



# GHANA WHOLESALE ELECTRICITY MARKET BULLETIN

## MARKET WATCH

Monthly Market Data Analysis

ISSUE NO. 43

1<sup>st</sup> August 2019 to 31<sup>st</sup> August 2019

This Bulletin covers major developments in the Wholesale Electricity Market (WEM) of Ghana from 1<sup>st</sup> August, 2019 to 31<sup>st</sup> August, 2019. 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 the impact of change in tariff structure on bulk customers.

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 month of August 2019 witnessed a marginal increase in the System Peak Load by 0.8%, from 2,484.2 MW in July 2019 to 2,503.2 MW. Similarly, the System Peak Load recorded in August 2019 was 1.2% higher than the 2,473 MW projected in the 2019 ESP. On the contrary, the Ghana Peak Load of 2,271.5 MW recorded in August 2019 was 0.8% lower than the 2,290.7 MW in July 2019. At the System Peak Load for August 2019, 37 MW was imported from CIE. A total of 284 MW was exported to CEB, and SONABEL which was 89.3% higher than the 150 MW projected in the 2019 ESP. Average electricity demand of 1,916 MW in August 2019 was 1.1% higher than the 1,895 MW projected in the 2019 ESP.

A total of 1,425.18 GWh of electricity was supplied in August 2019, which was 1.1% higher than the 1,409.7 GWh projected in the 2019 ESP. Out of the total electricity supplied, 8.79 GWh was imported from CIE with the remaining 1,416.39 GWh generated from domestic sources. A total of 1,330.1 GWh of electricity was consumed domestically was 0.1% higher than the 1,329.5 GWh projected in the 2019 ESP. Also, the total electricity of 95.08 GWh exported to CIE, CEB and SONABEL was 18.6% higher than the 80.2 GWh projected in the 2019 ESP.

The contribution of electricity generated from the hydro-electric power plants in the total electricity supplied in August 2019 reduced marginally from 34.1% in July 2019 to 32.5%. On the contrary, the share of electricity generated from thermal sources in the total electricity supplied increased from 64.7% in July 2019 to 66.6% in August 2019. Electricity

Table 1. Projected and Actual Outturn of electricity demand and supply in July 2019 and August 2019.

	August 2019		July 2019	
	Projected	Actual Outturn	Projected	Actual Outturn
Total Supply (GWh)	1,409.6	1,396.3	1,394.1	1,421.5
Source by Power Plants (GWh)				
AKOSOMBO	377.1	362.4	297.3	396.2
KPONG	67.6	69.0	67.6	72.2
BUI	55.2	32.1	55.2	27.6
Sunon Asogli	277.4	353.5	277.4	277.3
TAPCO	165.4	76.1	109.4	65.2
TICO	202.4	212.8	159.0	125.0
TF1PP	65.0	74.6	-	7.8
CENIT	-	-	-	-
TF2PP	-	17.7	-	19.5
Amandi	-	0.6	-	3.9
Karpowership	-	27.7	256.7	130.6
AMERI	51.6	118.6	51.6	156.1
KTTP	-	10.8	-	83.5
Trojan Power	-	-	-	-
CENPOWER	-	-	-	-
ARSA	143.0	25.6	115.0	39.3
BXC Solar	2.3	2.1	2.3	2.0
VRA Solar	0.3	-	0.3	-
Genser	-	0.2	-	0.2
Meinergy	2.3	1.6	2.3	1.6
Total Generation (GWh)	1,409.6	1,887.5	1,394.1	1,407.9
Imports (GWh)	-	8.8	-	13.6
Total Supply (GWh)	1,409.6	1,396.3	1,394.1	1,421.5
Deficit/Over supply (GWh)	-	(13.3)	-	27.4
Ghana Coincident Peak Load (MW)	2,323.0	2,271.5	2,320.0	2,290.7
System Coincident Peak Load (MW)	2,473.0	2,503.2	2,470.0	2,484.2

## HIGHLIGHTS OF THE MONTH

generated from solar power plants remained at 0.3% in August 2019.

The rate of increase in the water level for the hydro dams increased significantly in August 2019 by 5 folds. The Akosombo dam water level increased from 0.01 feet per day in July 2019 to 0.06 feet per day in August 2019. The water level for the Bui dam also increased from 0.12 feet per day in July 2019 to 0.24 feet per day in August 2019.

The consumption of natural gas for electricity generation increased significantly in August 2019, from 67.5% in July 2019 to 95%. This was mainly due to the relocation of the Karpowership power plant from the Tema Fishing Harbor to the Takoradi Naval Base. Consequently, the share of the total liquid fuel consumed reduced from 32.5% in July 2019 to 5% in August 2019.

### ELECTRICITY DEMAND AND SUPPLY

#### Electricity Demand

There was a marginal increase in the System Peak Load by 0.8%, from 2,484.2 MW in July 2019 to 2,503.2 MW in August 2019. On the contrary, the Ghana Peak Load reduced marginally by 0.8%, from 2,290.7 MW in July 2019 to 2,271.5 MW in August 2019. At the System Peak Load, a total of 284 MW was exported to CEB and SONABEL in August 2019. Out of the total electricity exported, 184 MW was supplied to CEB and 100 MW was supplied to SONABEL. A total of 37 MW was imported at the System Peak Load in August 2019. Electricity generated from hydro sources contributed 44.8% of the System Peak Load and 45.5% of the Ghana Peak Load. Thermal generation accounted for 53.7% of the System Peak Load and 53.8% of the Ghana Peak Load. Average electricity demand reduced marginally by 2%, from 1,955 MW in July 2019 to 1,916 MW in August 2019. Also, the System Load Factor of 74.8% recorded in August 2019 was lower than the 76.7% recorded in July 2019.

