



# GHANA WHOLESAL ELEC TRICIT Y MARKET BULLETIN

## MARKET WATCH

### Monthly Market Data Analysis

ISSUE NO. 35

1<sup>st</sup> November 2018 to 30<sup>th</sup> November 2018

This Bulletin covers major developments in the Wholesale Electricity Market (WEM) of Ghana from 1<sup>st</sup> November, 2018 to 30<sup>th</sup> November, 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 presents major happenings in the Wholesale Electricity Market (WEM) in November 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

The system Peak Load of 2,471.8 MW recorded for November 2018 was lower than the 2,513 MW projected under the 2018 ESP by 3.3%. Also, the Ghana Peak Load of 2,304.8 MW recorded in November 2018 was lower than the 2,380 MW projected under the 2018 ESP. However, average electricity demand of 1,887.3 MW recorded in November 2018 was marginally higher than the 1,816.4 MW projected under the 2018 ESP by 5.2%. At the System Peak, a total load of 167 MW was exported which was 25.6% higher than the 133 MW projected under the 2018 ESP. Out of the total electricity exported at the System Peak, 99 MW and 68 MW were supplied to CEB and SONABEL respectively in November 2018.

The total electricity of 1,450.23 GWh supplied in November 2018 was marginally higher than the 1,396.5 GWh projected under the 2018 ESP by 3.9%. Similarly, the total domestic consumption of 1,370.51 GWh recorded in November 2018 was marginally higher than the 1,320 GWh projected under the 2018 ESP by 3.6%. The total of 66.03 GWh of electricity exported in November 2018 was 10.8% lower than the 74 GWh projected under the 2018 ESP.

Contribution of electricity generated by hydro power plants in the total electricity supplied increased marginally from 47.5% in October 2018 to 47.9% in November 2018. Correspondingly, electricity supply from thermal sources reduced from 52.5% in October 2017 to 51.2% in November 2018.

The increase in the water level for the Akosombo dam ended on 16th November 2018 with the water level for Akosombo dam

Table 1. Projected and Actual Outturn of electricity demand and supply in October 2018 and November 2018.

	November 2018		October 2018	
	Projected	Actual Outturn	Projected	Actual Outturn
Total Supply (GWh)	1,397.4	1,450.2	1,407.8	1,404.1
Source by Power Plants (GWh)				
AKOSOMBO	305.3	449.7	315.0	408.3
KPONG	49.2	63.6	51.0	70.0
BUI	68.7	201.2	71.0	170.8
Simon Asogli	117.8	171.7	118.0	223.4
TAPCO	172.8	78.1	179.0	28.5
TICO	97.9	142.6	101.0	173.6
TT1PP	57.6	30.1	-	1.2
CENIT	44.5	-	46.0	-
TT2PP	-	-	-	-
MRP	-	-	-	-
Karpowership	254.2	82.2	261.0	104.1
AMERI	73.4	118.1	76.0	75.4
KTPP	-	38.0	63.0	59.3
Trojan Power	-	-	-	-
CENPOWER	104.0	0.5	108.0	10.3
AKSA	47.5	45.8	14.0	28.1
BXC Solar	2.1	1.8	2.2	2.7
VRA Solar	0.3	0.3	0.4	0.3
Gasener	-	35.8	-	34.8
Meinergy	2.1	-	2.2	-
Total Generation (GWh)	1,397.4	1,438.5	1,407.8	1,390.7
Imports (GWh)	-	11.7	-	13.4
Total Supply (GWh)	1,397.4	1,450.2	1,407.8	1,404.1
Deficit/Over supply (GWh)	-	52.8	-	(5.7)
Ghana Coincident Peak Load (MW)	2,380.0	2,304.8	2,251.0	2,243.7
System Coincident Peak Load (MW)	2,513.0	2,471.8	2,384.0	2,471.4

## HIGHLIGHTS OF THE MONTH

reaching a maximum of 263.67 feet. The Bui dam water level on the other hand started decreasing from the 1st November 2018 at a rate of 0.21 feet per day. The Akosombo dam decreased at a rate of 0.03 feet per day from 16th November 2018.

The consumption of natural gas in the total fuel mix continued to increase in November 2018, from a share of 65.4% in September 2018 and 70.2% in October 2018 to 79.9%. Consequently, the consumption of liquid fuel in the total fuel mix reduced from 23.5% in October 2018 to 14.9% in November 2018. Also, the consumption of LPG reduced in November 2018, from 6.3% in October 2018 to 5.2%.

### ELECTRICITY DEMAND AND SUPPLY

#### Electricity Demand

The System Peak Load recorded for November 2018 was approximately the same as the System Peak Load recorded in October 2018 with a marginal increase of 0.4 MW. There was a marginal increase in the Ghana Peak Load by 2.7%, from 2,243.7 MW in October 2018 to 2,304.8 MW in November 2018. This was as a result of increase in domestic demand in November 2018. At the System Peak Load, 18 MW was imported from CIE, representing 0.7% of the total load served at the system Peak in November 2018. A total of 99 MW and 68 MW were exported to CEB and SONABEL during the System Peak Load in November 2018. The average electricity demand of 1,887.3 MW recorded in November 2018 was 2.7% higher than the 1,838.4 MW recorded in October 2018. Electricity generation from hydro sources contributed 45% of both the System Peak Load and the Ghana Peak Load in November 2018.

#### Electricity supply

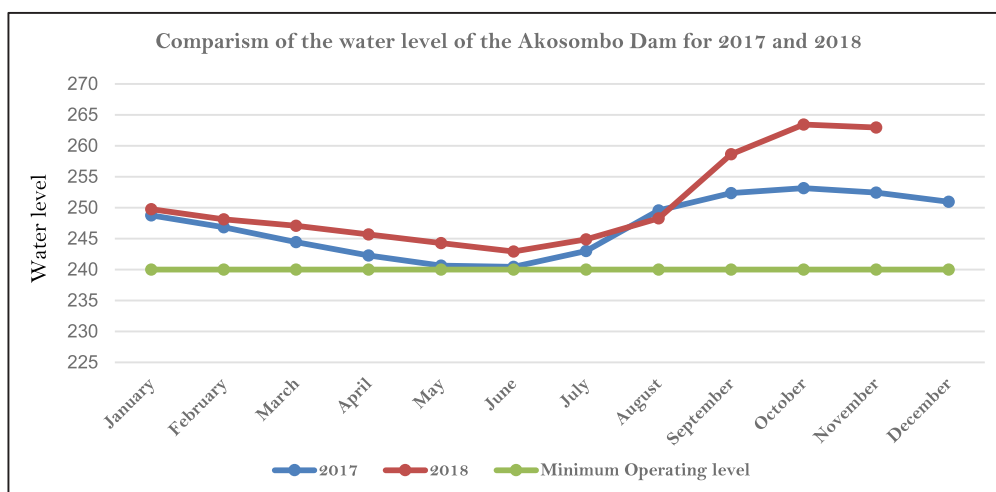
There was a marginal increase in the average electricity supplied in November 2018 by 6.7%, from 45.3 GWh per day in October 2017 to 48.34 GWh per day. Similarly, the total electricity supplied increase from 1,404.13 GWh in October 2018 to 1,450.23 GWh in November 2018 by 3.3%. This was predominantly due to increase in domestic demand in November 2018. Out of the total electricity supplied in November 2018, 11.69 GWh was imported from CIE with the remaining 1,438.54 GWh from domestic sources. A total of 7.14 GWh, 29.44 GWh and 43.13 GWh were exported to CIE, CEB and SONABEL respectively in November 2018. Electricity supplied by hydro power plants constituted 47.9% of the total electricity supplied in November 2018.

