



GHANA WHOLESALE ELECTRICITY MARKET BULLETIN

MARKET WATCH

Monthly Market Data Analysis

ISSUE NO. 36

1st December 2018 to 31st December 2018

This Bulletin covers major developments in the Wholesale Electricity Market (WEM) of Ghana from 1st December, 2018 to 31st December, 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 the full year report on the Wholesale Electricity Market (WEM).

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 December 2018 recorded a System Peak Load of 2,524.6 MW and represented the System Peak Load for the year. This System Peak Load was marginally higher than the projected 2,523 MW in the 2018 Electricity Supply Plan (ESP). The Ghana Peak Load for December 2018 was 2,382.6 MW which also represented the Ghana Peak Load for 2018. However, this was marginally lower than the 2,390 MW projected in the 2018 ESP. A total of 142 MW of electricity was exported during the System Peak Load, where 74 MW was exported to CIE and 68 MW to SONABEL.

Total electricity supplied in December 2018 was 1,481.71 GWh and this was marginally higher than the 1,456.7 GWh projected in the 2018 ESP by 1.7%. Also, the total electricity consumed domestically was marginally was 1395.25 and this was higher than the 1,378.6 MW projected in the 2018 ESP, by 1.2% in December 2018. The total electricity of 86.46 GWh exported in December 2018 was also 13.8% higher than the 76 GWh projected in the 2018 ESP.

Electricity generation from hydro sources in the total electricity supplied increased from 47.5% in November 2018 to 49.2% in December 2018. Consequently, the total electricity supplied from thermal sources in December 2018 reduced from 51.2% in November 2018 to 50.3%.

The rate of drop in the water levels for both the Akosombo and Bui Dams recorded an increase in December 2018. The rate of drop in the water level for the Akosombo GS increased from 0.03 feet per day in November

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

	December 2018		November 2018	
	Projected	Actual Outturn	Projected	Actual Outturn
Total Supply (GWh)	1,456.7	1,481.7	1,397.4	1,450.2
Source by Power Plants (GWh)				
AKOSOMBO	313.8	488.0	305.3	429.7
KPONG	51.1	73.3	49.2	63.6
BUI	71.0	168.3	68.7	201.2
Simon Asogli	117.8	142.8	117.8	171.7
TAPCO	178.6	116.3	172.8	78.1
TICO	202.5	115.1	97.9	142.6
TT1PP	-	9.1	57.6	30.1
CENIT	46.1	2.2	44.5	-
TT2PP	-	2.6	-	-
MRP	-	-	-	-
Karpowership	210.4	77.3	254.2	82.2
AMERI	75.9	135.9	73.4	118.1
KTPP	63.2	45.3	-	38.9
Trojan Power	-	-	-	-
CENPOWER	107.5	28.2	104.0	0.5
AKSA	14.0	42.5	47.5	45.8
BXC Solar	2.2	1.1	2.1	1.8
VRA Solar	0.4	0.3	0.3	0.3
Genser	-	28.7	-	35.8
Meinergy	2.2	-	2.1	-
Total Generation (GWh)	1,456.7	1,476.8	1,397.4	1,438.5
Imports (GWh)	-	4.9	-	11.7
Total Supply (GWh)	1,456.7	1,481.7	1,397.4	1,450.2
Deficit/Over supply (GWh)	-	25.0	-	52.8
Ghana Coincident Peak Load (MW)	2,380.0	2,382.6	2,380.0	2,304.8
System Coincident Peak Load (MW)	2,513.0	2,524.6	2,513.0	2,471.8

HIGHLIGHTS OF THE MONTH

2018 to 0.04 feet per day in December 2018. Similarly, the rate of drop in the water level for the Bui Dam increased from 0.212 feet per day in November 2018 to 0.23 feet per day in December 2018.

There was an increase in the consumption of liquid fuel in the total fuel mix in December 2018, from a share of 14.9% in November 2018 to 17.5%. Consequently, the share of natural gas in the total fuel mix reduced from 79.9% in November 2018 to 78.1% in December 2018. Likewise, the share of LPG in the total fuel consumed in December 2018 reduced from 5.2% in November 2018 to 4.4%.

ELECTRICITY DEMAND AND SUPPLY

Electricity Demand

There was an increase in the System Peak Load for December 2018, from 2,471.8 MW in November 2018 to 2,524.6 MW by 2.1%. The System Peak Load recorded in December 2018 happened to be the System Peak Load for 2018. Similarly, the Ghana Peak Load increased by 3.4% in December 2018, from 2,304.8 MW in November 2018 to 2,382.6 MW. The increase in the Ghana Peak Load in December 2018 was predominantly due to an increase in domestic demand. At System Peak Load, there was no import from CIE. A total of 74 MW and 68 MW were exported to CIE and SONABEL respectively at the System Peak Load in December 2018. Average electricity demand dropped marginally by 1.1% in December 2018, from 2,014 MW in November 2018 to 1,992 MW. Also, the Load Factor decreased in December 2018, from 79.5% in November 2018 to 77.3%. Hydro contributed 46.4% to both the System Peak Load and the Ghana Peak Load in December 2018.

Electricity supply

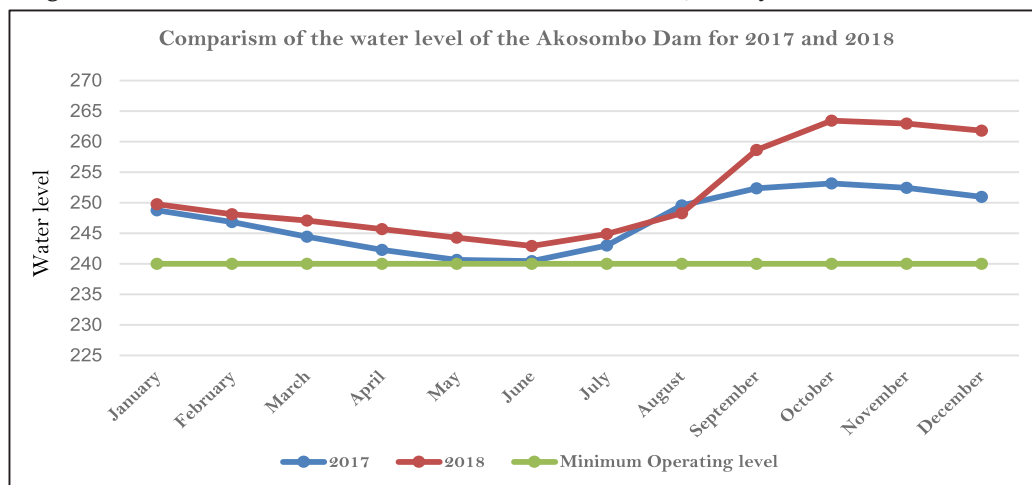
Average electricity supplied in December 2018 reduced marginally by 1.1%, from 48.34 GWh per day in November 2018 to 47.8 GWh per day. On the contrary, the total electricity supplied in December 2018 increased marginally by 2.2%, from 1,450.23 GWh in November 2018 to 1,481.71 GWh. The increase in the total electricity supplied was due to greater number of days in December than November. Out of the total electricity supplied in December 2018, 4.88 GWh was imported from CIE with the remaining 1,476.82 GWh from domestic sources. Out of the total electricity of 86.46 GWh exported, 26.25 GWh, 16.65 GWh and 43.57 GWh were supplied to CEB, CIE and SONABEL respectively in December 2018. Electricity generation from hydro sources constituted 49.2% of the total electricity supplied with thermal accounting for 50.3% and the remaining from solar power plants.