#### Electricity supply

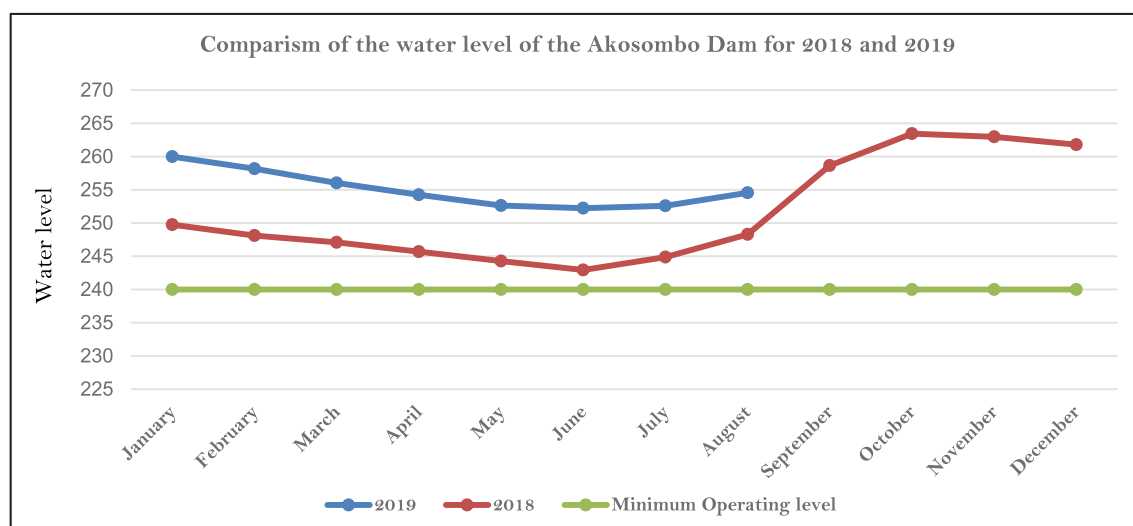
The average electricity supplied in August 2019 reduced marginally by 2%, from 46.92 GWh per day in July 2019 to 45.97 GWh per day. Likewise, the total electricity supplied decreased from 1,454.67 GWh in July 2019 to 1,425.18 GWh in August 2019. Out of the total electricity supplied in August, 8.79 GWh was imported from CIE and the remaining 1,416.39 GWh was generated from domestic sources. A total of 95.08 GWh of electricity was exported to CIE, CEB and SONABEL in August 2019. Out of the total electricity exported, 3.52 GWh, 42.65 GWh and 48.91 GWh were supplied to CIE, CEB and SONABEL respectively. Electricity generated from hydro sources contributed 32.5% and 66.6% was from thermal generation sources.

### HYDRO DAM LEVELS

#### Akosombo Dam Water Level continued to increase in August 2019

There was a significant increase of about 5 folds in the rate of increase in the water level for the Akosombo dam, from 0.01 feet per day in July 2019 to 0.06 feet per day in August 2019. The water level of 252.6 feet recorded at the beginning of the month increased by 1.95 feet to a month-end water level of 254.55 feet. The water level recorded at the end of the month was 6.25 feet above the water level recorded for the same period in 2018. Also, the water level recorded at the end of August 2019 was 14.55 feet above the minimum operating level of 240 feet.

Figure 1: Month-End Water Level for Akosombo Dam from January 2018 to August 2019



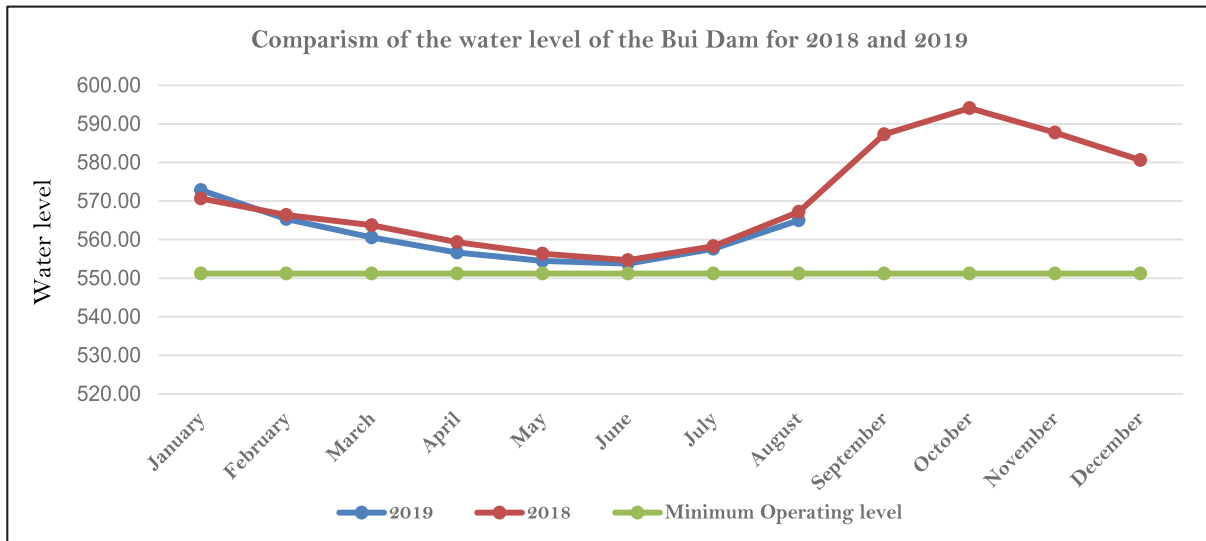
## HIGHLIGHTS OF THE MONTH

### Bui Dam Water Level continued to increase in August 2019

The rate of increase in the water level for the Bui GS increased significantly by 1 fold, from 0.12 feet per day in July 2019 to 0.24 feet per day in August 2019. The water level of 557.6 feet recorded at the beginning of the month increased by 7.38 feet to a month end water level of 564.99 feet. The water level recorded at the end of the month was 2.22 feet lower than the water level recorded for the same period in 2018. The month-end water level recorded for the Bui GS was 13.81 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 2018 to August 2019.

**Figure 2: Month-End Water Level for Bui Dam from January 2018 to August 2019**



## FUEL SUPPLY FOR POWER GENERATION

### Natural gas flow rate from WAGPCo decreased in August 2019

Natural gas supply from the West African Gas Pipeline Company (WAGPCo) to the Tema and Kpone power enclave increased marginally by 1.4%, from 87.33 MMSCFD in July 2019 to 88.53 MMSCFD in August 2019. Consequently, the total natural gas supplied increased from 2,707.33 MMSCF in July 2019 to 2,744.35 MMSCF in August 2019. The total natural gas supplied by WAGPCo constituted 35.5% of the total natural gas consumed in August 2019, which was lower than the 41.5% recorded in July 2019. On the contrary, the share of natural gas supplied by WAGPCo in the total fuel mix increased marginally from 33.5% in July 2019 to 33.7% in August 2019.