### HYDRO DAM LEVELS

#### Akosombo Dam Water Level dropped in November 2018

The net inflows into the Akosombo GS ended on 16th of November 2018, with the highest water level being recorded at 263.67 feet with the water level decreasing at the rate of 0.03 feet per day afterwards. The water of 263.46 feet recorded at the beginning of November 2018, dropped by 0.48 feet to 262.98 feet at the end of the month. The end month water level of 262.98 feet recorded at the end of the month was 10.54 feet above the water level recorded for the same period in 2017.

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



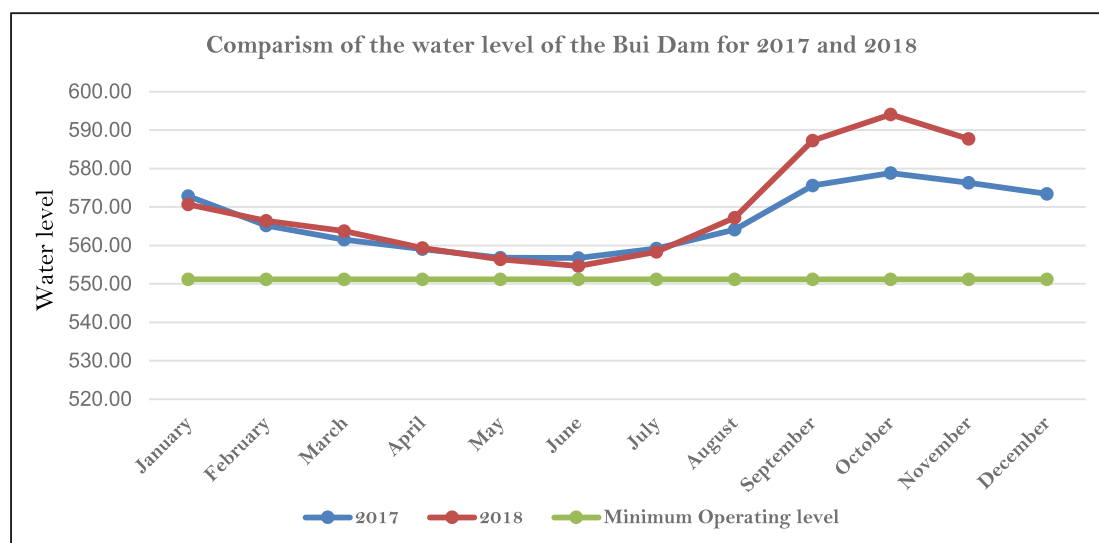
#### Bui Dam Water Level dropped in November 2018

The net inflows into the Bui GS ended on 1st November 2018, with the highest water level being recorded at 594.15 feet. The rate of decrease in the water level was recorded at 0.21 feet per day in November 2018. The water level of 594.09 feet recorded at the beginning of the month, reduced by 6.36 feet to 587.73 feet at the end of November 2018. The month end water level of 587.73 feet recorded in November 2018 was 11.4 feet above the water level of 576.33 feet recorded in the same period for 2017.

## HIGHLIGHTS OF THE MONTH

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

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



### FUEL SUPPLY FOR POWER GENERATION

#### Natural gas flow rate from WAGPCo decreased in November 2018

The natural gas flow rate from WAGPCo to Tema and Kpone keeps reducing in November 2018, from 83.44 MMSCFD in September 2018, 72.61 MMSCFD in October 2018 to 69.08 MMSCFD in November 2018. However, the total natural gas of 2,156.24 MMSCF consumed from WAGP in November 2018 was also lower than the 2,667.66 MMSCF consumed in October 2018. The shares of natural gas from WAGP in the total fuel mix reduced from 41.4% in October 2018 to 29.6% in November 2018. Natural gas from WAGP contributed 37% of the total natural gas consumed in November 2018 and was lower than the 58.9% recorded in October 2018.

#### Natural gas flow rate from GNGC increased in November 2018.

Natural gas flow rate from AGPP to Aboadze power enclave increased in November 2018 by 63.6%, from 31 MMSCFD in October 2018 to 50.72 MMSCFD. Natural gas flow for 14 day from the AGPP in October 2018 at an average of about 65 MMSCFD. Likewise, the total natural gas consumed from GNGC increased significantly by 51%, 961.04 MMSCF recorded in October 2018 to 1,456.07 MMSCF recorded in November 2018. The total natural gas supplied by GNGC contributed 20.9% of the total fuel mix in November 2018 which was higher than the 14.9% it recorded in October 2018. In the total natural gas consumed, the natural gas supplied by GNGC contributed 26.1% in November 2018 which was higher than the 21.2% it recorded in October 2018.

#### Natural gas flow from ENI increased in November 2018

The natural gas flow rate from ENI to the Aboadze power enclave increased in November 2018 by over 1.7 folds, from 26.2 MMSCFD in October 2018 to 71.44 MMSCFD. Natural gas flow for 14 day from the ENI in October 2018 at an average of about 58 MMSCFD. Also, the total natural gas supplied by ENI increased from 811.42 MMSCF in October 2018 to 2,050.84 MMSCF in November 2018. The total natural gas supplied by ENI constituted 29.4% of the total fuel mix in November 2018 which was higher than the 14% it recorded in October 2018. In the total natural gas consumed, ENI contributed 36.8% which was higher than the 19.9% it recorded in October 2018.

### Liquid Fuel

The consumption of liquid fuel continued to decrease in November 2018 from 402,731 barrels in September 2018 and 256,946 barrels in October 2018 to 117,090 barrels in November 2018. This was predominantly due low consumption of Light Crude Oil (LCO) in November 2018 compared to the previous month. The share of LCO in the total fuel consumed reduced from 3.8% in October 2018 to 0.3% in November 2018. LCO share in the total liquid fuel consumed reduced from 27.1% in October 2018 to 2% in November 2018. HFO share in the total fuel mix reduced from 17% in October 2018 to 14.6% in November 2018. On the contrary, the share of HFO in the total liquid fuel consumed increased from 72% in October 2018 to 98% in November 2018 due to the reduced share of LCO. The shares of DFO in the total fuel mix and liquid fuel consumed reduced from 0.2% and 0.9% in October 2018 to less than 0.01% in both the total fuel mix and total liquid fuel consumed.