HYDRO DAM LEVELS

Akosombo Dam Water Level continued to drop in December 2018

The rate of drop in the water level for the Akosombo Dam increased in December 2018, from 0.03 feet per day in November 2018 to 0.04 feet per day. This was due to increase electricity generation from the hydro power plant. The water level of 262.98 feet recorded at the beginning of the month dropped by 1.18 feet to a month end water level of 261.8 feet. Nevertheless, the water level of 261.8 feet recorded at the end of the month was 10.49 feet higher than the water level recorded for the same period of 2017. The Akosombo GS will begin 2019 with a water level of 261.8 feet.

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



Bui Dam Water Level continued to drop in December 2018

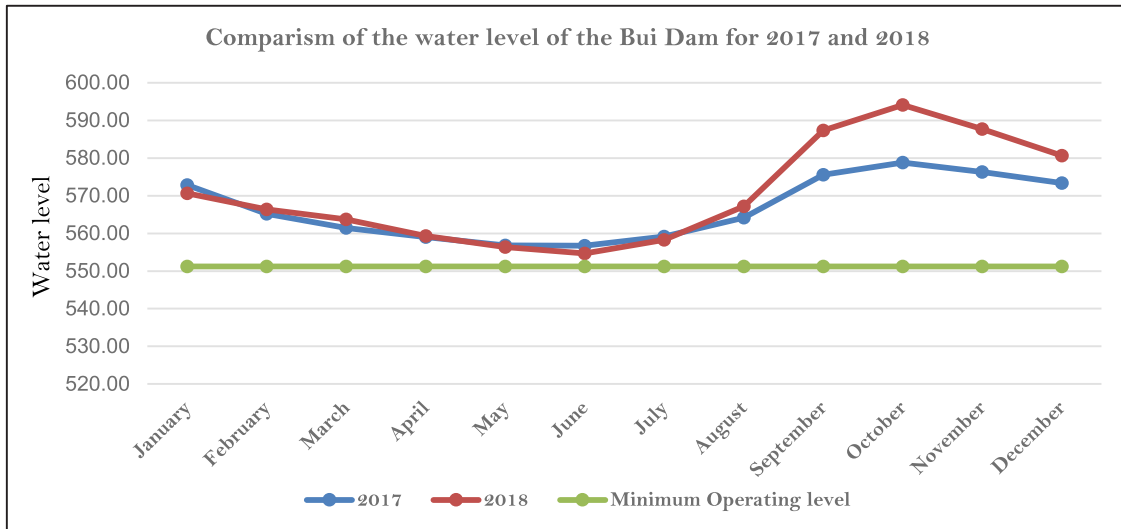
The Bui Dam water level continued to drop in December 2018, from 0.21 feet per day in November 2018 to 0.23 feet per day. The water level of 587.73 feet recorded at the beginning of the month reduced by 7.12 feet to a month end water level of 580.61 feet. The

HIGHLIGHTS OF THE MONTH

water level of 580.61 feet recorded at the end of the month was 6.58 feet higher 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 December 2018.

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



FUEL SUPPLY FOR POWER GENERATION

Natural gas flow rate from WAGPCo continued to decrease in December 2018

The natural gas flow rate from the West African Gas Pipeline continued to decrease in December 2018, from 72.61 MMSCFD in October 2018 and 69.05 MMSCFD in November 2018 to 59.82 MMSCFD. Similarly, the total natural gas consumed decreased in December 2018, from 2,156.24 MMSCF in November 2018 to 1,771.93 MMSCF. The composition of natural gas supply from WAGP in the total fuel mix reduced from 29.6% in November 2018 to 23.7% in December 2018. Also, the share of natural gas supply from WAGP constituted 30.3% of the total natural gas consumed in December 2018 which was lower than the 37% it recorded in November 2018.

Natural gas flow rate from GNGC increased in December 2018.

There was an increase in the natural gas flow rate by 27.9% in December 2018, from 49.3 MMSCFD in November 2018 to 63.05 MMSCFD. Similarly, the total natural gas supplied from AGPP to the Aboadze Power Enclave increased from 1,456.07 MMSCF in November 2018 to 1,886.44 MMSCF in December 2018. The share of natural gas supply from GNGC in the total fuel mix increased from 20.9% in November 2018 to 26.4% in December 2018. Again, the total natural gas supplied by GNGC constituted 33.8% of the total natural gas consumed in December 2018 and was higher than the 26.1% recorded in November 2018.

Natural gas flow from ENI decreased in December 2018

Natural gas flow rate from ENI to the Aboadze Power Enclave reduced in December 2018, from 69.44 MMSCFD in November 2018 to 66.87 MMSCFD. Likewise, the total natural gas supplied by ENI reduced from 2,050.84 MMSCF in November 2018 to 2,000.73 MMSCF in December 2018. Natural gas supply from ENI dominated the total fuel mix at a share of 28% which was lower than the 29.4% it recorded in November 2018. The share of natural gas from ENI in the total natural gas consumed reduced from the 36.8% it recorded in November 2018 to 35.9% in December 2018.

Liquid Fuel

There was a significant increase in the consumption of liquid fuel in December 2018 by 88%, from 117,090 barrels in November 2018 to 220,234 barrels. The increase in the consumption of liquid fuel was as a result of the consumption of LCO by Cenpower plant in December 2018 for commissioning of the gas turbines. This notwithstanding, the share of LCO in the total fuel consumed increased from 0.3% in November 2018 to 4.2% in December 2018. Similarly, the consumption of DFO increased marginally with its shares in the total fuel consumed and the total liquid fuel consumed increasing from less than 0.01% in November 2018 to 0.02% and 0.1% in December 2018 respectively. In the total liquid fuel consumed, the share of LCO increased from 2% in November 2018 to 24.2% in December 2018. On the contrary, the share of HFO in the total fuel mix and the total liquid fuel consumed reduced from 14.6% and 98% in November 2018 to 13.3% and 75.7% in December 2018 respectively.

HIGHLIGHTS OF THE MONTH

Plant by Plant Highlights

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

The Akosombo GS continued to record an increase in its electricity generation in December 2018. Average electricity generation from the hydro power plant increased by 9.9% from 14.32 GWh per day in November 2018 to 15.74 GWh per day in December 2018. Similarly, the total electricity supplied by the hydro power plant increased by 13.6%, from 429.7 GWh in November 2018 to 487.98 GWh in December 2018. The increase in the electricity generated by the power plant was due to fuel supply challenges with some of the thermal power plants. The total electricity supplied by Akosombo GS constituted 32.9% of the total electricity supplied in December 2018 and was 55.4% higher than the 314 GWh projected in the 2018 ESP. The power plant contributed 807.1 MW to both the System Peak Load and the Ghana Peak Load, representing 32% of both Peak Loads.