### Natural gas flow from GNGC increased in July 2019.

Natural gas supply from the Atuabo Gas Processing Plant (AGPP) to power plants for electricity generation increased by 73.2% in August 2019. Average natural gas supplied from the AGPP to the Aboadze Power Enclave increased from 38.55 MMSCFD in July 2019 to 66.78 MMSCFD in August 2019. A total of 1,734.5 MMSCF of natural gas was supplied to the Aboadze Power Enclave, which was higher than the 1,195.38 MMSCF supplied in July 2019. Also, a total of 335.69 MMSCF of natural gas was supplied by GNGC to Genser in August 2019, which was lower than the 367.14 MMSCF in July 2019. In summary, a total of 2,070.19 MMSCF of natural gas was supplied by GNGC in August 2019, which was higher than the 1,562.52 MMSCF supplied in July 2019. The share of natural gas supplied from GNGC in the total natural gas consumed increased from 23.1% in July 2019 to 26.3% in August 2019. Similarly, the share of natural gas supplied by GNGC in the total fuel mix increased from 18.7% in July 2019 to 24.9% in August 2019.

### Natural gas flow from ENI/GNPC increased in August 2019

There was an increase of 27% in the total natural gas supplied by ENI/GNPC in August 2019. The average natural gas supplied to the Aboadze Power Enclave increased from 56 MMSCFD in July 2019 to 61.74 MMSCFD in August 2019. Similarly, the total natural gas supplied to the Aboadze Power Enclave increased from 1,732.89 MMSCF in July 2019 to 1,914 MMSCF in August 2019. Natural gas supplied to the East through the reverse flow facility increased from 637.63 MMSCF in July 2019 to 1,013.63 MMSCF in August 2019. In Summary, a total of 2,927.64 MMSCF of natural gas was supplied by ENI/GNPC for electricity generation in August 2019, which was higher than the 2,370.52 MMSCF in July 2019. The share of natural gas supplied by ENI/GNPC in the total natural gas consumed increased from 35.4% in July 2019 to 38.7% in August 2019. Similarly, the total natural gas supplied by ENI/GNPC constituted 36.7% of the total fuel mix in August 2019, which was higher than the 28.6% in July 2019.

## HIGHLIGHTS OF THE MONTH

### Liquid Fuel

There was a significant reduction of 74.2% in the total liquid fuel consumed in August 2019, from 280,735 barrels in July 2019 to 72,399 barrels. This was mainly due to the relocation of the Karpowership power plant from the Tema Fishing Harbor to the Takoradi Naval Base. Consequently, the share of the total HFO consumed in the total fuel mix, reduced from 15.9% in July 2019 to 5% in August 2019. On the contrary, the share of HFO in the total liquid fuel consumed increased from 82.7% in July 2019 to 98.6% in August 2019. The share of DFO in the total liquid fuel consumed increased from no consumption in July 2019 to 1.4% in August 2019. LCO was not consumed for electricity generation in August 2019.

### Plant by Plant Highlights

#### Electricity Generation at the Akosombo Generation Station (GS) decreased in August 2019

Average electricity supplied by the Akosombo GS decreased by 8.5%, from 12.78 GWh per day in July 2019 to 11.69 GWh per day in August 2019. Similarly, the total electricity supplied by the hydro power plant decreased from 396.16 GWh in July 2019 to 362.44 GWh in August 2019. The total electricity generated by the hydro power plant constituted 25.4% of the total electricity supplied in August 2019 and was 3.9% lower than the 377.1 GWh projected in the ESP. The Akosombo GS generated 803.5 MW and 865.7 MW to the System Peak Load and the Ghana Peak Load respectively. This translates into 32.1% of the System Peak Load and 36.5% of the Ghana Peak Load in August 2019.

#### Electricity supply by Kpong Generation Station (GS) decreased in August 2019

There was a reduction in the average electricity supplied by the Kpong GS by 4.4%, from 2.33 GWh per day in July 2019 to 2.23 GWh per day in August 2019. Similarly, the total electricity supplied by the hydro power plant decreased from 72.16 GWh in July 2019 to 68.99 GWh in August 2019. Kpong GS' total electricity supplied constituted 4.8% of the total electricity supplied in August 2019 and was 2.1% higher than the 67.6 GWh projected in the 2019 ESP.

#### Electricity supply by the Bui Generation Station (GS) increased in August 2019

The average electricity supplied by the Bui GS increased by 16.1%, from 0.89 GWh per day in July 2019 to 1.03 GWh per day in August 2019. Likewise, the total electricity supplied the Bui GS increased from 27.64 GWh in July 2019 to 32.08 GWh in August 2019. The total electricity supplied by the Bui GS constituted 2.3% of the total electricity supplied in August 2019 and was 41.9% lower than the 55.2 GWh projected in the 2019 ESP. The hydro power plant contributed 203.5 MW and 104.5 MW of the System Peak Load and the Ghana Peak Load. This translates into 8.1% of the System Peak Load and 4.4% of the Ghana Peak Load.

#### Generation by the Sunon Asogli Power Plant (SAPP) increased in August 2019

There was an increase in the average electricity supplied by the Asogli power plant by 28.2%, from 8.94 GWh per day in July 2019 to 11.5 GWh per day in August 2019. Also, the total electricity supplied by the thermal power plant increased from 277.27 GWh in July 2019 to 355.53 GWh in August 2019. SAPP's total electricity generated in August 2019 constituted 25% of the total electricity supplied and was 28.2% higher than the 277.4 GWh projected in the 2019 ESP. The thermal power plant contributed 488.1 MW to the System Peak Load and 490.4 MW to the Ghana Peak Load, translating into 19.5% and 20.7% of the peak loads respectively. The Asogli power plant consumed a total of 2,600.45 MMSCF of natural gas at an estimated heat rate of 7,807.69 Btu/kWh in August 2019, which was lower than the heat rate of 8,125.91 Btu/kWh recorded in July 2019.