## HIGHLIGHTS OF THE MONTH

### Plant by Plant Highlights

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

The Akosombo GS recorded a marginal increase in its average electricity generated by 8.8%, from 13.17 GWh per day in October 2018 to 14.32 GWh per day. Likewise, the total electricity supplied by the power plant increased by 5.2%, from 408.31 GWh in October 2018 to 429.7 GWh in November 2018. The total electricity supplied by the hydro power plant was 40.9% more than the 305 GWh projected under the 2018 ESP. Also, the total electricity supplied by Akosombo GS contributed 29.6% of the total electricity supplied in November 2018. The hydro power plant contributed 653.5 MW to both the System Peak Load and the Ghana Peak Load. This translates into 26.4% of the System Peak Load and the Ghana Peak Load in November 2018.

#### Electricity supply by Kpong Generation Station (GS) decreased in November 2018

Average electricity generated from the Kpong GS reduced by 6.1%, from 2.26 GWh per day in October 2018 to 2.12 GWh per day in November 2018. Similarly, the total electricity supplied by the hydro power plant reduced from 70 GWh in October 2018 to 63.64 GWh in November 2018. The total electricity supplied by the power plant was 29.9% higher than the 49 GWh projected under the 2018 ESP and constituted 4.4% of the total electricity supplied in November 2018. The Kpong GS contributed 71 MW to both the System Peak Load and the Ghana Peak Load, representing 2.9% of both the System Peak Load and the Ghana Peak Load.

#### Electricity supply by the Bui Generation Station (GS) continued to increase in November 2018

Bui GS continued to record an increase in its average electricity generation from, 1.72 GWh per day in September 2018, 5.51 GWh per day in October 2018 to 6.71 GWh per day in November 2018. Consequently, the total electricity supplied by the hydro power plant increased by 17.8%, from 170.78 GWh in October 2018 to 201.25 GWh in November 2018. The total electricity supplied by the power plant constituted 13.9% of the total electricity supplied in November 2018 and was significantly higher than the 69 GWh projected under the 2018 ESP. The Bui GS contributed 387.7 MW to both the System Peak Load and the Ghana Peak Load, representing 15.7% of the System Peak Load and the Ghana Load in November 2018.

#### Generation by the Sunon Asogli Power Plant (SAPP) decreased in November 2018

Sunon Asogli power plant recorded a reduction in its average electricity generated by 20.6%, from 7.21 GWh per day in October 2018 to 5.72 GWh per day in September 2018. The total electricity supplied by the power plant reduced by 23.1%, from 223.4 GWh in October 2018 to 171.7 GWh in November 2018. The power plant was projected to supply 118 GWh under the ESP for 2018 but supplied 45.5% more. The total electricity supplied by the power plant constituted 11.8% of the total electricity in November 2018. SAPP contributed 270.5 MW to both the System Peak Load and the Ghana Peak Load, representing 10.9% of the System Peak Load and the Ghana Peak Load. SAPP consumed a total of 1,411.15 MMSCF of natural gas at an estimated efficiency of 8,095.45 Btu/kWh in November 2018. The efficiency of 8,095.45 Btu/kWh recorded in November 2018 was lower than the 7,684.68 Btu/kWh recorded in October 2018.

#### Ameri Energy Power Plant's generation increased significantly in November 2018

There was a significant increase in the average electricity generation from the Ameri power plant by 62%, from 2.43 GWh per day in October 2018 to 3.94 GWh per day in November 2018. The power plant supplied a total of 118.13 GWh in November 2018 which was 56.8% higher than the 75.36 GWh it supplied in October 2018. The total electricity supplied by the power plant constituted 8.2% of the total electricity supplied in November 2018. The Ameri power plant supplied 61.8% more than the 73 GWh projected under the 2018 ESP. The power plant contributed 191.1 MW to the System Peak Load and the Ghana Peak Load, representing 7.7% of the System Peak Load and the Ghana Peak Load. The Ameri power plant consumed a total of 1,154.46 MMSCF of natural gas, at an estimated fuel efficiency of 10,056.32 Btu/kWh in November 2018. The fuel efficiency recorded in November 2018 was higher than the 10,195.26 Btu/kWh recorded in October 2018.

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

The Karpowership recorded a decrease in its average electricity supplied in November 2018 by 18.4%, from 3.36 GWh per day in October 2018 to 2.74 GWh per day. Also, the total electricity of 82.21 GWh supplied by the power plant was 21.1% lower than the 104.13 GWh it supplied in November 2018. The power plant was projected to supply 254 GWh under the 2018 ESP but supplied 67.6% lower than that in November 2018. The total electricity supplied by Karpowership constituted 5.7% of the total electricity supplied in November 2018. The Karpowership contributed 238.6 MW to both the System Peak Load and the Ghana Peak Load, representing 9.7% of the System Peak Load and the Ghana Peak Load. A total of 110985.47 barrels of HFO was consumed by the thermal power plant at an estimated fuel efficiency of 8,167.75 Btu/kWh in November 2018 and was lower than the 8,146.07 Btu/kWh recorded in October 2018.

#### AKSA Power Plant's generation increased significantly in November 2018

AKSA power plant's average electricity generated in November 2018 increased significantly by 68.6% in November 2018, from 0.91 GWh per day in October 2018 to 1.53 GWh per day. The total electricity supplied by the power plant increased from 28.09 GWh in October 2018 to 45.84 GWh in November 2018 by 63.2%. The total electricity supplied by the thermal power plant constituted 3.2% of the total electricity supplied in November 2018 and was 4.5% lower than the 48 GWh projected under the 2018 ESP. AKSA power plant contributed 109.4 MW to both the System Peak Load and the Ghana Peak in November 2018. This translates into 4.4% of the System Peak Load and the Ghana Peak Load. The thermal power plant consumed a total of 62,039.09 barrels of HFO at an estimated fuel efficiency of 8,188.56 Btu/kWh in November 2018. The fuel efficiency recorded in November 2018 was marginally lower than the 8,140.15 Btu/kWh recorded in October 2018.

#### Takoradi International Company (TICO) generation decreased in November 2018

Average electricity generation from TICO power plant reduced in November 2018 by 15.1%, from 5.6 GWh per day in October 2018 to 4.75 GWh per day. The total electricity of 142.6 GWh supplied by the power plant in November 2018 was 17.9% lower than the 173.6 GWh it supplied in October 2018. The total electricity supplied by the thermal power plant was 45.5% higher than the 98

## HIGHLIGHTS OF THE MONTH

GWh projected under the 2018 ESP and constituted 9.8% of the total electricity supplied in November 2018. TICO contributed 211 MW to both the System Peak Load and the Ghana Peak Load, representing 8.5% of the System Peak Load and the Ghana Peak Load. A total of 1,501.5 MMSCF of natural gas, 3,667.25 barrels of LCO and 22.99 barrels of DFO at an estimated fuel efficiency of 10,971.75 Btu/kWh in November 2018. The fuel efficiency recorded in November 2018 was significantly lower than the 7,625.46 Btu/kWh recorded in October 2018. The high heat rate of TICO recorded in November 2018 was due to the plant operating mostly on simple cycle.