Electricity supply by Kpong Generation Station (GS) increased in December 2018

Kpong GS recorded an increase in its average electricity supply in December 2018 by 11.5%, from 2.12 GWh per day in November 2018 to 2.36 GWh per day. Similarly, the total electricity supplied by the hydro power plant increased by 15.2%, from 63.64 GWh in November 2018 to 73.3 GWh in December 2018. The total electricity supplied by the power plant constituted 5% of the total electricity supplied in December 2018 and was 24.8% higher than the 51 GWh projected in the 2018 ESP. Kpong GS contributed 112 MW to both the System Peak Load and the Ghana Peak Load, which represent 4.4% of both Peak Loads in December 2018.

Electricity supply by the Bui Generation Station (GS) decreased in December 2018

Electricity generation from the Bui GS reduced in December 2018, from an average of 6.71 GWh per day in November 2018 to 5.43 GWh per day. Also, the total electricity supplied by the hydro power plant reduced by 16.4%, from 201.25 GWh in November 2018 to 168.29 GWh in December 2018. The total electricity supplied by the power plant contributed 11.4% of the total electricity supplied in December 2018 and was 1.8 folds higher than the 71 GWh projected in the 2018 ESP. Bui GS contributed 252 MW to both the System Peak Load and the Ghana Peak Load, representing 10% for both Peak Loads.

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

There was a drop of about 19.5% in the average electricity supplied by the Sunon Asogli Power Plant (SAPP) in December 2018, from 5.43 GWh per day in November 2018 to 4.61 GWh per day. Likewise, the total electricity supplied by the thermal power plant reduced by 16.8%, from 171.7 GWh in November 2018 to 142.8 GWh in December 2018. The electricity supplied by the SAPP contributed 9.6% of the total electricity supplied in December 2018 and was 45.5% higher than the 118 GWh projected in the 2018 ESP. SAPP contributed 281.3 MW to both the System Peak Load and the Ghana Peak Load, representing 11.1% of both Peak Loads. A total of 1,136.75 MMSCF of natural gas was consumed by the thermal power plant with an estimated heat rate of 7,840.88 Btu/kWh in December 2018. The heat rate recorded in December 2018 was lower than the 8,095.45 Btu/kWh it recorded in November 2018.

Ameri Energy Power Plant's generation increased in December 2018

Average electricity generation from the Ameri power plant increased by 11.3% in December 2018, from 3.94 GWh per day in November 2018 to 4.38 GWh per day. Consequently, the total electricity supplied by the thermal power plant increased from 118.13 GWh in November 2018 to 135.87 GWh in December 2018 by 15%. The total electricity supplied by Ameri was significantly higher than the 76 GWh projected in the 2018 ESP by 55.4% and constituted 9.2% of the total electricity supplied in December 2018. The Ameri power plant contributed 95 MW to both the System Peak Load and the Ghana Peak Load, translating into 3.8% of both Peak Loads in December 2018. The thermal power plant consumed a total of 1,338.33 MMSCF of natural gas at an estimated heat rate of 10,136.04 Btu/kWh in December 2018. The heat rate recorded by the thermal power plant was higher than the 10,056.32 Btu/kWh it recorded in November 2018.

The Karpowership Power Plant's generation decreased in December 2018

The Karpowership continued to record a reduction in its electricity generation from an average of 3.36 GWh per day in October 2018 and 2.74 GWh per day in November 2018 and 2.49 GWh per day in December 2018. Also, the total electricity supplied by the power ship decreased from 104.13 GWh in October 2018 and 82.21 GWh in November 2018 to 77.34 GWh in December 2018. The reduce electricity generation from Karpowership has been due to fuel supply challenges with the thermal power plant. The total electricity supplied by the thermal power plant constituted 5.2% of the total electricity supplied in December 2018 and was 60.9% significantly lower than the 210 GWh projected in the 2018 ESP. Karpowership contributed 256.1 MW to both the System Peak Load and the Ghana Peak Load. The total load supplied by the power plant at peak, contributed 10.1% of the System Peak Load and the Ghana Peak Load in December 2018. A total of 103,693 barrels of HFO was consumed by the thermal power plant and at an estimated heat rate of 8,112.74 Btu/kWh in December 2018. The heat rate recorded by the power plant was marginally lower than the 8,167.75 Btu/kWh it recorded in November 2018.

AKSA Power Plant's generation decreased in December 2018

Average electricity generation from AKSA decreased in December 2018 by 10.3%, from 1.53 GWh per day in November 2018 to 1.37 GWh per day. Similarly, the total electricity supplied by the thermal power plant reduced by 7.3%, from 45.84 GWh in November 2018 to 42.49 GWh in December 2018. The AKSA power plant generation continued to decline due to low HFO stocks. The total electricity supplied by the power plant constituted 2.9% of the total electricity supplied in December 2018 and was significantly higher than the 14 GWh projected in the 2018 ESP. AKSA contributed 46.5 MW to both the System Peak Load and the Ghana Peak Load, representing 1.8% of both Peak Loads. The total fuel of 57,357.42 barrels of HFO consumed by AKSA recorded an estimated heat rate of 8,166.3 Btu/kWh in December 2018. The heat rate recorded by the power plant in December 2018 was marginally lower than the 8,188.56 Btu/kWh it recorded in November 2018.

Takoradi International Company (TICO) generation decreased in December 2018

The TICO power plant recorded a decrease in its average electricity generation in December 2018 by 21.9%, from 4.75 GWh per day in November 2018 to 3.75 GWh per day. Similarly, the total electricity supplied by the thermal power plant reduced by 19.3%, from 142.6 GWh in November 2018 to 115.1 GWh in December 2018. The total electricity supplied by the thermal power plant constituted 7.8% of the total electricity supplied in December 2018 and was lower than the 202 GWh projected in the 2018 ESP. TICO contributed 170 MW to both the System Peak Load and the Ghana Peak Load, representing 6.7% of both Peak Loads in December 2018. A total of 1,280.85 MMSCF of natural gas was consumed by the thermal power plant at an estimated heat rate of 11,450.45 Btu/kWh and was significantly higher than the 10,971.75 Btu/kWh it recorded in November 2018.

HIGHLIGHTS OF THE MONTH

Takoradi Power Company (TAPCO) Plant's generation increased significantly in December 2018

Electricity generation from TAPCO in December 2018 increased significantly by 44.1%, from an average of 2.6 GWh per day in November 2018 to 3.75 GWh per day. Similarly, the total electricity supplied by the thermal power plant increased by 48.9%, from 78.08 GWh in November 2018 to 116.26 GWh in December 2018. The total electricity generated by the power plant constituted 7.9% of the total electricity supplied in December 2018 but was lower than the 179 GWh projected in the 2018 ESP. TAPCO contributed 211 MW to both the System Peak Load and the Ghana Peak Load, representing 8.4% of both the System Peak Load and the Ghana Peak Load. The power plant consumed a total of 1,267.99 MMSCF of natural gas at an estimated heat rate of 11,223.28 Btu/kWh in December 2018. The heat rate recorded in December 2018 was lower than the 11,240.29 Btu/kWh it recorded in December 2018.

