



GHANA WHOLESALE ELECTRICITY MARKET BULLETIN

MARKET WATCH

Monthly Market Data Analysis

ISSUE NO. 34

1st October 2018 to 31st October 2018

This Bulletin covers major developments in the Wholesale Electricity Market (WEM) of Ghana from 1st October, 2018 to 31st October, 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 a write up on Emergency Power Plant electricity generation.

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 for October 2018 was 0.6% lower than the System Peak Load of 2,487 MW projected in the 2018 Electricity Supply Plan (ESP) for October 2018. Likewise, the Ghana Peak Load was also 4.7% lower than the Ghana Peak Load projected in the 2018 ESP for October. Average electricity demand for October 2018 was, likewise, 2.9% lower than the 1,891.4 MW projected in the 2018 ESP. Average export demand for October 2018 of 88.8 MW was significantly lower than projected in the 2018 ESP of 103.5 MW for October 2018. Average demand by CEB and SONABEL was 20.3 MW and 56.5 MW respectively.

The total electricity of 1,404.13 GWh supplied in October 2018 was 0.3% lower than the projected 1,407.8 GWh in the 2018 ESP. Likewise, domestic electricity consumption of 1,338.1 GWh was 0.5% higher than the projected 1,331.8 GWh projected in the 2018 ESP. A total of 66.03 GWh of electricity was exported and was lower than the 76 GWh projected under the 2018 ESP by 13.1%.

There was a significant increase in electricity supply from hydro sources from 29.9% in September 2018 to 46.2% in October 2018. Correspondingly, electricity supply from thermal sources decrease from 69.9% of the total electricity supplied in September 2018 to 53.8% in October 2018. The rate of increase in the hydro water levels decreased significantly in October 2018 due to the significant increase in generation from the hydro power plants. The Akosombo dam water level had a net inflows of 4.81 feet in October 2018 while the Bui Dam had a net inflow of 6.79 feet.

Consumption of natural gas increased

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

	October 2018		September 2018	
	Projected	Actual Outturn	Projected	Actual Outturn
Total Supply (GWh)	1,407.8	1,404.1	1,334.5	1,323.7
Source by Power Plants (GWh)				
AKOSOMBO	315.0	408.3	285.0	286.6
KPONG	51.0	70.0	49.0	58.0
BUI	71.0	170.8	69.0	51.7
Sanon Asogli	118.0	223.4	118.0	215.4
TAPCO	179.0	28.5	173.0	68.8
TICO	101.0	173.6	196.0	193.3
TT:PP	-	1.2	57.0	76.1
CENIT	46.0	-	45.0	-
TT:PP	-	-	-	-
MRP	-	-	-	-
Karpowership	261.0	104.1	147.0	226.3
AMERI	76.0	75.4	73.0	51.5
KTPP	65.0	59.3	-	-
Trojan Power	-	-	-	-
CENPOWER	108.0	10.3	104.0	22.3
AKSA	14.0	28.1	14.0	26.4
BXC Solar	2.2	2.7	2.1	2.0
VRA Solar	0.4	0.3	0.3	0.2
Genser	-	34.8	-	36.0
Meinergy	2.2	-	2.1	-
Total Generation (GWh)	1,407.8	1,390.7	1,334.5	1,314.6
Imports (GWh)	-	13.4	-	9.1
Total Supply (GWh)	1,407.8	1,404.1	1,334.5	1,323.7
Deficit/Over supply (GWh)	-	(3.7)	-	(10.8)
Ghana Coincident Peak Load (MW)	2,251.0	2,243.7	2,211.0	2,290.8
System Coincident Peak Load (MW)	2,384.0	2,471.4	2,384.0	2,401.8

HIGHLIGHTS OF THE MONTH

marginally in the total fuel mix in October 2018 to 70.2% from 65.4% in September 2018. Likewise, LPG consumption increased from 4.9% of the total fuel supply mix to 6.3% of the total fuel supply mix in October 2018. Subsequently, liquid fuel consumption reduced marginally from 29.7% in September 2018 to 23.5% in October 2018. On the individual fuel level, HFO share of the total fuel consumption reduced from 25.6% in September 2018 to 17% in October 2018. Natural gas supply from the West African Gas Pipeline (WAGP) and Ghana National Petroleum Company (GNPC, from the Sankofa fields) increased from 32% and 6.1% respectively in September 2018 to 36.9% and 14% in October 2018. LCO share in the total fuel consumed in October 2018 increased to 6.4% from 3.8% in September 2018.

ELECTRICITY DEMAND AND SUPPLY

Electricity Demand

The System Peak Load recorded an increase of 2.9% in October 2018, from 2,401.2 MW in September 2018 to 2,471.4 MW in October 2018. The increase in the System Peak Load was due to a significant increase in the demand for export. The System Peak Load recorded in October 2018 was 15.6 MW lower than the 2,487 MW projected under the 2018 ESP. On the contrary, the Ghana Peak Load reduced by 2.1%, from 2,291.8 MW in September 2018 to 2,243.7 MW in October 2018. The Ghana Peak Load of 2,243.7 MW recorded in October 2018 was 110.3 MW lower than the 2,354 MW projected under the 2018 ESP. At the System Peak Load, there was no import from CIE but there was export to CIE, CEB and SONABEL. The total electricity exported to CIE, CEB and SONABEL during the System Peak Load were 84 MW, 103 MW and 64 MW respectively. Consequently, a total of 251 MW was exported and was 88.7% more than the 133 MW protected under the 2018 ESP. Electricity generation from hydro sources, constituted 46% of the System Peak Load and 39% of the Ghana Peak Load in October 2018.