### **Takoradi Power Company (TAPCO) Plant's generation increased in November 2018**

TAPCO's average electricity generation increased significantly by over one and half folds, from 0.92 GWh per day in October 2018 to 2.6 GWh per day in November 2018. Similarly, the total electricity supplied by the power plant increased from 28.9 GWh in October 2018 to 78.08 GWh in November 2018. The total electricity supplied by the thermal power plant was 54.9% lower than the 173 GWh projected under the 2018 ESP and constituted 5.4% of the total electricity supplied in November 2018. TAPCO contributed 113 MW to the System Peak Load and the Ghana Peak Load, representing 4.6% of the System Peak Load and the Ghana Peak Load in November 2018. The power plant consumed a total of 850.94, MMSCF of natural gas, 327.52 and 32.97 barrels of DFO at an estimated fuel efficiency of 11,240.29 Btu/kWh in November 2018. The fuel efficiency recorded by TAPCO in November 2018 was lower than the 10,763.96 Btu/kWh it recorded in September 2018.

### **Kpone Thermal Power Plant's (KTPP) generation decreased in November 2018**

The Kpone Thermal Power Plant continued its operation in November 2018 with its average electricity generation reducing by 32.2%, from 1.91 GWh per day in October 2018 to 1.3 GWh per day. The total electricity generated by the thermal power plant reduced significantly by 34.4%, from 59.31 GWh in October 2018 to 38.93 GWh in November 2018. The total electricity supplied by KTPP constituted 2.7% of the total electricity supplied in November 2018. The thermal power plant contributed 102 MW to both the System Peak Load and the Ghana Peak Load, representing 4.1% of the System Peak Load and the Ghana Peak Load. A total of 409.68 MMSCF of natural gas was consumed by the thermal power plant at an estimated fuel efficiency of 10,307.31 Btu/kWh in November 2018. The fuel efficiency recorded by KTPP in November 2018 was marginally higher than the 10,313.29 Btu/kWh recorded in October 2018. However, the power plant was projected to be offline in November 2018.

### **Tema Thermal 1 Power Plant's (TT1PP) generated in November 2018**

An average of 1 GWh of electricity was generated by TT1PP in November 2018. A total of 30.11 GWh of electricity was supplied by the power plant which was 48.1% lower than the 58 GWh projected under 2018 ESP. The thermal power plant contributed 106 MW to both the System Peak Load and the Ghana Peak Load, representing 4.3% of the System Peak Load and the Ghana Peak Load. TT1PP consumed a total of 335.42 MMSCF of natural gas at an estimated fuel efficiency of 10,972.61 Btu/kWh in November 2018.

## **Embedded Electricity Generation**

### **Genser Power Plant's generation increased in November 2018**

Average electricity generation from Genser power plant increased marginally in November 2018, from 1.12 GWh per day in October 2018 to 1.13 GWh per day. The thermal power plant consumed a total of 33.78 GWh in November 2018 which was lower than the 34.83 GWh it generated in October 2018. The total electricity supplied by the power plant constituted 2.3% of the total electricity supplied in November 2018. A total of 8,675.97 tonnes of LPG was consumed by the thermal power plant with an estimated fuel efficiency of 10,954.57 Btu/kWh in November 2018.

### **BXC Solar generation decreased in November 2018**

BXC Solar power plant's total electricity supplied decreased by 32.2% in November 2018, from 2.67 GWh in October 2018 to 1.81 GWh. The total electricity generated by the solar power plant was 13.6% lower than the 2.1 GWh projected under the 2018 ESP and constituted 0.1% of the total electricity supplied in November 2018.

### **VRA Navrongo Solar generation decreased marginally in November 2018**

The total electricity generation from the VRA Solar power plant decreased marginally by 1%, from 0.254 GWh in October 2018 to 0.251 GWh in November 2018. The total electricity supplied by the solar power plant was 16.2% lower than the 0.3 GWh projected under the 2018 ESP and contributed 0.02% of the total electricity supplied in November 2018.

## **Electricity Exchange – Import decreased while Exports increased in November 2018**

Average electricity import in November 2018 decreased by 9.8%, from 0.43 GWh per day in October 2018 to 0.39 GWh. The total electricity import of 11.69 GWh recorded in November 2018 was 12.7% lower than the 13.4 GWh recorded in October 2018. Import from CIE contributed 0.8% of the total electricity supplied in November 2018. Electricity import contributed 18 MW to both the System Peak Load and the Ghana Peak Load in November 2018.

Average electricity supply to CEB and SONABEL increased by one fold and 6% respectively but export to CIE decreased by 16.6% in November 2018. The average electricity supplied to CEB and SONABEL increased from 0.49 GWh per day and 1.36 GWh per day in October 2018 to 0.98 GWh per day and 1.44 GWh per day in November 2018 respectively. Average electricity export to CIE decreased from 0.29 GWh per day in October 2018 to 0.24 GWh per day in November 2018. In total, average electricity export increased by 24.8%, from 2.13 GWh per day in October 2018 to 2.66 GWh per day in November 2018. A total of 7.14 GWh, 43.13 GWh and 29.44 GWh were exported to CIE, SONABEL and CEB respectively in November 2018. However, the total electricity of 79.71 GWh exported was 7.7% lower than the 74 GWh projected under the 2018 ESP.

However, Ghana continues to be a net exporter of electricity in November 2018.

# OPERATIONAL FACT SHEET

## Monthly Market Data Analysis

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

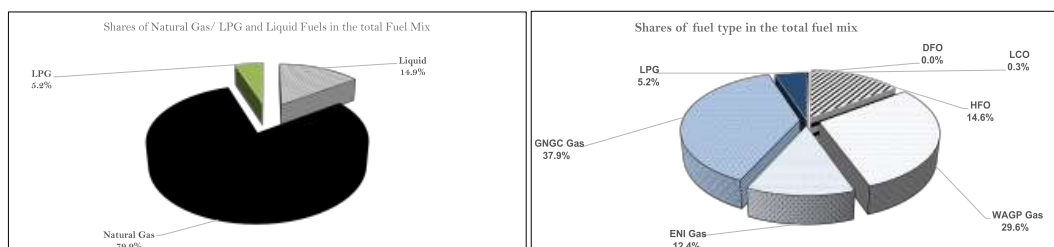


Figure 4a: Contribution of Natural Gas Supply by sources

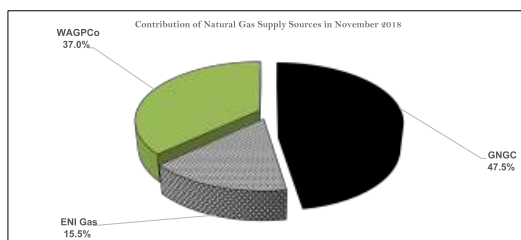
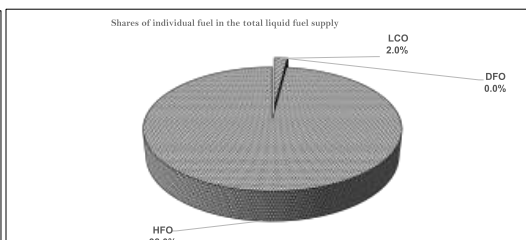