Kpone Thermal Power Plant's (KTPP) generation increased in December 2018

Average electricity generation from KTPP increased in December 2018 by 12.6%, from 1.3 GWh per day in November 2018 to 1.46 GWh per day. Similarly, the total electricity supplied by the thermal power plant increased by 16.3%, from 38.93 GWh in November 2018 to 45.28 GWh in December 2018. The total electricity supplied by the thermal power plant constituted 3.1% of the total electricity supplied in December 2018 but was lower than the 63 GWh projected in the 2018 ESP. KTPP contributed 102 MW to both the System Peak Load and the Ghana Peak Load, representing 4% of both the System Peak Load and the Ghana Peak Load. KTPP consumed a total of 476.33 MMSCF of natural gas at an estimated heat rate of 10,303.01 Btu/kWh in December 2018. The heat rate recorded in December 2018 was marginally lower than the 10,307.31 Btu/kWh it recorded in November 2018.

Tema Thermal 1 Power Plant's (TT1PP) decreased significantly in December 2018

TT1PP operation in December 2018 was limited to 4 days and was subsequently shutdown to make natural gas available to KTPP as the two power plant undergo rotational operation to ration the low levels of natural gas available. The power plant generated a total of 9.08 GWh and consumed a total of 102.22 MMSCF of natural gas. The power plant recorded an estimated heat rate of 11,088.59 Btu/kWh in December 2018. The power plant did not contribute to neither the System Peak Load nor the Ghana Peak Load. However, the thermal power plant was projected to be offline in December 2018.

Tema Thermal 2 Power Plant (TT2PP) came back online in December 2018

TT2PP came back online and started commissioning of natural gas on 12th December 2018. The power plant operated for 14 days and generated a total of 2.58 GWh. The thermal power plant consumed a total of 29.82 MMSCF of natural gas at an estimated heat rate 11,366.34 Btu/kWh in December 2018. The power plant did not contribute to the System Peak Load and the Ghana Peak Load and was also projected to be offline in the 2018 ESP.

Cenit Energy Power Plant Successfully Commissioned on natural gas in December 2018

Cenit Energy power plant commissioned on natural gas from 17th December 2018 to 19th December 2018. The power plant operated for 3 days and supplied a total of 2.2 GWh. The total electricity supplied by the thermal power plant was significantly lower than the 46 GWh projected in the 2018 ESP. Cenit contributed 71 MW to both the System Peak Load and the Ghana Peak Load, representing 2.8% of both Peak Loads. A total of 26.82 MMSCF of natural gas was consumed by the thermal power plant at an estimated heat rate of 12,006.5 Btu/kWh.

Embedded Electricity Generation

Genser Power Plant's generation decreased in December 2018

Electricity generation from Genser power plant reduced in December 2018 by 17.8%, from an average of 1.12 GWh per day in November 2018 to 0.93 GWh per day. Similarly, the total electricity supplied by the thermal power plant reduced by 15%, from 33.78 GWh in November 2018 to 28.7 GWh in December 2018. The total electricity supplied by the power plant constituted 1.9% of the total electricity supplied in December 2018. A total of 7,516.88 tonnes of LPG was consumed by the thermal power plant at an estimated heat rate of 11,171.02 Btu/kWh. The heat rate recorded by the thermal power plant in December 2018 was higher than the 10,954.57 Btu/kWh in November 2018.

BXC's Solar generation decreased in December 2018

The total electricity supplied by BXC solar power plant in December 2018 reduced by 38.7%, from 1.81 GWh in November 2018 to 1.15 GWh. The total electricity supplied by the solar power plant was 17.6% lower than the 2.2 GWh projected in the 2018 ESP and constituted 0.1% of the total electricity supplied in December 2018.

VRA Navrongo Solar generation increased marginally in December 2018

VRA Navrongo solar total electricity generation in December 2018 increased marginally by 1.7%, from 0.25 GWh in November 2018 to 0.26 GWh. However, the total electricity supplied by the solar power plant was 37.1% lower than the 0.4 GWh projected in the 2018 ESP and constituted 0.02% of the total electricity supplied in December 2018.

Electricity Exchange – Import decreased significantly while Exports increased in December 2018

Average electricity import from CIE in December 2018 decreased significantly by 59.6%, from 0.39 GWh per day in November 2018 to 0.16 GWh per day. Also, the total electricity imported decreased by 58.2%, from 11.69 GWh in November 2018 to 4.88 GWh per day in December 2018. Electricity import did not contribute to both the System Peak Load and the Ghana Peak Load in December 2018.

Average electricity export to CIE increased significantly by 1.3 folds, from an average of 0.24 GWh per day in November 2018 to 0.54 GWh per day in December 2018. On the contrary, average electricity export to CEB and SONABEL decreased by 13.7% and 2.3%, from 0.98 GWh per day and 1.44 GWh per day in November 2018 to 0.85 GWh per day and 1.41 GWh per day in December 2018 respectively. In contrast to the reduce average electricity export to SONABEL and CEB, the total electricity exported increased marginally by 1%, from 43.13 GWh in November 2018 to 43.57 GWh in December 2018 due to greater number of days in December than November.

The total electricity exported to CIE increased significantly by 1.3 folds, from 7.14 GWh in November 2018 to 16.65 GWh in December 2018. The total electricity exported to CEB decreased by 10.8%, from 29.44 GWh in November 2018 to 26.25 GWh in December 2018. The total electricity exported to CEB, CIE and SONABEL was 13.8% higher than the 76 GWh projected in the 2018 ESP and was 8.5% more than the 79.71 GWh exported in November 2018.

However, Ghana continues to be a net exporter of electricity in December 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

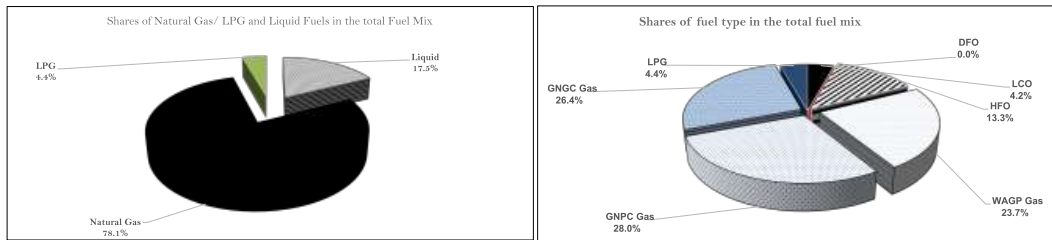


Figure 4a: Contribution of Natural Gas Supply by sources

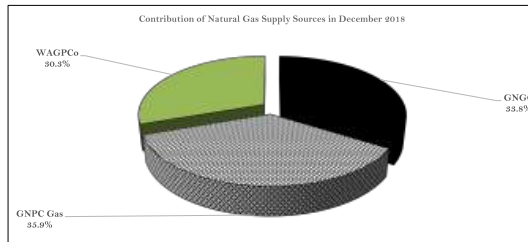
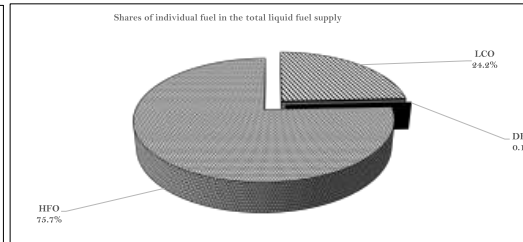