#### Ameri Energy Power Plant's generation decreased in August 2019

The Ameri power plant recorded a reduction of 24% in the average electricity supplied in August 2019, from 5.04 GWh per day in July 2019 to 3.83 GWh per day. Similarly, the total electricity supplied by the thermal power plant decreased from 156.12 GWh in July 2019 to 118.64 GWh in August 2019. The total electricity supplied by the thermal power plant constituted 8.3% of the total electricity supplied in August 2019 and was over a fold more than the 51.6 GWh projected in the 2019 ESP. Ameri supplied a total of 197.8 MW to the System Peak Load and 123 MW to the Ghana Peak Load, representing 7.9% and 5.2% of the peak loads respectively. A total of 1,162.13 MMSCF of natural gas was consumed by the thermal power plant at an estimated heat rate of 10,079.59 Btu/kWh in August 2019, which was marginally lower than the 10,087.91 Btu/kWh recorded in July 2019.

#### The Karpowership Power Plant's generation decreased in August 2019

The average electricity supplied by the Karpowership reduced from 4.21 GWh per day in July 2019 to 0.89 GWh per day in August 2019. Similarly, the total electricity supplied by the thermal power plant reduced from 130.56 GWh in July 2019 to 0.89 GWh in August 2019. The significant reduction in electricity supplied was due to the relocation of the Karpowership from the Tema fishing Harbour to the Sekondi Naval Base on the 13th August 2019 to be able to utilize the indigenous natural gas located in the West. The total electricity supplied by the thermal power plant constituted 1.9% of the total electricity supplied in August 2019 and was projected to be offline in August 2018 in the 2019 ESP. The Karpowership did not contribute to the System Peak Load and the Ghana Peak Load for August 2019. The thermal power plant consumed a total of 36,611.59 barrels of HFO at an estimated heat rate of 7,997.61 Btu/kWh in August 2019 which was marginally lower than the 8,026.03 Btu/kWh recorded in July 2019.

#### AKSA Power Plant's generation decreased in August 2019

There was a reduction in the average electricity supplied by the AKSA power plant by 35%, from 1.27 GWh per day in July 2019 to 0.82 GWh per day in August 2019. Similarly, the total electricity supplied by the thermal power plant decreased from 39.34 GWh in July 2019 to 25.56 GWh in August 2019. The total electricity supplied by the thermal power plant constituted 1.8% of the total electricity supplied in August 2019 and was 82% lower than the 143 GWh projected in the 2019 ESP. AKSA contributed 48.2 MW and 47.9 MW to the System Peak Load and the Ghana Peak Load respectively. The total electricity generated at both peak constituted 1.9% and 2% of the System Peak Load and the Ghana Peak Load respectively. The thermal power plant consumed a total of 34,660 barrels of HFO at an estimated heat rate of 8,203.79 Btu/kWh which was higher than the 8,182.25 Btu/kWh in July 2019.

## HIGHLIGHTS OF THE MONTH

### Takoradi International Company (TICO) generation increased in August 2019

The average electricity generated by the TICO power plant increased significantly by 70.2% in August 2019, from 4.03 GWh per day in July 2019 to 6.86 GWh per day. Similarly, the total electricity supplied by the TICO power plant increased from 125.02 GWh in July 2019 to 212.8 GWh in August 2019. The total electricity supplied by the thermal power plant constituted 14.9% of the total electricity supplied in August 2019 and was 5.1% higher than the 202.4 GWh in August 2019. The thermal power plant generated 358 MW and 359 MW to the System Peak Load and the Ghana Peak Load, representing 14.3% and 15.2% of the peak loads respectively. TICO consumed a total of 1,684.55 MMSCF of natural gas at an estimated heat rate of 8,145.88 Btu/kWh in August 2019, which marginally higher than the 8,133.41 Btu/kWh it recorded in July

### Takoradi Power Company (TAPCO) Plant's generation increased in August 2019

There was an increase in the average electricity supplied in August 2019 by 16.8%, from 2.1 GWh in July 2019 to 11.47 GWh. Similarly, the total electricity supplied by the thermal power plant increased from 65.18 GWh in July 2019 to 76.13 GWh in August 2019. The total electricity supplied by the thermal power plant constituted 5.3% of the total electricity supplied in August 2019 and was 54% lower than the 165.4 GWh projected in the 2019 ESP. TAPCO contributed 106 MW and 107 MW to the System Peak Load and the Ghana Peak Load respectively. This translates into, 4.2% of the System Peak Load and 4.5% of the Ghana Peak Load in August 2019. The TAPCO power plant consumed a total of 801.82 MMSCF of natural gas at an estimated heat rate of 10,837.32 Btu/kWh in August 2019, which was marginally lower than the 10,875.52 Btu/kWh recorded in July 2019.

### Kpone Thermal Power Plant (KTPP) generation decreased in August 2019

The operation of the Kpone Thermal Power Plant (KTPP) was limited to 6 days in August 2019 to make fuel available for electricity generation by TT1PP. The thermal power plant supplied a total of 10.8 GWh, which constituted 0.8% of the total electricity supplied in August 2019. KTPP did not contribute to both the System Peak Load and the Ghana Peak Load in August 2019. The thermal power plant consumed a total of 113.1 MMSCF of natural gas at an estimated heat rate of 11,181.23 Btu/kWh in August 2019.

### Tema Thermal 1 Power Plant (TT1PP) came back online in August 2019

TT1PP operated throughout August 2019 and generated at an average electricity of 2.41 GWh after it was shut down in July 2019 to make natural gas available for electricity generation by KTPP. The total electricity of 74.64 GWh supplied by the thermal power plant constituted 5.2% of the total electricity supplied in August 2019 and was 65% higher than the 14.83 GWh projected in the 2019 ESP. TT1PP contributed 108 MW to the System Peak Load and the Ghana Peak Load, representing 4.3% and 4.6% of the peak loads respectively in August 2019. The thermal power plant consumed a total of 836.03 MMSCF of natural gas at an estimated heat rate of 11,956.46 Btu/kWh in August 2019.

## Embedded Electricity Generation

### Genser Power Plant's generation decreased in August 2019

The Genser thermal power plant recorded a reduction in the average electricity supplied in August 2019, from 1.07 GWh per day in July 2019 to 0.93 GWh per day. Similarly, the total electricity of 28.87 GWh supplied by the thermal power plant in August 2019 constituted 2% of the total electricity supplied in August 2019. The thermal power plant consumed a total of 335.69 MMSCF of natural gas at an estimated heat rate of 11,964.91 Btu/kWh in August 2019 which was higher than the 11,861.3 Btu/kWh it recorded in July 2019.