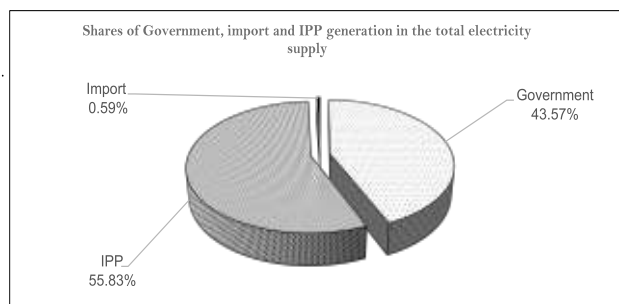
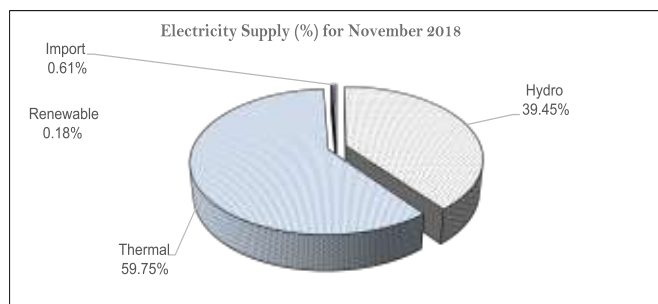
Figure 4b: Contribution of individual fuel in the liquid fuel supply



Peak Electricity Supply - November 2018			
Source of Supply	Generation at System Peak Load of November 2018 (MW)	Generation at Ghana Peak Load of November 2018 (MW)	Electricity Supply (GWh)
AKOSOMBO	653.50	653.50	429.70
KPONG	71.00	71.00	63.64
BUI	387.70	387.70	201.25
SAPP	270.50	270.50	171.70
TAPCO	113.00	113.00	78.08
TICO	211.00	211.00	142.60
TT1PP	106.00	106.00	30.11
CENIT	-	-	-
TT2PP	-	-	-
MRP	-	-	-
KARPOWER	238.60	238.60	82.21
AMERI	191.10	191.10	118.13
KTPP	102.00	102.00	38.93
Trojan Power	-	-	-
CENPOWER	-	-	0.52
AKSA	109.40	109.40	45.84
BXC Solar	-	-	1.81
Safisana	-	-	-
VRA Solar	-	-	0.25
Genser	-	-	33.78
IMPORT	18.00	18.00	11.69
Export to CEB	-	-	29.44
Export to CIE	99.00	99.00	7.14
Export to SONABEL	68.00	68.00	43.13
System Coincident Peak Load	2,471.80	-	-
Ghana Coincedent Peak Load	-	2,304.80	-
Total Supply	-	-	1,450.23
Total Supply without export	-	-	1,370.52

Ghana Electricity Demand & Supply		
		Nov-18
Maximum System Peak Load	MW	2,471.8
Minimum System Peak Load	MW	2,141.2
Average Peak Generation	MW	2,320.0
System Base Load	MW	1,121.2
Total Electricity	GWh	1,450.2
Load Factor (LF)	%	79.5

# OPERATIONAL FACT SHEET



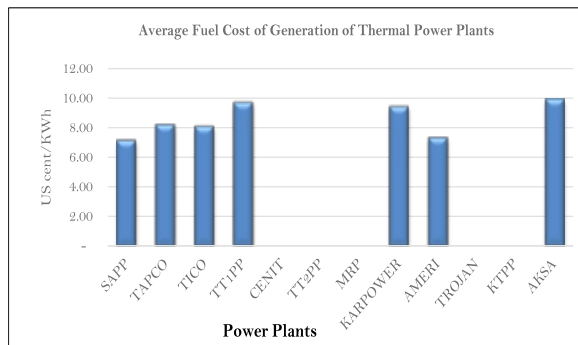
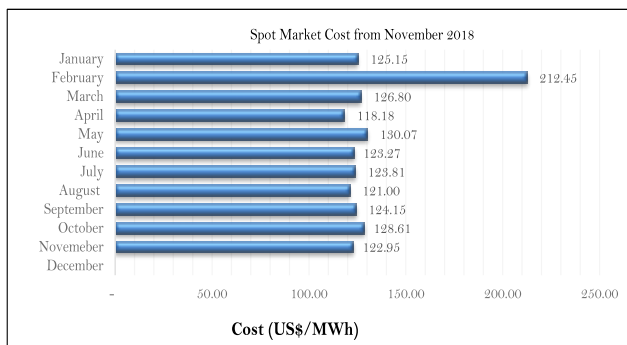
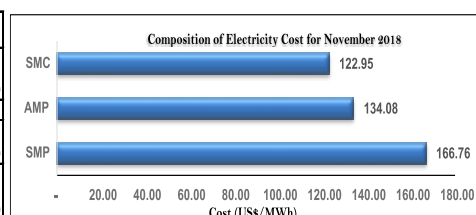
Power Plant Data for November 2018								
	Installed Capacity (MW)	Plant Capacity Utilization (%)	Heat Rate (Btu/kWh)	Natural Gas Consumption (MMBtu)	LCO Consumption (MMBtu)	DFO Consumption (MMBtu)	HFO Consumption (MMBtu)	LPG Consumption (MMBtu)
Akosombo	1,020.00	58.51	-	-	-	-	-	-
Kpong	160.00	55.24	-	-	-	-	-	-
Bui	400.00	69.88	-	-	-	-	-	-
SEAP	560.00	42.58	8,095.45	1,389,977.95	-	-	-	-
TAPCO	330.00	32.86	11,238.02	875,615.15	1,815.42	-	-	-
TICO	340.00	58.25	10,971.75	1,545,048.24	19,403.06	123.71	-	-
TT1PP	126.00	33.19	10,972.61	330,385.42	-	-	-	-
CENIT	126.00	-	-	-	-	-	-	-
TT2PP	49.50	-	-	-	-	-	-	-
MRP	-	-	-	-	-	-	-	-
KARPOWER	470.00	24.29	8,167.75	-	-	-	671,462.06	-
AMERI	250.00	65.63	10,056.32	1,187,942.64	-	-	-	-
TROJAN	56.00	-	-	-	-	-	-	-
Cenpower	0.00	-	-	-	-	-	-	-
KTPP	220.00	24.57	10,307.31	401,213.13	-	-	-	-
AKSA	360.00	17.68	8,188.56	-	-	-	375,336.51	-
Genser	95.00	49.39	10,954.57	-	-	-	-	370,045.43
<b>Total</b>	<b>4,562.50</b>			<b>5,730,182.53</b>	<b>21,218.49</b>	<b>123.71</b>	<b>1,046,798.57</b>	<b>370,045.43</b>

Natural gas flow rate (MMSCF/D)	
Location	Monthly Average
Etoki	74.45
Tema WAGPCo	68.56
Aboadze WAGPCo	0.00
Aboadze GNGC	122.16