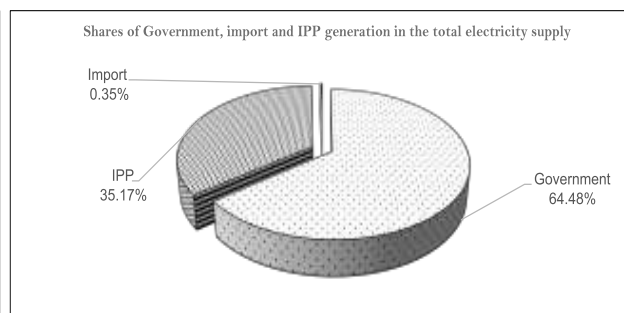
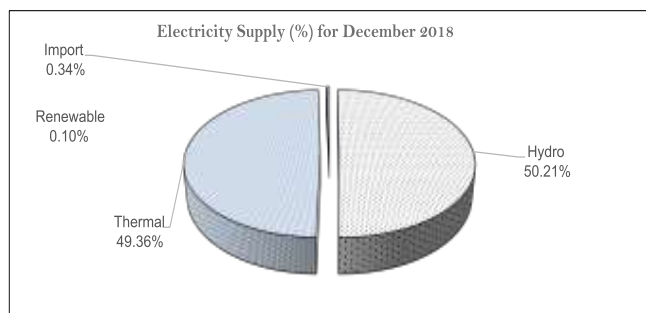
Figure 4b: Contribution of individual fuel in the liquid fuel supply



Peak Electricity Supply - December 2018			
Source of Supply	Generation at System Peak Load of December 2018 (MW)	Generation at Ghana Peak Load of December 2018 (MW)	Electricity Supply (GWh)
AKOSOMBO	807.10	807.10	487.98
KPONG	112.00	112.00	73.30
BUI	251.60	251.60	168.29
SAPP	281.30	281.30	142.80
TAPCO	211.00	211.00	116.26
TICO	170.00	170.00	115.10
TT1PP	-	-	9.08
CENT	71.00	71.00	2.20
TT2PP	-	-	2.58
MRP	-	-	-
KARPOWER	256.10	256.10	77.33
AMERI	95.00	95.00	135.87
KTPP	102.00	102.00	45.28
Trojan Power	-	-	-
CENPOWER	121.00	121.00	28.17
AKSA	46.50	46.50	42.49
BXC Solar	-	-	1.15
Safisana	-	-	-
VRA Solar	-	-	0.26
Genser	-	-	28.70
IMPORT	-	-	4.89
Export to CEB	74.00	74.00	26.25
Export to CIE	-	-	16.65
Export to SONABEL	68.00	68.00	43.57
System Coincident Peak Load	2,524.60		
Ghana Coincident Peak Load		2,382.60	
Total Supply			1,481.71
Total Supply for domestic consumption			1,395.25

Ghana Electricity Demand & Supply		
		Dec-18
Maximum System Peak Load	MW	2,524.6
Minimum System Peak Load	MW	2,115.5
Average Peak Generation	MW	2,369.4
System Base Load	MW	1,344.5
Total Electricity	GWh	1,481.7
Load Factor (LF)	%	77.3

OPERATIONAL FACT SHEET



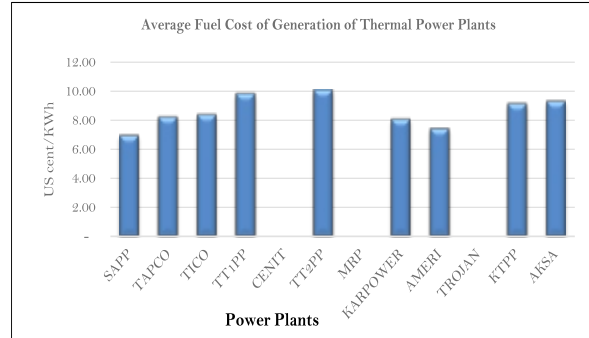
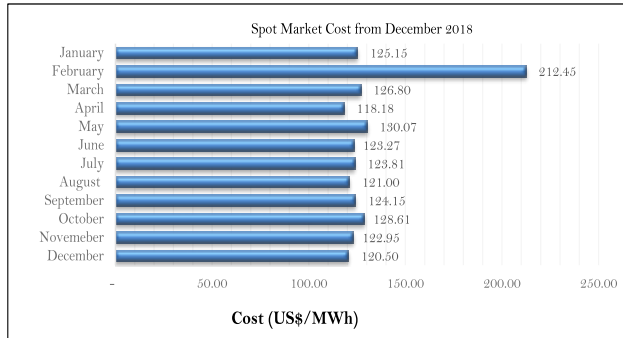
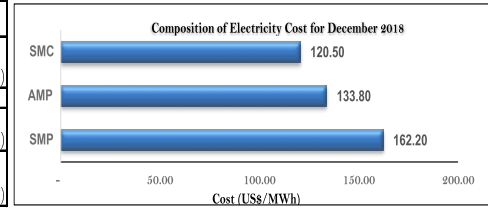
Power Plant Data for December 2018								
	Installed Capacity (MW)	Plant Capacity Utilization (%)	Heat Rate (Btu/kWh)	Natural Gas Consumption (MMBtu)	LCO Consumption (MMBtu)	DFO Consumption (MMBtu)	HFO Consumption (MMBtu)	LPG Consumption (MMBtu)
Akosombo	1,020.00	66.45	-	-	-	-	-	-
Kpong	160.00	63.63	-	-	-	-	-	-
Bui	400.00	58.43	-	-	-	-	-	-
SEAP	560.00	35.42	7,840.88	1,119,694.27	-	-	-	-
TAPCO	330.00	48.93	11,223.28	1,304,762.22	-	-	-	-
TICO	340.00	47.02	11,450.45	1,317,994.00	-	-	-	-
TT1PP	126.00	10.01	11,088.59	100,684.42	-	-	-	-
CENIT	126.00	2.42	12,006.50	26,405.91	-	-	-	-
TT2PP	49.50	7.25	11,366.34	29,375.18	-	-	-	-
MRP	-	-	-	-	-	-	-	-
KARPOWER	470.00	22.85	8,112.74	-	-	-	627,343.54	-
AMERI	250.00	75.48	10,136.04	1,377,143.11	-	-	-	-
TROJAN	56.00	-	-	-	-	-	-	-
Cenpower	0.00	-	-	-	311,926.78	1,223.67	-	-
KTPP	220.00	28.58	10,303.01	466,492.29	-	-	-	-
AKSA	360.00	16.39	8,166.30	-	-	-	347,012.41	-
Genser	95.00	41.96	11,171.02	-	-	-	-	320,608.28
Total	4,562.50			5,742,551.39	311,926.78	1,223.67	974,355.95	320,608.28

Natural gas flow rate (MMSCF/D)	
Location	Monthly Average
Etoki	72.72
Tema WAGPCo	59.82
Aboadze WAGPCo	0.00
Aboadze GNGC	129.92