Electricity supply

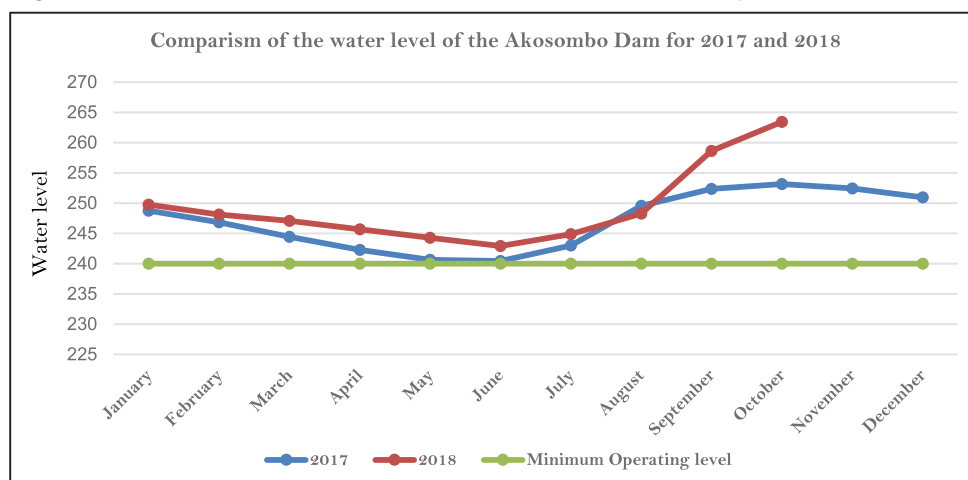
Average electricity supply in October 2018 increased marginally by 2.7%, from 44.12 GWh per day in September 2018 to 45.3 GWh per day. Similarly, the total electricity supplied increased by 6.1%, from 1,323.67 GWh in September 2018 to 1,404.13 GWh in October 2018. The increase in the total electricity supplied was predominantly due to an increase in electricity export in October 2018. The total electricity supplied was almost the same as the 1,407.8 GWh projected under the 2018. Out of the total electricity supplied in October 2018, 13.4 GWh was imported from CIE and the remaining was supplied from domestic sources. A total of 15.14 GWh, 8.85 GWh and 42.03 GWh was exported to CEB, CIE and SONABEL respectively in October 2018. Electricity generation from hydro sources constituted 46.2% of the total electricity supplied in October 2018.

HYDRO DAM LEVELS

Akosombo Dam Water Level continued to increase in October 2018 but at a reduced rate

The water level for the Akosombo GS continued to increase but at a reduced rate in October 2018. The reduction in the rate of increase in the water level of Akosombo GS was predominantly due to increase in the electricity generated by the power plant. The rate of increase in the water level dropped to 0.16 feet per day in October 2018 from 0.35 feet per day in September 2018. As a result, the water level increased from 258.65 feet at the beginning of the month to 263.46 feet at the end of the month, with an increase of 4.81 feet. The month end water level of 263.46 feet recorded in October 2018 was 10.3 feet above the water level of 253.16 feet recorded at the end of October 2017.

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



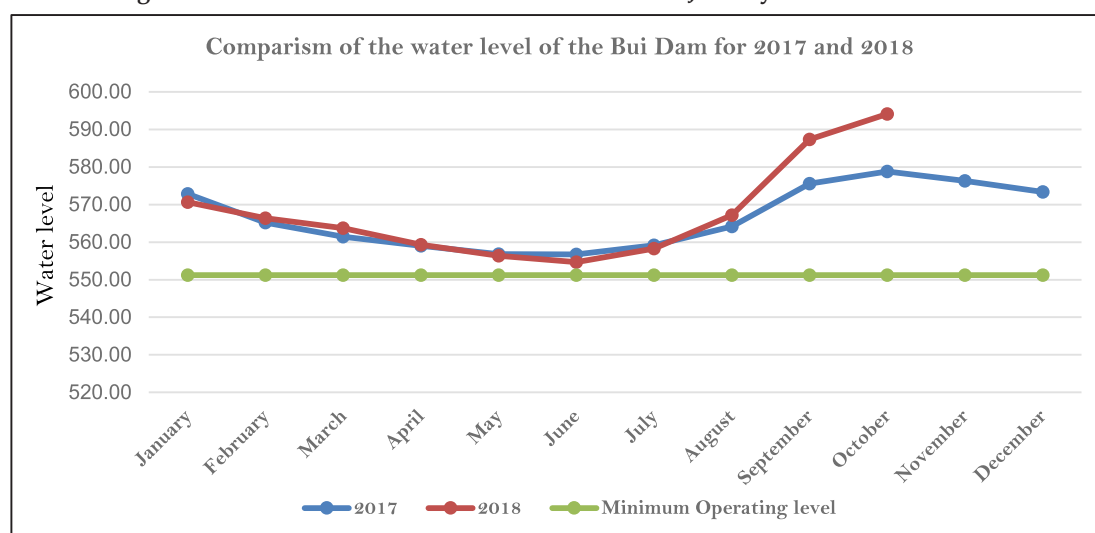
HIGHLIGHTS OF THE MONTH

Bui Dam Water Level continued to increase in October 2018 but at a reduced rate

The Bui GS recorded an increase in the water level but at a reduced rate in October 2018. This was due to a significant increase in the electricity supplied by the Bui GS in October 2018. The rate of increase in the water level dropped from 0.67 feet per day in September 2018 to 0.22 feet per day in October 2018. Therefore, the water level increased by 6.79 feet, from 587.3 feet recorded at the beginning of the month to 594.09 feet at the end of the month. The month end water level of 594.09 feet recorded in October 2018 was 15.27 feet above the water level of 578.82 feet recorded in October 2017.

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

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



FUEL SUPPLY FOR POWER GENERATION

Natural gas flow rate from WAGPCo decreased in October 2018

There was a reduction of 13% in the natural gas flow rate from WAGP to Tema and Kpone in October 2018. Natural gas flow rate decreased from 83.44 MMSCFD in September 2018 to 72.61 MMSCFD in October 2018. Also, natural gas flow rate to Aboadze from WAGP was recorded at 35.26 MMSCFD in October 2018. The natural gas supply from WAGP to Aboadze was to make up for the short falls in natural gas supply from AGPP and ENI as a result of a shutdown. Natural gas from WAGP constituted 41.4% of the total fuel mix and 58.9% of the total natural gas consumed in November 2018.

Natural gas flow rate from GNGC decreased in October 2018.

Natural gas flow rate from AGPP to Aboadze decreased by 4.8%, from 72.14 MMSCFD in September 2018 to 68.65 MMSCFD in October 2018. GNGC supplied natural gas to Aboadze for only 15 days in October 2018. However, a total of 961.04 MMSCF of natural gas was supplied by GNGC to Aboadze which was significantly lower than the 2,164.28 MMSCF supplied in September 2018. The total natural gas supplied by GNGC contributed 14.9% of the total fuel mix which was lower than the 27.3% it recorded in September 2018. The shares of natural gas from GNGC in the total natural gas consumed reduced from 41.8% in September 2018 to 21.2% in October 2018.