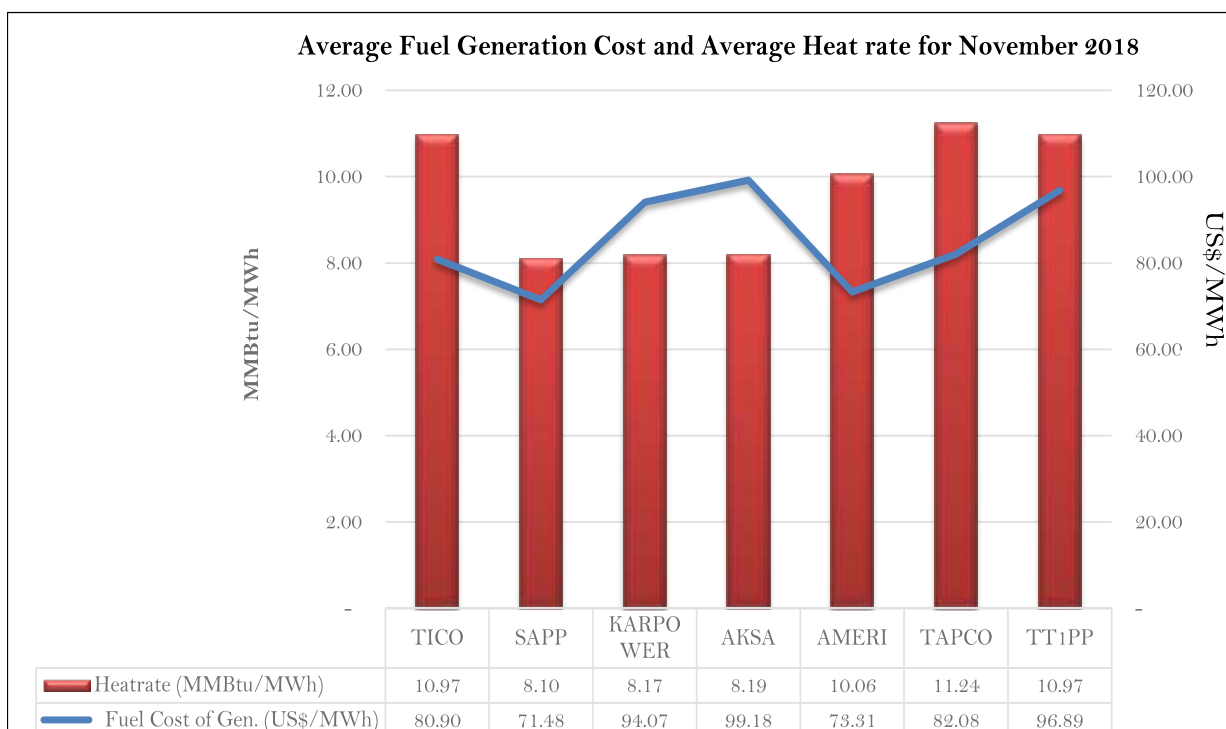
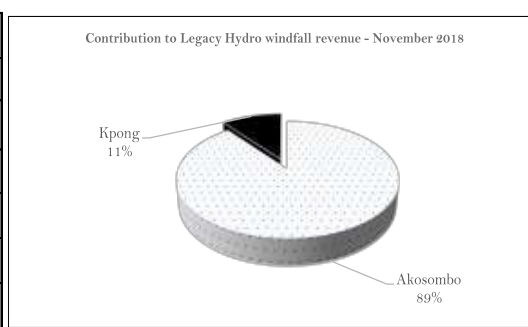
Nov-18			
	Beginning month (ft)	End month (ft)	Change in water level (feet)
Hydro Dam			
Akosombo	263.46	262.98	-0.48
Bui	594.09	587.73	-6.36

# ECONOMIC FACT SHEET

		Nov-18	Oct-18	Change
Average Market Price	US\$/MWh	134.08	135.60	(1.51)
System Marginal Cost (SMC)	US\$/MWh	122.95	128.61	(5.66)
System Marginal Price (SMP)	US\$/MWh	166.76	174.26	(7.50)

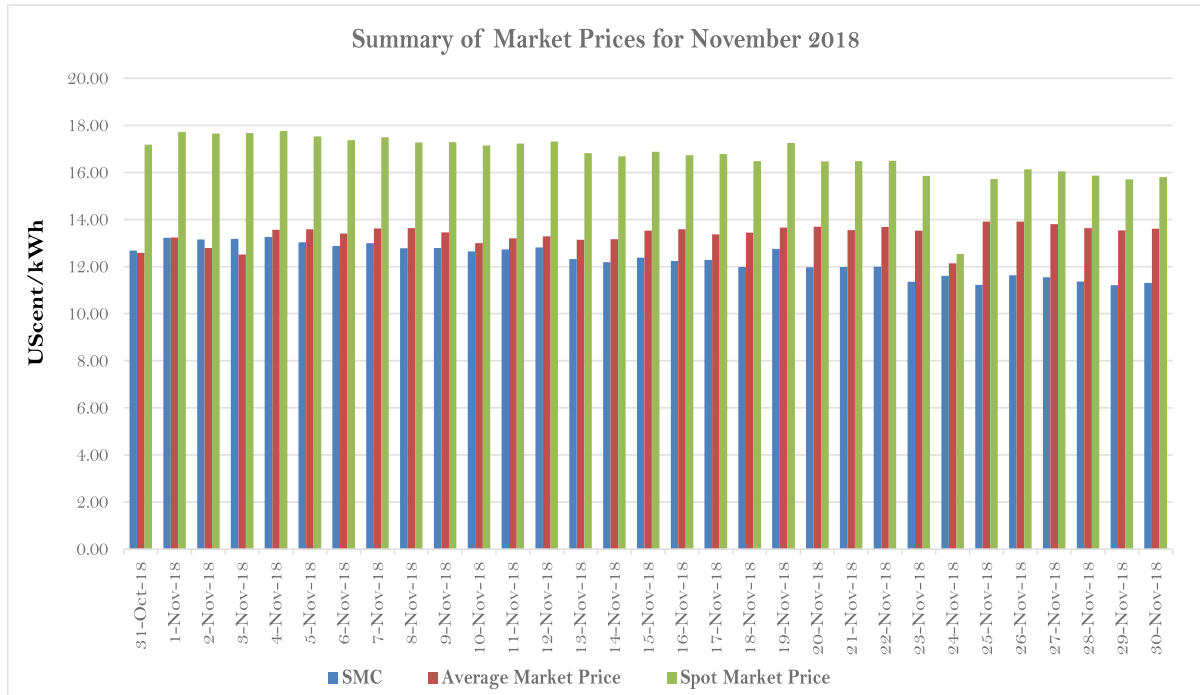


Average Fuel Prices		
		Nov-18
Fuel Type	Unit	Delivered Cost
Natural Gas	US\$/MMBtu	7.85
LCO	US\$/BBL	74.45
HFO	US\$/Tonne	414.24
DFO	US\$/Tonne	816.93