### BXC Solar generation increased in August 2019

The BXC Solar power plant recorded an increase of 5.6% in the total electricity supplied in August 2019, from 1.97 GWh in July 2019 to 2.08 GWh. The total electricity supplied by the solar power plant constituted 0.2% of the total electricity supplied in August 2019 and was 9.6% lower than the 2.3 GWh projected in the 2019 ESP.

## Electricity Exchange – Import and Export decreased in August 2019

Electricity import from CIE reduced by 35.4%, from 0.44 GWh per day in July 2019 to 0.28 GWh per day in August 2019. Similarly, the total electricity imported from CIE reduced from 13.62 GWh in July 2019 to 8.79 GWh in August 2019. The total electricity imported from CIE constituted 0.6% of the total electricity supplied in August 2019.

There was a reduction in the average electricity supplied to CEB and SONABEL by 24.4% and 2.3%, from 1.82 GWh per day and 1.61 GWh per day in July 2019 to 1.38 GWh per day and 1.58 GWh per day in August 2019 respectively. On the contrary, the average electricity supplied to CIE increased by 16%, from 0.1 GWh per day in July 2019 to 0.11 GWh per day in August 2019.

Consequently, the total electricity exported to CIE, CEB and SONABEL reduced by 13.2%, from 109.53 GWh in July 2019 to 95.08 GWh in August 2019. The total electricity supplied to CEB and SONABEL decreased from, 56.44 GWh and 50.06 GWh in July 2019 to 42.65 GWh and 48.91 GWh in August 2019. The total electricity exported to CIE increased from 3.04 GWh in July 2019 to 3.52 GWh in August 2019.

Ghana continued to be a net exporter of electricity in August 2019.

# 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

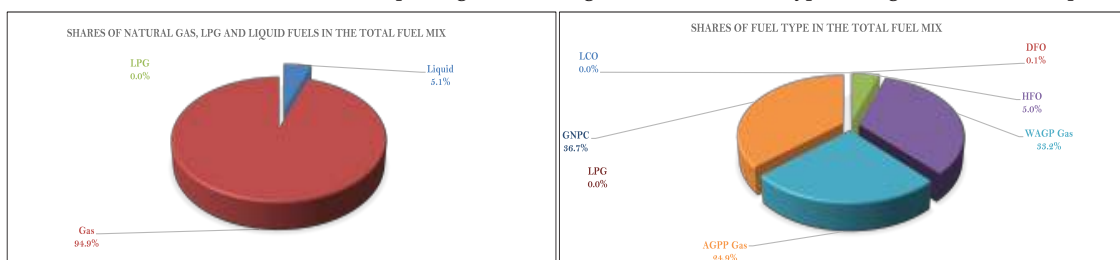
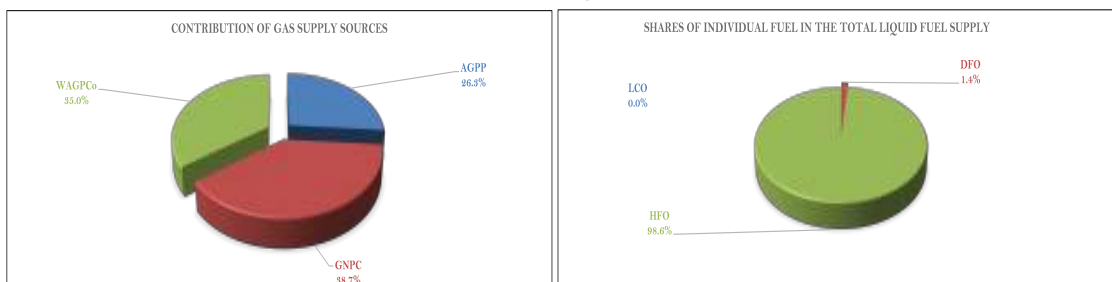


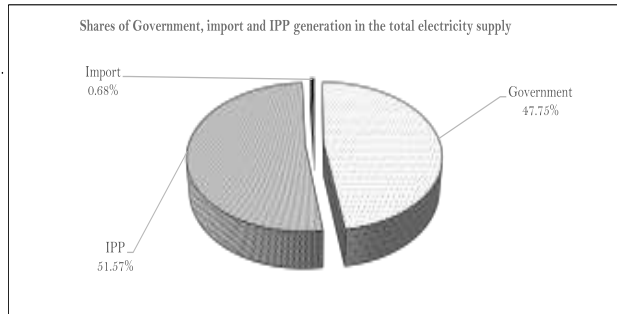
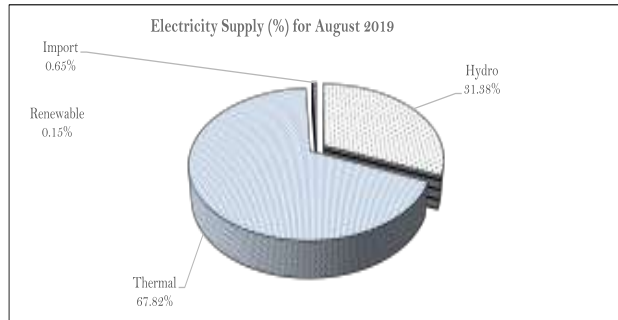
Figure 4a: Contribution of Natural Gas Supply by sources

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



Peak Electricity Supply - August 2019			
Source of Supply	Generation at System Peak Load (MW)	Generation at Ghana Peak Load (MW)	Electricity Supply (GWh)
AKOSOMBO	803.50	865.70	362.44
KPONG	115.00	107.00	68.99
BUI	203.50	104.50	32.08
SEAP	488.10	490.40	355.53
TAPCO	106.00	107.00	76.13
TICO	358.00	359.00	212.80
TT1PP	108.00	108.00	74.64
CENIT	-	-	-
TT2PP	38.10	38.30	17.70
MRP	-	-	0.57
KARPOWER	-	-	27.70
AMERI	197.80	123.70	118.64
KTPP	-	-	10.80
Trojan Power	-	-	-
CENPOWER	-	-	-
AKSA	48.20	47.90	25.56
BXC Solar	-	-	2.08
Safisana	-	-	-
VRA Solar	-	-	0.24
Genser	37.00	-	28.87
IMPORT	37.00	18.00	8.79
Export to CIE at peak	-	-	42.65
Export to CEB at peak	184.00	98.00	3.52
Export to Sonabel	100.00	-	48.91
<b>System Coincident Peak Load</b>	<b>2,503.20</b>		
<b>Ghana Coincedent Peak Load</b>		<b>2,271.50</b>	
<b>Total Supply</b>			<b>1,423.56</b>
<b>Total Supply without export</b>			<b>1,328.48</b>