Natural gas flow from ENI increased in October 2018

Natural gas supply from ENI to Aboadze power enclave increased significantly close to three folds, from 14.84 MMSCFD in September 2018 to 57.96 MMSCFD in October 2018. A total of 811.42 MMSCF of natural gas was supplied by ENI to Aboadze power enclave in October 2018. The shares of natural gas supply from ENI in the total fuel mix increased from 6.1% in September 2018 to 14% in October 2018. In the total natural gas consumed, the shares of natural gas supply from ENI increased from 9.3% in September 2018 to 19.9% in October 2018.

Liquid Fuel

Liquid fuel consumption decreased significantly by 36.2%, from 402,731.42 barrels in September 2018 to 256,946.18 barrels in October 2018. This was predominantly due to reduced electricity generation from Karpowership in October 2018. This notwithstanding, the shares of liquid fuel consumed in the total fuel mix reduced from 29.9% in September 2018 to 23.6% in October 2018. The shares of HFO in the total fuel mix reduced from 25.6% from September 2018 to 17% in October 2018. HFO shares in the total liquid fuel consumed decreased from 86.1% in September 2018 to 72% in October 2018. LCO shares in the total fuel mix increased from 3.8% in September 2018 to 6.4% in October 2018. Likewise, the shares of LCO in the total liquid fuel consumed increased from 12.8% in September 2018 to 27.1% in October 2018. The shares of DFO in the total fuel mix and the total liquid fuel consumed decreased from 0.3% and 1.1% in September 2018 to 0.2% and 0.9% in October 2018 respectively.

Plant by Plant Highlights

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

There was a significant increase in the electricity generation from the Akosombo GS in October 2018. Average electricity generation increased by 37.9%, from 9.55 GWh per day in September 2018 to 13.17 GWh per day in October 2018. Likewise, the total electricity supplied by the hydro power plant increased by 42.5%, from 286.55 GWh in September 2018 to 408.31 GWh in October 2018. The increase in electricity generated by the hydro power plant was due to short falls in thermal generation as a result fuel supply challenges. The total electricity supplied by the power plant constituted 29.1% of the total electricity supplied in October 2018. The 408.31 GWh of electricity supplied by the power plant was 29.9% higher than the 315 GWh projected under the 2018 ESP. The Akosombo GS contributed 796.6 MW to the System Peak Load and 555.1 MW to the Ghana Peak Load, representing 32.2% of the System Peak Load and 23.9% of the Ghana Peak Load.

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

Average electricity generation from the Kpong GS increased by 16.7% in October 2018, from 1.94 GWh per day in September to 2.26 GWh per day. Consequently, the total electricity supplied by the power plant increased by 20.6%, from 58.05 GWh in September 2018 to 70 GWh in October 2018. The total electricity supplied by the hydro power plant was 37.2% higher than the 51 GWh projected under the 2018 ESP and constituted 5% of the total electricity supplied in October 2018. The Kpong GS contributed 75 MW to the System Peak Load and 106 MW to the Ghana Peak Load, representing 3% of the System Peak Load and 4.6% of the Ghana Peak Load.

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

Average electricity generation from the Bui GS increased significantly by over two folds in October 2018, from 1.72 GWh per day in September 2018 to 5.51 GWh per day. Similarly, the total electricity generated by the power plant increased significantly from 51.73 GWh in September 2018 to 170.78 GWh in October 2018. This significant increase is due to the power plant generating during certain off-peak hours in October 2018 to make up for shortfalls from thermal generation. The total electricity supplied by Bui GS constituted 12.2% of the total electricity supplied and was over a fold more than the 71 GWh projected under the 2018 ESP. The Bui GS contributed 264.5 MW to the System Peak Load and 248 MW to the Ghana Peak Load, representing 10.7% of the System Peak Load and 10.8% of the Ghana Peak Load.

Generation by the Sunon Asogli Power Plant (SAPP) increased in September 2018

There was a marginal increase in average electricity generation from the SAPP by 0.4%, from 7.18 GWh per day in September 2018 to 7.21 GWh per day in October 2018. Similarly, the total electricity supplied by the power plant increased by 3.7%, from 215.44 GWh in September 2018 to 223.41 GWh in October 2018. The total electricity supplied by the power plant constituted 15.9% of the total electricity supplied in October 2018. The power plant generated 89.3% higher than the 118 GWh projected under the 2018 ESP. The SAPP contributed 275 MW to the System Peak Load and 260.9 MW to the Ghana Peak Load, representing 11.1% of the System Peak Load and 11.2% of the Ghana Peak Load. A total of 1,742.94 MMSCF of natural gas was consumed by the power plant with an estimated fuel efficiency of 7,684.68 Btu/kWh in October 2018. The heat rate of 7,684.68 Btu/kWh recorded in October 2018 was lower than the 8,063.64 Btu/kWh in September 2018.

Ameri Energy Power Plant's generation increased in October 2018

Ameri power plant recorded a significant increase in its average electricity by 41.7%, from 1.72 GWh per day in September 2018 to 2.4 GWh per day in October 2018. Similarly, the total electricity supplied by the power plant increased by 46.4%, from 51.46 GWh in September 2018 to 75.36 GWh in October 2018. The total electricity supplied by the power plant constituted 5.4% of the total electricity supplied and was .9% lower than the 76 GWh projected under the 2018 ESP. A load of 213.9 MW was supplied by the Ameri power plant to the System Peak Load and 191 MW to the Ghana Peak Load in October 2018. The Load supplied constituted 8.7% of the System Peak and 8.2% of the Ghana Peak Load. The power plant consumed a total of 746.62 MMSCF of natural gas, with an estimated efficiency of 10,195.26 Btu/kWh in October 2018. The efficiency of 10,195.26 Btu/kWh recorded in October 2018 was higher than the 10,654.79 Btu/kWh recorded in September 2018.

