92.68/MWh in April 2018.

#### Acronyms

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

**For any enquiries please contact the:**  
EMOP Secretariat, Energy Commission, Accra.  
Tel: 0302 813756/7/9 E-mail: emop@energycom.gov.gh