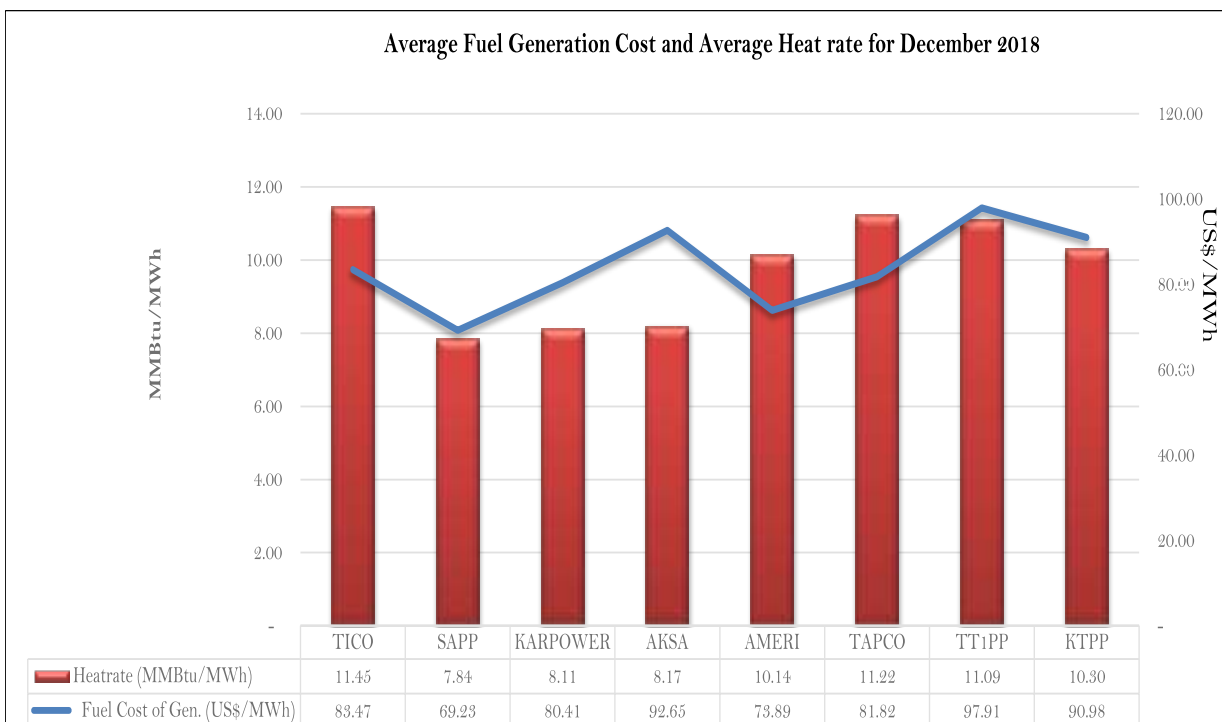
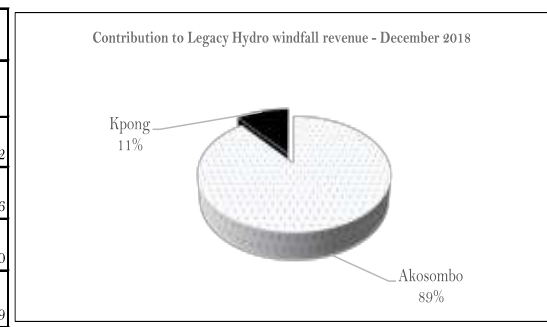
Dec-18			
	Beginning month (ft)	End month (ft)	Change in water level (feet)
Hydro Dam			
Akosombo	262.98	261.80	-1.18
Bui	587.73	580.61	-7.12

ECONOMIC FACT SHEET

		Dec-18	Nov-18	Change
Average Market Price	US\$/MWh	133.80	134.08	(0.28)
System Marginal Cost (SMC)	US\$/MWh	120.50	122.95	(2.45)
System Marginal Price (SMP)	US\$/MWh	162.20	166.76	(4.56)

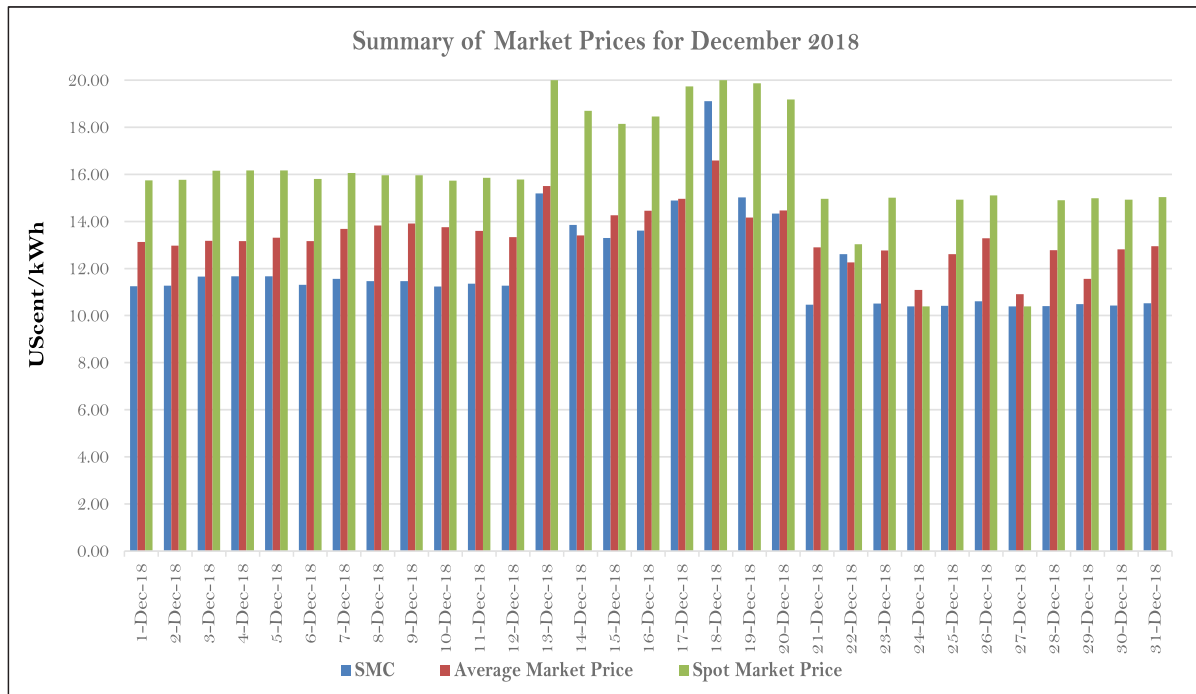


Fuel Type	Unit	Price
Natural Gas	US\$/MMBtu	7.82
LCO	US\$/BBL	57.36
HFO	US\$/Tonne	352.00
DFO	US\$/Tonne	750.79



ECONOMIC FACT SHEET

Power Plant	Average Heat rate (Btu/KWh)	Average Fuel Cost of Generation (US\$/MWh)	Emission Factor kgCO ₂ /kWh
SAPP	7,840.88	69.23	0.42
TAPCO	11,223.28	81.82	0.60
TICO	11,450.45	83.47	0.61
TT1PP	11,088.59	97.91	0.59
CENIT	12,006.50	-	0.64
TT2PP	11,366.34	100.36	0.60
KARPOWER	8,112.74	80.41	0.64
AMERI	10,136.04	73.89	0.54
TROJAN	-	-	-
KTPP	10,303.01	90.98	0.55
Cenpower	-	-	0.83
AKSA	8,166.30	92.65	0.64
Genser	11,171.02	-	0.70
Average			0.57



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1.0 Review of the annual performance of electricity generation and supply

Ghana's grid installed capacity increased marginally at about 0.8% to 4,402 MW (this exclude plants under commissioning, embedded power plants and T3) in 2018. This was due to the marginal increase in capacity of AKSA from 323 MW in 2017 to 360 MW. Hydro Electric Power Plant constituted 34.09% of the total installed capacity while Thermal Power Plant constituted 65.42%. Total embedded generation in 2018 was 233 MW (excluding Meinergy which is under commissioning), made up of renewable energy (Utility Scale Solar PV Plant) 9.7% and 93% of thermal power plant.