The Karpowership Power Plant's generation decreased significantly in October 2018

The Karpowership recorded a significant reduction in its average electricity supplied by 55.5%, from 7.55 GWh per day in September 2018 to 3.36 GWh per day in October 2018. Consequently, the total electricity supplied by the power plant reduced by 54%, from 226.35 GWh in September 2018 to 104.13 GWh in October 2018. The total electricity supplied by the power plant constituted 7.4% of the total electricity supplied and was significantly lower than the 261 GWh projected under the 2018 ESP by 60%. The Karpowership supplied a total load of 311.5 MW to the System Peak Load and 224.4 MW to the Ghana Peak Load in October 2018. The total load supplied during the peak time constituted 12.6% of the System Peak Load and 9.7% of the Ghana Peak Load. A total of 140,201.22 barrels of HFO, at an estimated efficiency of 8,146.07 Btu/kWh in October 2018. The fuel efficiency recorded in October 2018 was marginally lower than the 8,139.4 Btu/kWh recorded in September 2018.

AKSA Power Plant's generation increased in October 2018

Average electricity generated by the AKSA power plant increased marginally by 3% in October 2018, from 0.88 GWh per day in September 2018 to 0.91 GWh per day. Similarly, the total electricity supplied by the power plant increased by 6.5%, from 26.39 GWh in September 2018 to 28.09 GWh in October 2018. The total electricity generation from the power plant contributed 2% to the total electricity supplied in October 2018 and was a fold more than the 14 GWh projected under the 2018 ESP. AKSA power plant supplied a total load of 15.9 MW to the System Peak Load and 310.3 MW to the Ghana Peak Load, representing 0.6% of the System Peak Load and 13.4% of the Ghana Peak Load in October 2018. The power plant consumed a total of 37,796.54 barrels of HFO, at an estimated fuel efficiency of 8,140.15 Btu/kWh in October 2018. The fuel efficiency of AKSA recorded in October 2018 was marginally higher than the 8,170.57 Btu/kWh recorded in September 2018.

HIGHLIGHTS OF THE MONTH

Takoradi International Company (TICO) generation decreased in October 2018

TICO power plant recorded a reduction of 13% in the average electricity it generated in October 2018. The electricity supplied by the thermal power plant reduced from 6.44 GWh per day in September 2018 to 5.6 GWh per day in October 2018. Similarly, the total electricity supplied by the power plant reduced from 193.29 GWh in September 2018 to 173.6 GWh in October 2018 by 10.2%. The power plant's total electricity supplied constituted 12.4% of the total electricity supplied and was 71.9% higher than the 101 GWh projected under the 2018 ESP. The TICO power plant contributed 312 MW to the System Peak Load and 321 MW to the Ghana Peak Load, translating into 12.6 of the System Peak Load and 13.8% of the Ghana Peak Load. The power plant consumed a total of 1,014.3 MMSCF of natural gas, 52,128.94 barrels of LCO, and 793.06 barrels of DFO. The efficiency of the thermal power plant was recorded at 7,625.49 Btu/kWh in October 2018 and was lower than the 7,471.87 Btu/kWh recorded in September 2018.

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

Average electricity generation from TAPCO reduced significantly in October 2018 by 59.9%, from 2.29 GWh per day in September 2018 to 0.92 GWh per day. Likewise, the total electricity supplied by the power plant reduced by 58.6%, from 68.76 GWh in September 2018 to 28.48 GWh in October 2018. The shares of the electricity supplied by the power plant in the total electricity supplied in October 2018 was 2%. The total electricity supplied was 84.1% lower than the projected 179 GWh under the 2018 ESP. The power plant contributed 105 MW to the System Peak Load but did not contribute to the Ghana Peak Load in October 2018. The load supplied by TAPCO to the System Peak Load constituted 4.3%. A total of 297.9 Btu/kWh was consumed by the power plant at an estimated fuel efficiency of 10,763.96 Btu/kWh. The fuel efficiency recorded in October 2018 was marginally higher than the 10,777.8 Btu/kWh in recorded in September 2018.

Kpone Thermal Power Plant's (KTPP) came back online in October 2018

The KTPP came back online and operated through out October 2018 at an average of 1.91 GWh per day. The power plant supplied a total of 59.31 GWh and constituted 4.2% of the total electricity supplied in October 2018. The total electricity supplied by the power plant was 5.9% lower than the 63 GWh projected under the 2018 ESP. KTPP supplied a total of 102 MW and 104 MW to the System Peak and the Ghana Peak Load respectively. This translate into 4.1% and 4.5% of the System Peak Load and the Ghana Peak Load respectively. The power plant consumed a total of 624.63 MMSCF of natural gas at an estimated fuel efficiency of 10,313.29 Btu/kWh in October 2018.

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

TT1PP operated for a day in October 2018 and supplied a total of 1.22 GWh. The power plant did not contribute to both the System Peak Load and the Ghana Peak. TT1PP consumed a total of 13.73 MMSCF of natural gas, at an estimated fuel efficiency of 11,083.38 Btu/kWh in October 2018.

Embedded Electricity Generation

Genser Power Plant's generation decreased in October 2018

Genser power plant recorded a reduction in the average electricity supplied in October 2018 by 6.3%, from 1.2 GWh per day in September 2018 to 1.12 GWh per day. The power plant supplied a total of 34.83 GWh in October 2018 was 3.2% lower than the 35.99 GWh generated in September 2018. A total of 9,019.06 tonnes of LPG was consumed by the power plant. The fuel efficiency of 11,044.47 Btu/kWh recorded was higher than the 11,047.01 Btu/kWh recorded in September 2018.

BXC Solar generation increased in October 2018

BXC Solar power plant recorded a significant increase in its electricity supply by 35%, from 1.98 GWh in September 2018 to 2.67 GWh in October 2018. The total electricity supplied by the power plant constituted 0.2% of the total electricity supplied and was 21.3% higher than the 2.2 GWh projected under the 2018 ESP.

VRA Navrongo Solar generation increased in October 2018

Electricity generation from the VRA Navrongo solar plant increased by 10.6%, from 0.23 GWh in September 2018 to 0.25 GWh in October 2018. The total electricity generated by the solar power plant was 36.5% lower than the 0.4 GWh projected under the 2018 ESP and contributed 0.02% of the total electricity supplied in October 2018.