# OPERATIONAL FACT SHEET



Power Plant Data August 2019

	Installed Capacity (MW)	Plant Capacity Utilization (%)	Electricity Generation (GWh)	Gas Consumption (MMBtu)	LCO Consumption (MMBtu)	DFO Consumption (MMBtu)	HFO Consumption (MMBtu)	LPG Consumption (MMBtu)
Akosombo	1,020.00	47.76	362.44	-	-	-	-	-
Kpong	160.00	57.95	68.99	-	-	-	-	-
Bui	400.00	10.78	32.08	-	-	-	-	-
SEAP	560.00	85.33	355.53	2,775,877.95	-	-	-	-
TAPCO	330.00	31.01	76.13	825,077.41	-	-	-	-
TICO	340.00	84.12	212.80	1,733,404.19	-	-	-	-
TT1IPP	126.00	79.62	74.64	892,430.00	-	-	-	-
CENIT	126.00	-	-	-	-	-	-	-
TT2PP	87.00	27.35	17.70	217,537.00	-	-	-	-
KARPOWER	470.00	7.92	27.70	-	-	-	221,500.10	-
AMERI	250.00	63.78	118.64	1,195,832.25	-	-	-	-
Cenpower	370.00	-	-	-	-	-	-	-
TROJAN	56.00	-	-	-	-	-	-	-
KTPP	220.00	6.60	10.80	120,731.55	-	-	-	-
AKSA	360.00	9.54	25.56	-	-	-	209,695.53	-
GENSER	95.00	45.70	32.30	-	-	-	-	-
VRA Solar	2.50	14.93	0.28	-	-	-	-	-
BXC	20.00	12.10	1.80	-	-	-	-	-
Meinergy	20.00	9.00	1.34	-	-	-	-	-
<b>Total</b>	<b>5,012.50</b>	<b>38.04</b>	<b>1,418.72</b>	<b>7,760,890.34</b>	<b>-</b>	<b>-</b>	<b>431,195.62</b>	<b>-</b>

Average Monthly Flowrate (MMSCFD)

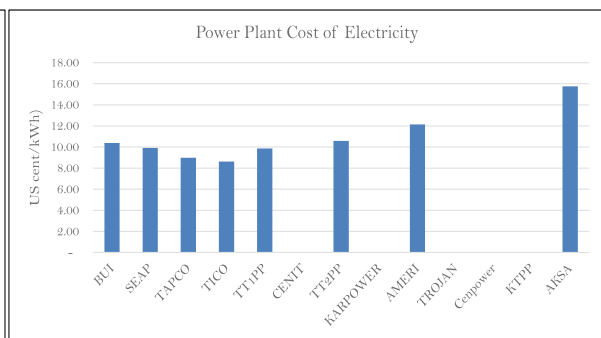
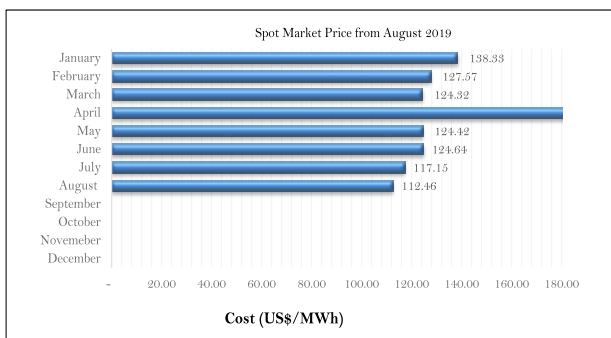
Location	Monthly Average
Etoki	112.30
Tema WAGPCo	121.33
Aboadze WAGPCo	0.00
Aboadze GNGC	121.76
Reverse Flow	33.06

Aug-19

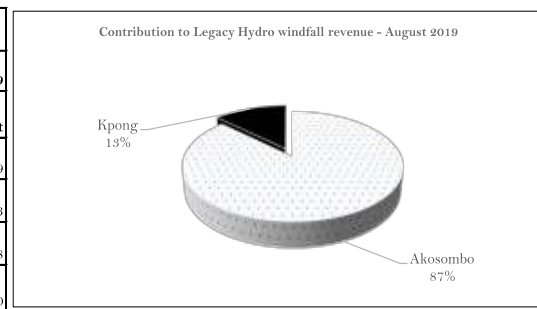
	Beginning month (ft)	End month (ft)	Change in water level (feet)
Hydro Dam			
Akosombo	252.60	254.55	1.95
Bui	557.60	564.99	7.38

# ECONOMIC FACT SHEET

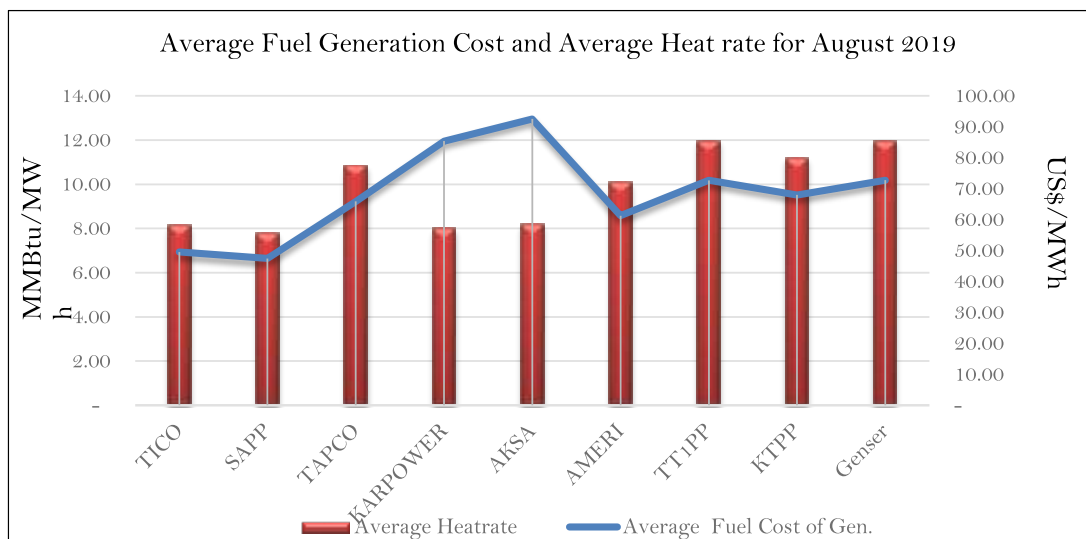
		Actual	Projected	Change
Average Market Energy Cost	US\$/MWh	78.99	83.74	(4.75)
Average Market Capacity Charge (AMCC)	US\$/MWh	33.83	31.67	2.16
Total Average Market Cost (TAC)	US\$/MWh	112.82	115.41	(2.59)
System Marginal Cost (SMC)	US\$/MWh	112.46	88.55	23.91
System Marginal Capacity Charge (SMCC)	US\$/MWh	23.95	23.42	0.53
Spot Market Price (SMP)	US\$/MWh	136.41	111.97	24.44
Composite Bulk Generation Charge (CBGC)	US\$/MWh	97.01	97.01	-
Deviation of TAC from CBGC	US\$/MWh	(15.81)	(18.40)	2.59
Deviation of SMP from CBGC	US\$/MWh	(39.40)	(14.96)	(24.44)