Electricity Demand

The Ghana's System Peak Load (Coincidence Peak Load) increased by 15.2% (333 MW) in 2018 from 2,192 MW in 2017 to 2,525 MW in 2018. This growth was largely attributable to an increase in domestic demand with the Ghana Peak Load increasing by 9.4% from 2,177 MW in 2017 to 2,383 MW in 2018. The System Peak Load grew by 7.5% in 2016 and 5.5% in 2017. Apart from the System Peak Load growth in 2005 of 26.3%, the demand growth in 2018 represents the highest recorded. From January 2018 to December 2018, the monthly System Peak Loads increased by 16.3%, a significant increase compared to 4.4% from January 2017 to December 2017 (growth between the minimum System Peak Load and Maximum Peak Load for the respective years).

Monthly System Peak Loads increased by an average of 12.7% from 2,099 MW in 2017 to 2,364 MW in 2018. The 2018 Electricity Supply Plan (ESP) projected near correctly the System Peak Load for 2018 with 0.08% deviation (Lower). There is the need to assess if there was a link between the reduction in electricity tariffs and the high growth in demand.

Average electricity export also increased from an average of 36.4 MW in 2017 to 84.4 MW in 2018 due to increase supply to SONABEL. From April, there was a significant demand growth of about 14%. Compared to 2017, average System Peak Demand increased by 12.7% in 2018. The load factor has however reduced from 74.5% in 2017 to 72.2% in 2018. Load factor for 2018 was above 70% with capacity factor averaging 40.3% in 2018 indicating that Ghana has a high capacity for growth in the power sector. Table 1.0 shows the monthly System Peak Load.

Table 1.0: Monthly System Peak Load for 2017 & 2018

Monthly System Peak Demand Comparism between 2017 & 2018				
	2017	2018	Growth (%)	Load factor (%)
January	2,100	2,172	3.43	79.20
February	2,084	2,269	8.88	72.10
March	2,153	2,278	5.81	80.20
April	2,161	2,433	12.59	78.40
May	2,158	2,406	11.49	75.30
June	2,077	2,292	10.35	74.90
July	2,042	2,349	15.03	75.50
August	1,930	2,296	18.96	77.20
September	2,021	2,402	18.85	71.90
October	2,131	2,471	15.95	74.30
November	2,192	2,472	12.77	79.50
December	2,135	2,525	18.27	77.30
Average	2,099	2,364	12.70	72.20

Average electricity demand has increased by 15.3% in 2018 from a maximum average demand of 1,697 MW in 2017 to 1,956 MW in 2018. From January 2018 to December 2018, average demand grew by 14.3% at an average of 1,822 MW compared to the average of 1,619 MW in 2017. Similar to the System Peak Load, average electricity demand increased substantially from April 2018. Average demand increased by 137 MW from March 2018 to December 2018. Average demand growth in 2018 is also higher than the 9.8% projected for 2018 in the ESP.

Table 2.0: Average monthly demand for 2017 & 2018

Average System Peak Demand Comparism between 2017 & 2018			
	2017	2018	Growth (%)
January	1,680	1,711	1.84
February	1,671	1,797	7.52
March	1,734	1,819	4.92
April	1,697	1,911	12.60
May	1,648	1,814	10.07
June	1,601	1,765	10.19
July	1,519	1,768	16.40
August	1,500	1,765	17.67
September	1,369	1,776	29.67
October	1,642	1,832	11.52
November	1,689	1,951	15.53
December	1,672	1,956	12.54
Average	1,619	1,822	12.54

Reserve margins taking into consideration fuel supply challenges and technical challenges to the power plants averaged 17.7%. The average reserve margin of 17.7% was lower than the required reserve margin of 25% stated in the ESP.

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Bulk customer demand on the NITS grew by 29.6% from 349 MW in 2018 to 453 MW. This was due to the addition of one extra potline of VALCO which increased its demand by 97.7% from 77.4 MW in 2017 to 153 MW in 2018. Demand for the mines increased by 8.8% from 240 MW in 2017 to 261 MW in 2018. Demand by other bulk customers increased by 82 MW in 2018.

Electricity Supply

Electricity supply increased by 11.8% in 2018 from 14,622 GWh in 2017 to 16,350 GWh in 2018. Grid electricity supply (supply from the NITS including import) increased significantly by 12.1% in 2018 from 14,236 GWh in 2017 to 15,960 GWh in 2018. Electricity import reduced by 43.3% in 2018 to 139.8 GWh from 246.8 GWh in 2017. Commissioning of some power plants was undertaken in 2018. The CENIT Power Plant commissioned on Natural gas in December 2018. The Meinery Solar Plant also commenced commissioning in September 2018.

Total electricity supply was 0.4% higher than projected. The major contributor to the higher than projected supply in 2018 was Akosombo GS, Kpong GS and the Sunon Asogli Power Plant generating higher than projected. Ghana was a net exporter to electricity in 2018 with a net export of 362.7 GWh representing a 96.3% increase in export for 2018 largely due to the increase in export to SONABEL.

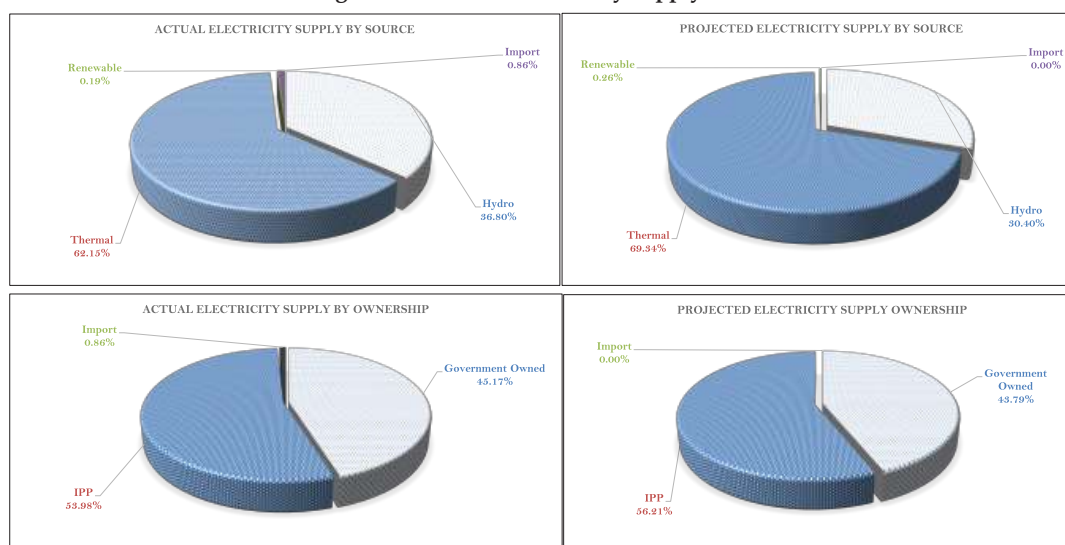
Government's owned power plants contributed 45.1% of the total electricity supplied in 2018 compared to a projected 43.8%. This was predominantly due to the increase in generation from Akosombo GS and Bui GS especially in the last quarter of 2018. IPP generation therefore reduced to 54% from a projected 56.2%. Renewable energy sources, specifically Utility Scale Solar Power Plant accounted for 0.26% of the total supply in 2018, 44.4% higher than projected.