Electricity Exchange – Import and Exports increased in October 2018

There was a significant increase in average electricity import from CIE by 43.1% in October 2018, from an average of 0.3 GWh in September 2018 to an average of 0.43 GWh. Consequently, the total electricity imported from CIE increased from 9.06 GWh in September 2018 to 13.4 GWh in October 2018. Import from CIE constituted 1% of the total electricity supplied in October 2018. Electricity imported from CIE did not contribute to both the System Peak Load and the Ghana Peak Load in October 2018.

Average electricity export to CIE, CEB and SONABEL increased in October 2018 by 19.2%, 1.79 GWh per day in September 2018 to 2.13 GWh per day in October 2018. Similarly, the total electricity exported to CIE, CEB and SONABEL increased from 53.61 GWh in September 2018 to 66.03 GWh in October 2018. The total electricity exported to these countries were 13.1% lower than the 76 GWh projected under the 2018 ESP. Out of the total electricity exported, 8.85 GWh, 15.14 GWh and 42.03 GWh were supplied to CIE, CEB and SONABEL respectively.

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

OPERATIONAL FACT SHEET

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

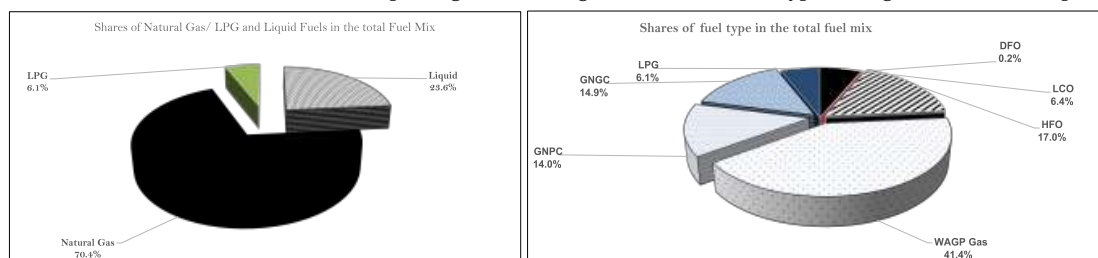


Figure 4a: Contribution of Natural Gas Supply by sources

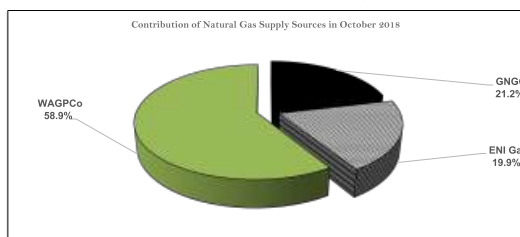
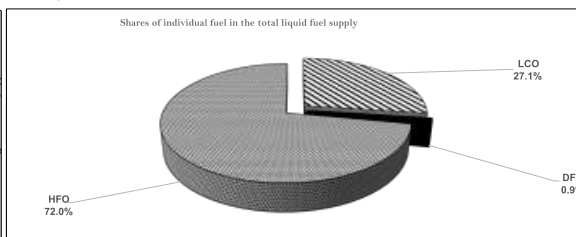


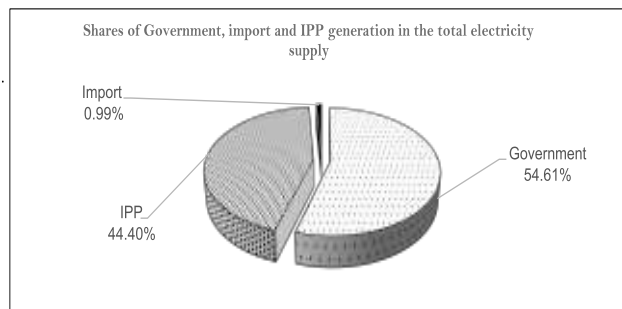
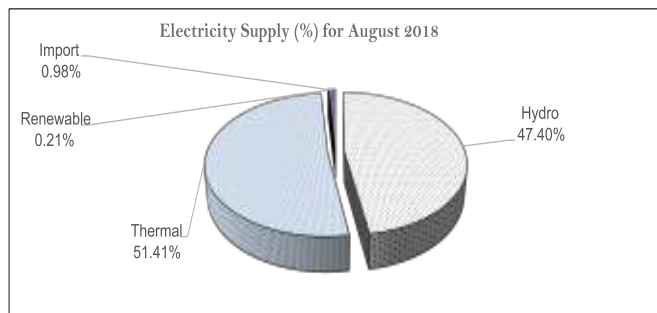
Figure 4b: Contribution of individual fuel in the liquid fuel supply



Peak Electricity Supply - October 2018			
Source of Supply	Generation at System Peak Load of October 2018 (MW)	Generation at Ghana Peak Load of October 2018 (MW)	Electricity Supply (GWh)
AKOSOMBO	796.60	555.10	408.31
KPONG	75.00	106.00	70.00
BUI	264.50	248.00	170.78
SAPP	275.00	260.90	223.41
TAPCO	105.00	-	28.48
TICO	312.00	321.00	173.60
TT1PP	-	-	1.22
CENIT	-	-	-
TT2PP	-	-	-
MRP	-	-	-
KARPOWER	311.50	224.40	104.13
AMERI	213.90	191.00	75.36
KTPP	102.00	104.00	59.31
Trojan Power	-	-	-
CENPOWER	-	-	10.30
AKSA	15.90	310.30	28.09
BXC Solar	-	-	2.67
Safisana	-	-	-
VRA Solar	-	-	0.25
Genser	-	-	34.83
IMPORT	-	-	13.40
Export to CEB	103.00	-	15.14
Export to CIE	84.00	31.00	8.85
Export to SONABEL	64.00	46.00	42.03
System Coincident Peak Load	2,471.40	-	-
Ghana Coincident Peak Load	2,471.40	2,243.70	-
Total Supply	2,220.40	-	1,404.13
Total Supply without export	-	-	1,338.10

Ghana Electricity Demand & Supply		
		Oct-18
Maximum System Peak Load	MW	2,471.4
Minimum System Peak Load	MW	2,070.7
Average Peak Generation	MW	2,257.1
System Base Load	MW	1,114.7
Total Electricity	GWh	1,404.1
Load Factor (LF)	%	74.3