Average Fuel Prices		
		Aug-19
Fuel Type	Unit	Delivered Cost
Natural Gas	US\$/MMBtu	7.29
LCO	US\$/BBL	67.83
HFO	US\$/Tonne	372.08
DFO	US\$/Tonne	0.00



	Gazetted Natural Gas Price	Weighted average Natural Gas Price	LCO	HFO
US\$/MMBTu	6.08	5.97	12.82	10.97





## ECONOMIC FACT SHEET

Power Plant	Capacity Utilization (%)	Average Heat rate (Btu/KWh)	Average Fuel Cost of Generation (US\$/MWh)	Emission Factor (kgCO <sub>2</sub> /kWh)
Akosombo	47.76	-	-	-
Kpong	57.95	-	-	-
Bui	10.78	-	-	-
SAPP	85.33	7,807.69	47.47	0.41
TAPCO	31.01	10,837.32	65.89	0.58
TICO	84.12	8,145.88	49.53	0.43
TT1PP	79.62	11,956.46	72.70	0.63
CENIT	-	-	-	-
TT2PP	27.35	12,288.28	74.71	0.65
KARPOWER	7.92	7,997.61	85.38	0.63
AMERI	63.78	10,079.59	61.28	0.53
TROJAN	-	-	-	-
KTPP	6.60	11,181.23	67.98	-
AKSA	9.54	8,203.79	92.56	0.65
Genser	45.70	11,964.91	72.75	0.63

		Wholesale Electricity Market Price Data - 2019 (Uscent/kWh)							
		January	February	March	April	May	June	July	August
Average Market Price	Actual	14.14	14.26	13.87	16.68	13.91	13.55	11.91	11.28
	Projected	12.79	12.69	12.74	12.97	12.86	12.7	12.74	11.54
System Marginal Price	Actual	17.02	16.07	14.77	20.85	14.84	14.86	14.11	13.64
	Projected	12.83	13	12.83	12.88	12.83	12.88	12.83	11.20

### IMPACT OF CHANGE IN TARIFF STRUCTURE ON BULK CUSTOMERS

The Public Utilities Regulatory Commission (PURC) is mandated by the PURC Act, Act 538 to provide guidelines on the rates chargeable for the provision of utility services and also to examine and approve rates chargeable for the provision of utility services. To this end, the PURC published the Electricity Rate Setting Guidelines which provided the end-user tariff structure.

The Electricity Rate Setting Guidelines produced by the PURC in December 1999 specified the following customer categories:

- Residential Customers,
- Non Residential Customers and
- Special Load Tariff (SLT) Customers
  - SLT-LV
  - SLT-MV
  - SLT-HV

A new category, SLT-HV Mines was added in 2012.

Residential and non-residential customers receive electricity supply at a maximum voltage level of 415 V with a maximum demand lower than 100 kVA. SLT-LV customers receive electricity supply at a voltage level of 415 V and at a maximum demand greater than 100 kVA. Both categories of SLT-MV and SLT-HV customers receive electricity supply at voltage levels greater than 11 kV and at a demand greater than 100 kVA.

A bulk customer in respect of electricity consumption is any consumer of electricity with a Maximum Demand for a period, or a minimum annual energy consumption determined by the Energy Commission. In pursuance of the Energy Commission Act, 1997 (Act 541), the provisions under Regulation 2 of the Electricity Regulations, 2008 (L.I. 1937) and on the basis of Energy Commission Public Notice on Bulk Customer Classification dated May 30, 2003, January, 10, 2008, August 9, 2011 and August 25, 2011, Bulk Customer permits are issued to enterprises allowing them to commence operations as Bulk Customers of Wholesale Electricity Supply Utility and to operate in the deregulated Wholesale Electricity Market, having satisfied the stipulated demand and consumption threshold.

In November 2018, the Energy Commission revised the Bulk Customer threshold. By this revision, "A bulk customer in respect of electricity consumption is any consumer of electricity with a Maximum Demand of at least 500KVA consistently for a consecutive period of 3 months or a minimum annual energy consumption of 1 million kilowatt-hours (kWh)." The revision led to an increase in SLT customers which fall within the Bulk Customer classification bracket. Among others, the Bulk Customer permit gives these class of electricity consumers the right to choose their electricity supplier and also be able to negotiate for their tariffs.

Currently, some Bulk Customers with permits from the Energy Commission obtain electricity supply from both the National Interconnected Transmission System (NITS) while others get their supply through the distribution network. Within the distribution network, there are some bulk customers who are served by their chosen wholesale suppliers while others are served by the distribution companies. There are currently 21 licensed Bulk Customers who purchase their electricity from the distribution companies.

Prior to the 1st July 2019 gazetted tariff, the structure of the SLT customer tariff had the following:

- Service Charge (GHp/month);
- Demand Charge (GHp/kVA/month); and
- Energy Charge (GHp/kWh)

The Service Charge was a fixed charge paid every month (GHp/month), Demand Charge is paid per the maximum demand of the consumer (GHP/kVA/month) and the Energy Charge is paid per the amount of electricity consumed (GHp/kWh).