# ECONOMIC FACT SHEET



Power Plant	Average Heat rate (Btu/KWh)	Average Fuel Cost of Generation (US\$/MWh)	Emission Factor kgCO <sub>2</sub> /kWh
SAPP	8,095.45	71.48	0.43
TAPCO	11,238.02	82.08	0.60
TICO	10,971.75	80.90	0.59
TT1PP	10,972.61	96.89	0.58
CENIT	-	-	-
TT2PP	-	-	-
KARPOWER	8,167.75	94.07	0.64
AMERI	10,056.32	73.31	0.53
TROJAN	-	-	-
KTPP	10,307.31	91.01	0.55
Cenpower	-	-	-
AKSA	8,188.56	99.18	0.65
Genser	10,954.57	-	0.69
<b>Average</b>			<b>0.55</b>

### 1.0 Reduction in Bulk Customers threshold key in developing the Wholesale Electricity Market of Ghana

Bulk Customers are a class of electricity consuming client of either a Distribution Utility, Wholesale Supplier or an Electricity Broker. Bulk customers by the definition of the Energy Commission needs a permit from the Energy Commission. A bulk customer permit will permit any consumer of electricity with a Maximum Demand of a minimum stipulated amount established by the Commission consistently for a consecutive period of three (3) months or a minimum annual energy consumption of a stipulated amount established by the Commission to operate in the deregulated market.

The requirement for Bulk Customer permits have changed over the years. The requirement have changed from 2 MVA for a consecutive period of 3 months of a minimum annual generation of 3 GWh at the initial stage of the permitting process to 1 MVA demand for 3 consecutive period of 3 month or a minimum of 2 GWh annual energy consumption. In November 2018, the permitting requirement changed to a demand of 500 KVA for 3 consecutive month or a minimum of 1 GWh annual energy consumption. The reduction in the Bulk Customer threshold would bring several customers into this category including commercial entities.

Bulk Customers are critical off-taker in the Ghana Wholesale Electricity market. They essential end user of electricity in the WEM and serves as a means of growing and increasing trading on the WEM. Bulk customer demand averages around 380 MW and consumes about 2,100 GWh a year. The reduction in the bulk customer threshold is very significant in the development of the Ghana Wholesale Electricity Market. There are two reasons for this;

1. Decreasing the bulk customer threshold means a possible increase in the number of players in the Wholesale Electricity Market. Increase in the number of players in the Wholesale Electricity Market means increase volume of trade and increase liquidity in the market. More companies which previously did not qualify to be bulk customers can now apply to be bulk customers and would have the privilege to negotiate for their own power from any supplier of their choice. This will greatly increase competition in the market and would drive prices to its true value.

2. Reduction in the bulk customer threshold will bring about an increase in the number of bulk customers with individual BC demand too small to help it negotiate for favorable prices. In this case, the increase in the number of bulk customers will bring about a new player in the Wholesale Electricity Market, Electricity Broker. Electricity Brokers can aggregate the individual small demand from bulk customers to have a substantial demand to enable it bargain for favorable bulk electricity prices. The interaction between bulk customers and brokers have the potential of creating an electricity exchange market such as India Energy Exchange (IEX) and the European Energy Exchange (EEX).

Bulk customers hold the key to the development of a vibrant Wholesale Electricity Market in Ghana and therefore there is the need to help this group of customers to understand their role in the market. One of the major hindrance to achieving this is the education of these customers. For this reason, the Electricity Market Oversight Panel (EMOP) will be dedication the year 2019 to bulk customer education. The EMOP will make it a point to visit all the 37 licensed bulk customers to educate them on their roles and importance in the Wholesale Electricity Market. The EMOP will also engage potential bulk customers after the review of the threshold to educate them on the benefit of being a participant of the Wholesale Electricity Market and benefit of having a bulk customer license from the Energy Commission. Currently, there are 37 licensed bulk customers with about 17 trading on the Wholesale Electricity Market.

### 2.0 Fuel supply challenges causes load shedding in November 2018

Fuel supply challenges has over the years contributed to the shortfalls in supply and demand of electricity. Fuel supply challenges was the major cause of the load shedding experienced from 2012 to 2015 and February 2018. In November 2018, fuel supply challenges was a major contributor to the demand supply imbalance which resulted in load shedding from 16th November 2018 to 24th November 2018. Natural gas and HFO supply challenges were the major contributing factors to the load shedding experienced within the period.

Natural gas supply from the West African Gas Pipeline (WAGP) reduced from 106.2 MMSCFD on the 15th November 2018 to 8.97 MMSCFD on the 26th November 2018. Likewise, natural gas supply from the GNGC to the Aboadze Power Enclave reduced significantly causing the shutdown of some power plants. During this period load relief ranging between 13.5 MW and 350 MW was requested from the Electricity Company of Ghana (ECG). Natural gas supply challenges from the WAGP led to the loss of 425MW of thermal capacity at the East and 172 MW due to natural gas supply challenges from the GNGC in the West. Also, inadequate liquid fuel stocks (HFO) led to the loss of 721 MW of thermal capacity. Technical challenges to some units led to the loss of 220 MW.

Over the years, natural gas supply challenges has resulted in periods of intermittent electricity supply, for instance, the rupturing of the natural gas supply pipeline of the West African Gas Pipeline Company (WAPCo) in 2012 and the supply disruptions from the FPSO Kwame Nkrumah (especially tripping compressors). The procurement and storage of liquid fuel has also experienced some challenges.

## Other Market News and Trends

The future of Ghana's electricity supply is from natural gas and hence the need to solve all of its supply challenges. There is also the need for strategic stock of LCO at the Tema Power Enclave to help minimize supply demand imbalance. Adequate LCO stocks at the Tema Power Enclave could have reduced the deficit by about 100 MW to 200 MW.

### 3. The Bui Hydro Electric Power Plant continue to operate as a baseload plant in November 2018

The Bui Hydro Electric Power Plant is the third hydro power plant to be constructed in Ghana and the second biggest hydro power plant aside Akosombo Hydro Electric Power Plant. The Bui Hydro Electric Power Plant has 3 units each a 133 MW installed capacity. The total installed capacity is therefore 399 MW. Just like the Akosombo Hydro Electric Power Plant, the Bui Hydro Electric Power Plant is a reservoir or storage hydropower plant with a maximum dam height of 183 metres. The power plant has a minimum operating level of 168 metres.

Commencement of work on the construction of the Bui Hydro Electric Power Plant commenced in October 2017. The first unit was commissioned in May 2013 and the second unit in July 2013. Commissioning of the entire plant was completed in December 2013. The Bui Hydro Electric Power Plant was designed as a peaking plant. In 2018, the Bui Hydro Electric Power Plant was projected to generate 756.2 GWh, as at November 2018, the power plant has supplied 804.67 GWh, 6.4% higher than projected.