OPERATIONAL FACT SHEET



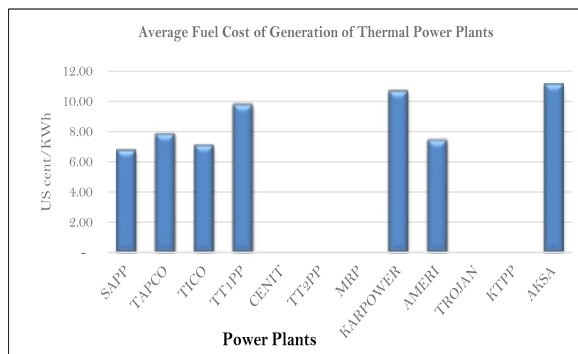
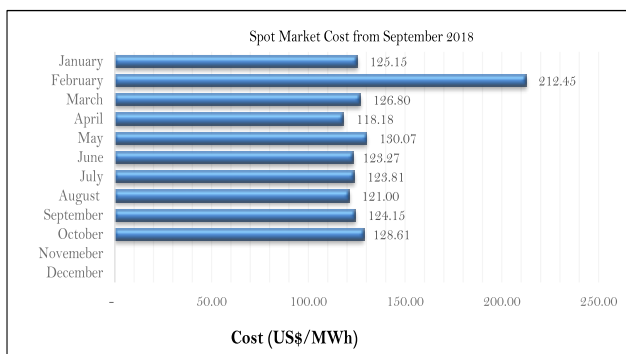
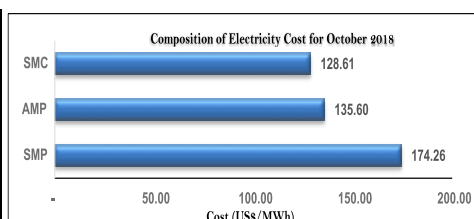
Power Plant Data for October 2018								
	Installed Capacity (MW)	Plant Capacity Utilization (%)	Heat Rate (Btu/kWh)	Natural Gas Consumption (MMBtu)	LCO Consumption (MMBtu)	DFO Consumption (MMBtu)	HFO Consumption (MMBtu)	LPG Consumption (MMBtu)
Akosombo	1,020.00	55.60	-	-	-	-	-	-
Kpong	160.00	60.77	-	-	-	-	-	-
Bui	400.00	59.30	-	-	-	-	-	-
SEAP	560.00	55.41	7,684.68	1,716,795.93	-	-	-	-
TAPCO	330.00	11.99	10,763.96	306,536.14	-	-	-	-
TICO	340.00	70.92	7,625.49	1,043,714.30	275,809.01	4,268.26	-	-
TT1PP	126.00	1.34	11,083.38	13,521.72	-	-	-	-
CENIT	126.00	-	-	-	-	-	-	-
TT2PP	49.50	-	-	-	-	-	-	-
MRP	-	-	-	-	-	-	-	-
KARPOWER	470.00	30.77	8,146.07	-	-	-	848,217.37	-
AMERI	250.00	41.86	10,195.26	768,274.36	-	-	-	-
TROJAN	56.00	-	-	-	-	-	-	-
Cenpower	0.00	-	-	-	128,835.20	9,000.57	-	-
KTPP	220.00	37.45	-	-	-	-	-	-
AKSA	320.00	12.19	8,140.15	-	-	-	228,669.08	-
Genser	95.00	50.92	11,044.47	-	-	-	-	384,679.00
Total	4,522.50			3,848,842.45	404,644.21	13,268.83	1,076,886.45	384,679.00

Natural gas flow rate (MMSCF/D)	
Location	October Monthly Average
Etoki	94.77
Tema WAGPCo	72.61
Aboadze WAGPCo	11.37
Aboadze GNGC	55.51

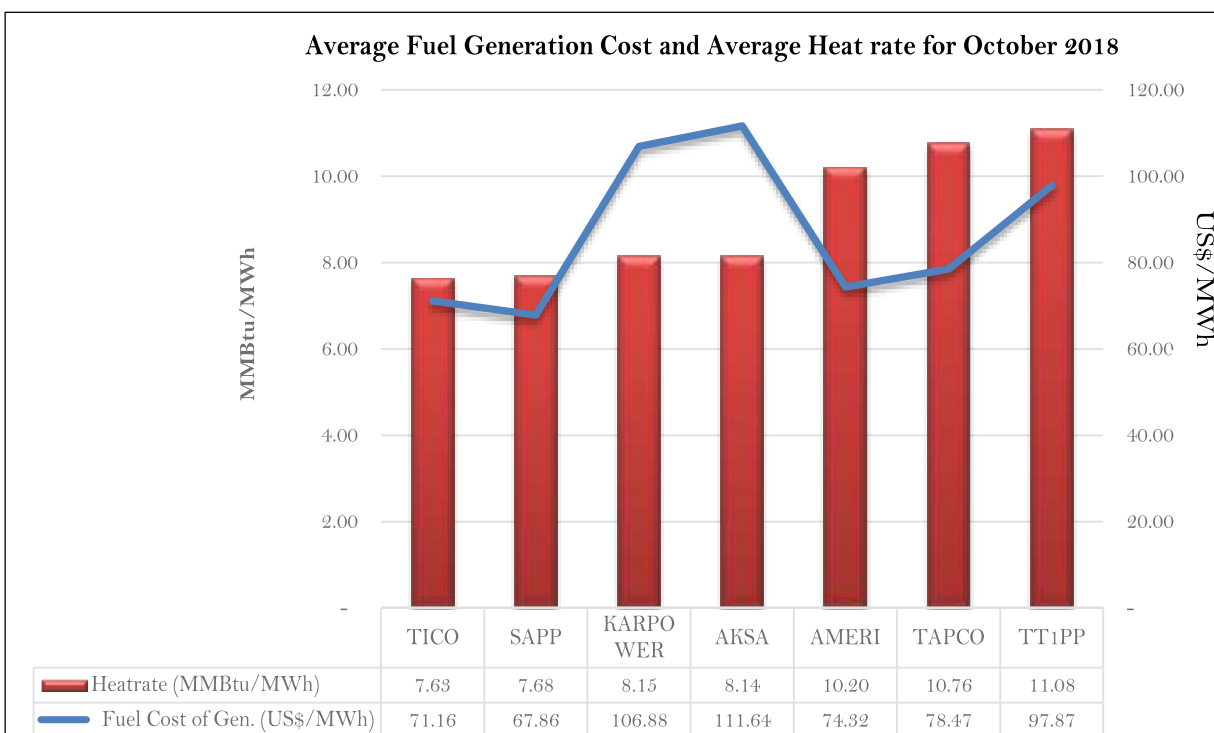
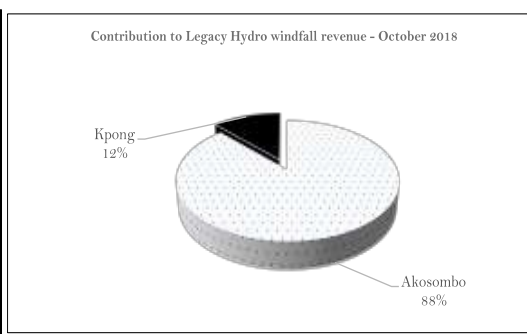
Oct-18			
	Beginning month (ft)	End month (ft)	Change in water level (feet)
Hydro Dam			
Akosombo	258.65	263.46	4.81
Bui	587.30	594.09	6.79