In the 1st July 2019 PURC gazette tariff, the structure of the SLT customers tariff was changed to consist of only:

- Service Charge (GHP/month)
- Energy Charge (GHp/kWh)

The new gazette tariff did not include demand charges. The change in the component of the tariff has raised concerns. Issues have been raised about the increases in electricity tariffs due to the change in the tariff structure by some Bulk Customers. This analysis aims to examine the impact of the change in the tariff structure on the tariff of Bulk Customers.

The structure of the SLT tariff prior to the 1st July 2019 gazette tariff was as shown below;

Table 1.0 Gazette tariff effective 15th March 2019

Category	Charge
<b><u>SLT-LV</u></b>	
Max. Demand – (GHp/kVA/month)	5,909.6029
Energy Charge (GHp/kWh)	75.664
Service Charge (GHp/month)	4,221.1449
<b><u>SLT-MV</u></b>	
Max. Demand – (GHp/kVA/month)	5,065.3739
Energy Charge (GHp/kWh)	53.8196
Service Charge (GHp/month)	5,909.6029
<b><u>SLT-HV</u></b>	
Max. Demand – (GHp/kVA/month)	5,065.3739
Energy Charge (GHp/kWh)	53.8196
Service Charge (GHp/month)	5,909.6029
<b><u>SLT-HV MINES</u></b>	
Max. Demand – (GHp/kVA/month)	5,909.6029
Energy Charge (GHp/kWh)	102.5739
Service Charge (GHp/month)	5,909.6029

The structure of the SLT tariff after the 1st July 2019 gazette tariff;

Table 2.0: Gazette tariff effective 1st July 2019

Category	Charge
<b><u>SLT-LV</u></b>	
Energy Charge (GHp/kWh)	98.8591
Service Charge (GHp/month)	4,692.6045
<b><u>SLT-MV</u></b>	
Energy Charge (GHp/kWh)	75.0589
Service Charge (GHp/month)	6,569.6464
<b><u>SLT-HV</u></b>	
Energy Charge (GHp/kWh)	78.7776
Service Charge (GHp/month)	6,569.6464
<b><u>SLT-HV MINES</u></b>	
Energy Charge (GHp/kWh)	249.1721
Service Charge (GHp/month)	6,569.6464

The tariff gazetted by PURC on 1st July 2019 did not include the maximum demand charges for SLT customers. This meant that the SLT customers will only pay for their electricity consumption and would not pay any demand charges. An analysis of the change in the tariff structure revealed that the impact of the change in the tariff structure on each SLT customer differs. Some bulk customers had a tariff increase while others had a tariff reduction.

A critical examination of the impact of the change in the tariff structure revealed that customers may have experienced an increase in tariff or otherwise depending on the load factor of each SLT customer. The Load factor is defined as the ratio of the average electricity consumed for a given time period to the energy that could have been supplied at maximum loading condition for the same time period. Prior to the 1st July, 2019 gazetted tariff, the higher the load tariff of a Bulk Customer, the lower the final tariff it pays. A unity power factor, an SLT-LV customer will pay a total tariff of approximately GHp 85.78/kWh, SLT-MV customers GHp 67.24/kWh and SLT-HV customers GHp 62.49/kWh. Table 3.0 and table 4.0 show the impact of load factor on a bulk customer's total tariff prior to the 1st July 2019 gazetted tariff.

## Other Market News and Trends

**Table 3.0 Comparison of the PURC gazette tariff prior to 1st July 2019 and the gazette tariff on 1st July 2019**

	Consolidated tariff of SLT Customer on the 15th March gazette tariff (Ghp/kWh)						Gazetted tariff 1st July 20 (Ghp/kWh)
	Load Factor (30%)	Load Factor (35%)	Load Factor (40%)	Load Factor (50%)	Load Factor (55%)	Load Factor (100%)	
SLT-HV	82.73	78.60	75.50	71.17	69.59	62.49	78.7776
SLT-MV	87.48	83.35	80.25	75.92	74.34	67.24	75.0589
SLT-LV	109.39	104.58	100.96	95.90	94.06	85.78	98.8591

**Table 4.0 Impact of the change in the tariff structure on bulk customer consumption at the different load factor levels.**

	Load Factor (30%)	Load Factor (35%)	Load Factor (40%)	Load Factor (50%)	Load Factor (55%)	Load Factor (100%)
SLT-HV	-4.8%	0.2%	4.3%	10.7%	13.2%	26.1%
SLT-MV	-14.2%	-9.9%	-6.5%	-1.1%	1.0%	11.6%
SLT-LV	-9.6%	-5.5%	-2.1%	3.1%	5.1%	15.2%

For a bulk customer obtaining supply on the HV lines, the change is beneficial to those with load factors of below 35%. At a load factor of 30% a customer obtaining supply on the HV line will enjoy approximately 4.8% lower tariff after the change in the tariff structure. For instance, a bulk customer with a maximum demand of 25 MVA should consume electricity lower than 4.5 GWh a month to realize a gain from the change in the tariff structure. Such a customer could gain approximately 2 million Ghana Cedis a year.

Customers on the MV lines will enjoy between 1.1% and 14.2% of tariff reduction due to change in the structure if the load factor of the customers are between 30% and 50%. For instance, a customer with a maximum demand of 12.5MVA would need to consume lower than 4 GWh a month to actualize a savings between 0.4 million Ghana Cedis a year to 3.3 million Ghana Cedis a year.

Finally, customers on the LV lines with a load factors lower than 45% will have higher than 2% reduction in tariffs. That is, an SLT customer with a maximum demand of about 6.25 MVA should consume electricity lower than 1.6 GWh a month to realize a gain from the change in the tariff structure.

The load factor of a bulk customer is critical in determining the impact of the change in the tariff and tariff structure. It is therefore very important for bulk customers in the distribution networks to manage their auxiliary load properly in order to benefit from the change in the tariff structure. Simple energy conservation techniques and demand management could help bulk customers reduce their load factor.

### 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 Peseva  
 GWh = Giga-watt Hours  
 KTRP = 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, Enyena, Ntomme  
 TT2PP = Tema Thermal 2 Power Plant  
 WAGPCo = West African Gas Pipeline Company  
 WEM = Wholesale Electricity Market

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