The Bui Hydro Electric Power Plant has generated largely as a peaking plant for most of the period from January 2018 to September 2018 at an average capacity of 264 MW at peak. From October 2018, the Bui Hydro Electric Power Plant started operating as a baseload plant. The power plant in October 2018 generated at an average capacity of 197.8 MW at off peak and 305.8 MW at peak. On the average, the power plant generated at 230 MW in October 2018. Despite the baseload generation, the water level for the Bui Hydro Electric Power Plant for October 2018 increased from 179.01 metres (587.3 feet) to 181.08 metres (594.09 feet).

The baseload generation continued in November 2018 with the Bui Hydro Electric Power Plant generating at an average capacity of 250 MW at off peak and 360 MW at peak. Over the period of November 2018, the Bui Hydro Electric Power Plant operated at an average capacity of 280 MW. The increase in generation resulted in a drop in water level from 181.08 m (594.09 feet) to 179.14 m (587.73 feet).

The baseload generation from October 2018 was necessitated by high inflows into the dam of the Bui Hydro Electric Power Plant. In August 2018, the water level was increasing at an average of 0.09 metres per day (0.29 feet per day) increasing to 0.2 metres per day (0.66 feet per day) in September 2018 and October 2018 attaining a maximum height of 181.08 metres (594.09 feet) in November 2018 which was 0.59 metres (1.92 feet) below the maximum level (which just two days of average inflows). Without these baseload generation, the Bui Hydro Electric Power Plant would have had to spill high volumes of water which would have been energy lost. Due to the baseload generation, the Bui Hydro Electric Power Plant generated 99.78 GWh and 132.55 GWh more than projected under the 2018 Electricity Supply Plan (ESP).

### 4. EMOP holds it maiden stakeholder engagements

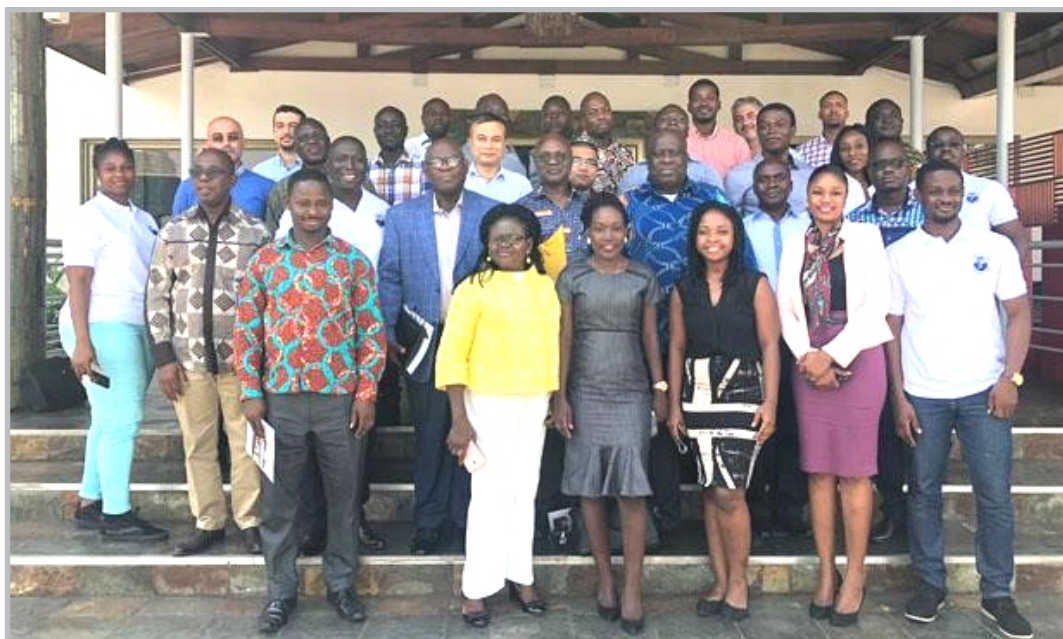
The Electricity Market Oversight Panel (EMOP) undertook stakeholder engagements with market participants to educate them on the mandate of the EMOP and to listen to their challenges being faced in the market. These engagements, were planned to meet the market participants at their respective locations or venues close them. The country was divided into the Northern, Western and Eastern Sectors with the Northern sector comprising of market participants in the Northern, Upper East, Upper West and Brong Ahafo Regions, the Western Sector comprising of those in Ashanti, Western and Central regions, while the Eastern Ssector comprises of those in the Volta and Greater Accra regions.

The stakeholder engagements were held from 22nd October 2018 to 24th October 2018 for the Northern Sector and 25th October 2018 to 26th October 2018 for the Western Sector while that of the Eastern Sector was held on Friday, 22nd November 2018. These three engagements were attended by about 60 participants made up of market participants, other stakeholders and the media.

The Engagements were very successful as the EMOP was able to educate the stakeholders on the functions and mandate of the EMOP, status of the Wholesale Electricity Market (WEM) and the complaint procedure for market participants in the WEM. The Market participants acknowledged having acquired a deeper understanding of the structure of the WEM and its governance. They also showed appreciation to the EMOP for bringing the stakeholder meetings closer to them and were optimistic about the prospects of the Wholesale Electricity Market.

In 2019, the EMOP will place much emphasis on educating Bulk Customers on their important role in the Wholesale Electricity Market. The panel will try as much as possible to meet all the Bulk Customers in 2019 to achieve the above and understand their challenges in exploring the benefits of the market..

Picture 1.0: Stakeholder engagement in Accra



### **Acronyms**

*AGPP = Atuabu Gas Processing Plant*

*CBGC = Composite Bulk Generation Charge*

*DFO = Distillate Fuel Oil*

*ECG = Electricity Company of Ghana*

*ESP = Electricity Supply Plan*

*GHP = Ghana Pesewa*

*GWh = Giga-watt Hours*

*KTPP = Kpone Thermal Power Plant*

*MRP = Mine Reserve Plant*

*LCO = Light Crude Oil*

*LTA = Long Term Average*

*MMscf = Million Standard Cubic Feet*

*NITS = National Interconnected Transmission System*

*SAPP = Sunon Asogli Power Plant*

*SNEP = Strategic National Energy Plan*

*TT2PP = Tema Thermal 2 Power Plant*

*VRA = Volta River Authority*

*WAGP = West African Gas Pipeline*

*Btu = British Thermal Units*

*CUF = Capacity Utilization Factor*

*EC = Energy Commission*

*EMOP = Electricity Market Oversight Panel*

*FPSO = Floating Production, Storage and Offloading*

*GNGC = Ghana National Gas Company*

*HFO = Heavy Fuel Oil*

*kWh = Kilo-watt hours*

*LEAP = Long-range Energy Alternative Planning*

*LI = Legislative Instrument*

*MW = Megawatt*

*MWh = Mega-watt hours*

*PV = Photovoltaic*

*SMP = System Marginal Price*

*TEN = Tweneboa, Enyenra, Ntomme*

*TT2PP = Tema Thermal 2 Power Plant*

*WAGPCo = West African Gas Pipeline Company*

*WEM = Wholesale Electricity Market*

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