ECONOMIC FACT SHEET

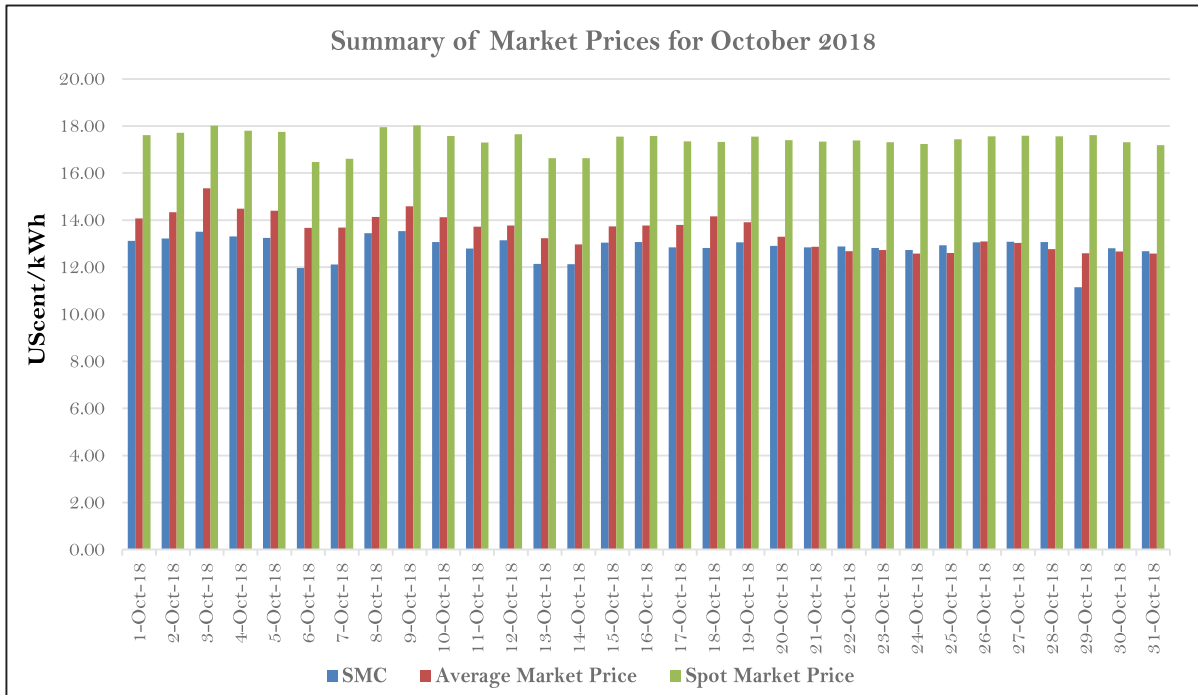
		Oct-18	Sep-18	Change
Average Market Price	US\$/MWh	135.60	133.11	2.48
System Marginal Cost (SMC)	US\$/MWh	128.61	124.15	4.46
System Marginal Price (SMP)	US\$/MWh	174.26	169.15	5.11



Average Fuel Prices		
		Oct-18
Fuel Type	Unit	Delivered Cost
Natural Gas	US\$/MMBtu	8.06
LCO	US\$/BBL	91.03
HFO	US\$/Tonne	476.33
DFO	US\$/Tonne	811.83



ECONOMIC FACT SHEET



Power Plant	Average Heat rate (Btu/kWh)	Average Fuel Cost of Generation (US\$/MWh)	Emission Factor kgCO ₂ /kWh
SAPP	7,684.68	67.86	0.41
TAPCO	10,763.96	78.47	0.57
TICO	7,625.49	71.16	0.44
TT ₁ PP	11,083.38	97.87	0.59
CENIT	-	-	-
TT ₂ PP	-	-	-
KARPOWER	8,146.07	106.88	0.60
AMERI	10,195.26	74.32	0.54
TROJAN	-	-	-
KTPP	-	-	0.55
Cenpower	-	-	-
AKSA	8,140.15	111.64	0.64
Genser	11,044.47	-	0.70

1.0 Emergency Power Plant's Generation in Ghana

Emergency power generator are source of electrical power supports important system on loss of normal power supply. Emergency power are important as they provide quick relief to electrical systems undergoing electricity supply challenges. The main element of emergency power plants is how quick it is deployed. The emergency power plants deployment could range from a few weeks to a few months. Its quick deployment help solve power supply challenges quickly. Emergency power plant could last for a few months to years but for a relatively lower number of years than other conventional power plants procured normally.