Table 3.0 shows the annual supply of electricity by sources and a comparison with the projections made in the 2018 ESP.

Table 3.0 Annual Electricity supply by source vrs ESP Projection - 2018

Source of Supply	Supply (GWh)			Deviation (%)	Actual Contribution to total Supply (%)	Projected Contribution to total Generation (%)
	Actual	Projected	Deviation (GWh)			
BUI	973.54	756.20	217.34	28.74	5.95	4.64
TAPCO	730.05	1,457.30	(727.25)	(49.90)	4.47	8.94
TICO	2,210.95	2,155.10	55.85	2.59	13.52	13.22
SAPP	1,969.88	1,466.10	503.78	34.36	12.05	8.99
TT2PP	2.68	-	2.68	-	0.02	-
AKOSOMBO	4,272.71	3,600.00	672.71	18.69	26.13	22.08
KPONG	771.12	600.10	171.02	28.50	4.72	3.68
TT1PP	314.34	353.30	(38.96)	(11.03)	1.92	2.17
CENIT	2.22	380.90	(378.68)	(99.42)	0.01	2.34
KARPOWERSHIP	2,556.24	2,708.30	(152.06)	(5.61)	15.63	16.61
AMERI PLANT	872.61	796.60	76.01	9.54	5.34	4.89
KPONE THERMAL	317.44	369.20	(51.76)	(14.02)	1.94	2.26
CENPOWER	79.20	1,061.20	(982.00)	(92.54)	0.48	6.51
AKSA ENERGY	747.56	558.50	189.06	33.85	4.57	3.43
BXC Solar	26.54	25.50	1.04	4.08	0.16	0.16
Safisana	0.32	-	0.32	-	0.00	-
VRA Solar	2.58	4.20	(1.62)	(38.68)	0.02	0.03
Genser	358.83	-	358.83	-	2.19	-
Meinery	1.30	12.90	(11.60)	(89.89)	0.01	0.08
Import	139.83	-	139.83	-	0.86	-
Total Supply	16,349.92	16,305.40	44.52	0.3	100.0	100.0
Domestic Supply	16,210.09	16,305.40	(95.31)	(0.6)		
Total Export	739.50	678.50	61.00	9.0		
Total Supply without export	15,610.42	15,626.90	(16.48)	(0.11)		

Figure 1.0 Shares of electricity supply in 2018



1.1 Hydro Generation Sources

The hydro power plants contributed 36.8% of the total electricity supplied 2018 against a projected 30.4% in the 2018 ESP. The increase in generation is to make up for the deficit in supply from thermal generation as a result of inadequate fuel supply and to prevent spilling of

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water from the hydro dams due to high inflows into the dam especially in September 2018 October 2018 and November 2018. All the hydro plants generated above their projected generation levels. The Akosombo GS generated 18.7% above its projected level, Kpong GS by 28.5% and whiles BUI GS generated 28.7% above its projected level in the 2018 ESP.

The water level for Akosombo GS begun the year 2018 at 251.31 feet which was 0.84 feet higher than the same time in 2017. The end year water level for the Akosombo dam was 10.5 feet higher than the beginning year water level of 251.31. The Akosombo GS's water level rose by 20.86 feet during the inflow season, rising from 242.81 feet to 263.67 feet. Similarly, the Bui GS dam begun the year at 574.03 feet and ended the year at 580.61 feet. The highest water level attained in 2018 by the BUI GS was 594.15 feet which was 6.24 feet lower than the maximum operating level of 600.39 feet.

1.2 Thermal Generation Sources

Thermal generation sources contributed 62.1% of the total electricity supplied in the year against a projected 69.4% in the 2018 ESP. Fuel supply inadequacy and lower than projected demand were the major contributors to the lower than projected contribution of Thermal Power Plants to the total electricity supply. All the thermal power plants deviated significantly from their projected generation by more than 10% except for TICO, Karpowership and AMERI power plants. CENIT Power Plant had the largest deviation of 99.4% (lower than projected) due to inadequate fuel supply (LCO and natural gas) as the power plant did not operate in 2018 but only commissioned on natural gas in December 2018.

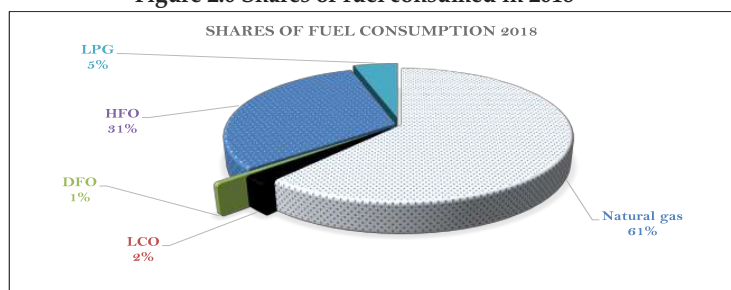
Ghana's fossil fuel dependency in 2018 was 62.1% with an average CO₂ emission factor of 0.34 kgCO₂/kWh of electricity produced in Ghana. Considering only thermal power plants, CO₂ emission factor averaged 0.54 kgCO₂/kWh of electricity produced from thermal plants only.

1.3 Fuel Supply Outturn 2018

Table 1.3 Fuel Supply to Power Plants for 2018

A total of 88.71 Trillion Btu was consumed 2018 which is a marginal increase of 18.7% from the electricity consumed in 2017. Liquid fuel consumption increased to 7.4 barrels from 5.7 barrels in 2017 due to the significant increase in HFO consumption from 3.6 million barrels in 2017 to 4.4 million barrels in 2018. Liquid fuel consumption in 2018 was made up of 0.4 million bbls of LCO, 0.09 million bbls of DFO and 4.5 million barrels of HFO. Natural gas consumption increased from 36.5 BSCF in 2017 to 54 BSCF of natural gas in 2018. Figure 2.0 shows the shares of the various forms of fuel in the total fuel mix.

Figure 2.0 Shares of fuel consumed in 2018



Natural gas accounted for 61% of the total fuel consumption, a marginal decline from the 54.6% recorded in 2017. HFO consumption likewise, saw a marginal increase in its consumption from 29.9% in 2017 to 31% in 2018. LCO and DFO consumption saw decline in its consumption from 12.6% and 2.9% respectively in 2017 to 2% and 2.9% respectively in 2018. LPG which was consumed by Genser Power Plant accounted for 5% of the total fuel consumed in 2018. The Karpowership accounted for 23.9% of the total fuel consumed in 2018 with TICO and Sunon Asogli Power Plant (SAPP) accounting for 19.6% and 17.5% respectively

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
 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, Enyenra, Ntomme
 TT2PP = Tema Thermal 2 Power Plant
 WAGPCo = West African Gas Pipeline Company
 WEM = Wholesale Electricity Market

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