Ghana has had its share of emergency power generation. This was largely brought about by low inflows in into the various hydro power plant dams in the country. Also, for some period, there was a combination of low inflows and low supply fuel (natural gas and liquid fuel) for thermal generation. In 1999, Ghana experiences a drought limiting the generation from the dominant hydro sources in the country. The government of Ghana procured 30 MW emergency generation from Aggreko Limited and 30 MW from Cummins Limited to augment the supply from the hydro sources. These emergency power plants were retired in the year 2000. Ghana has made use of emergency power generation to augment its generation since 1999 with diesel engines, HFO plants and natural gas power plants. Emergency power plants that has contributed to Ghana's electricity supply include:

Tema Reserve Power Plant (TRPP)

This is a 25.6 MW CAT diesel engines made up of both CAT C-32 and 3508 models. There are a total of 36 units in all and it is located in the Tema Thermal Power Enclave. The power plant was owned and operated by the Volta River Authority (VRA). In the 2007 and 2008 load shedding brought about by low inflows into the Akosombo hydro dam, this power plant supplied a total of 162 GWh in 2017 and 85 GWh in 2008. It generated at an average capacity of 18.5 MW in 2017 and 10 MW in 2008. The plant currently forms part of the Trojan Power Limited fleets of power plant and has been retrofitted to run on both natural gas and diesel at a ratio of 30:70 respectively. In 2016, the retrofitted power plant generated 32.5 GWh and 22.2 GWh in 2017. The power plant from 2016 fed directly into the ECG 11kV sub-station level (hence it is now an embedded power plant). The power plant did not supply electricity in 2018.

Emergency Reserve Power Plant (ERPP)

The ERPP is made up of 25 CAT C-32 and 3508 engines at a combined installed capacity of 20.5 MW located in the Tema Thermal Power Enclave. The power plant is diesel fired and generated 80 GWh in 2007 and 45 GWh in 2008 at the height of the load shedding 2007 and 2008. The power plant was owned and operated by VRA. Now, the plant is part of the fleet of power plants owned by Trojan Power Limited. It was refurbished in 2016 and supplied 2.91 GWh in that year and about 14.8 GWh in 2017. The power plant did not generate in 2018. The power plant feeds into the 11 kV ECG network at Tema.

Kumasi Reserve Power Plant (KRPP)

Just as ERPP, the KRPP is also made up of 25 CAT C-32 and 3508 diesel engines at a combined installed capacity of 20.5 MW located in Kumasi in the Ashanti Region. The power plant was owned and operated by the VRA. The power plant also generated in 2007 and 2008 at 33 GWh and 16 GWh respectively. This plant is also currently part of the fleet of power plant owned by Trojan Power Limited. The power plant was refurbished by Trojan Power Limited in 2016 producing 3.5 GWh in 2016 and 14.4 GWh in 2017. The power plant did not generate in 2018. The power plant feeds into the 11 kV ECG network at Tema. Just like TRPP and ERPP, the KRPP feeds into the 11 kV ECG network at Tema.

Mine Reserve Plant (MRP)

The MRP was commissioned in 2007 as a reserve plant for the mines operated by VRA. It was financed by a consortium of mining companies. It was later transferred to VRA in 2008. The power plant is located in the Tema Thermal Power Enclave. The MRP is made up 3 set of Pratt & Whitney gas turbines at 45 MW, 25 MW and 15 MW. The combined installed capacity is 80 MW. The power plant generation from 2007 to 2016 is as below

Table 1.0: Mine reserve Power Plant generation from the year 2000 to 2016

Mine Reserve Plant generation 2007 to 2016 (GWh)										
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
GWh	38	46	18	20	12	20	0	195	170	3

The power plant has supplied a total of 522 GWh from 2007 to 2016. The MRP generated of diesel from 2007 to 2012. The power plant was commissioned on natural gas by in February 2014 and generated 368 GWh on natural gas from 2014 to

2016. The power plant was officially decommissioned in 2017.

Karpowership

The Karpowership was the first emergency power plant to be procured during the prolong load shedding period in Ghana from 2012 to 2015. The initial Karpowership was made up of 12 watsila engines and a steam turbine at a combined capacity of 235 MW was commissioned in December 2016. The 235 MW Karpowership was replaced by 470 MW capacity power ship in December 2017. The 470 MW power ship is made up of 24 watsila engines and 2 steam turbines. The power plant is located at the Tema Fishing Harbor. Since coming online, the Karpowership has supplied a total of 6,041.57 GWh from January 2016 to October 2018. The power plant supplied 14% of the total electricity generation in 2016, 12.8% in 2017 and 18.5% of the total generation as at October 2018. The power plant operates on HFO and expected to commence generation on natural gas in August 2019. The Karpowership is expected to be in operation for a period of Ten (10) years.

Ameri Power Plant

The Ameri power plant was also procured during the prolong load shedding period from 2012 to 2015. The power plant consist of 10 GE TM2500+ gas turbine at an installed capacity of 250 MW (25 MW each). The plant is on a Build Operate and Transfer bases (BOT) where Ameri will hand over the plant to the Government of Ghana (GoG) after 5 years of operation the plant. It was commissioned in January 2016 and came online in February 2018 on natural gas. The power plant generated 1,233 GWh in 2016, 1,229 GWh in 2017 and 619.3 GWh as at October 2018.

AKSA Power Plant

The AKSA Power Plant which was contracted as part of the emergency power solution to the power crisis of 2012 to 2015. The power plant begun to feed into the grid on the 28th of March 2017 at an installed capacity of 250 MW. The power plant is owned and operated by AKSA Energy Limited and expected to operate for a period of 6 years. The capacity of AKSA power plant was increase to 325 MW in 2017 with the addition of 4 unit and 360 MW in 2018. The plant therefore has a total of 21 units as at the end of 2018. The AKSA power plant supplied 799 GWh in 2017 and 659.2 GWh from January 2018 to October 2018. This constituted 5.57% of the total electricity supply in 2017 and 5.1% of the total supply as at October 2018. The power plant is situated in the Tema Free Zones Enclave.

Emergency power generation has over the years proven to be critical to our power generation. From 2016, emergency power generation has accounted for 16% of the total supply, 19% in 2017 and 24% as at October 2018. It is projected to increase to 25% in 2019 with the coming online of Early Power Plant. Emergency power plant has become critical to Ghana's power generation largely due to fuel supply challenges to power plant, be it hydro or fossil fuel. Fossil fuel supply challenges has largely being due to lack of funds to procure these fuel. Other reasons include natural gas pipeline rupturing, long period of unplanned maintenance of power plants and insufficient storage capacity for liquid fuels. Ghana is moving towards dominant generation from natural gas and therefore there is the need for Government to ensure that disruption to natural gas supply are reduced to the barest minimum to forestall the need for emergency power generation in the future.

2.0 Ghana continues to be a leader in Utility Scale Solar PV in West Africa

Ghana has since 2013 being increasing its utility scale solar Photovoltaic (PV) production. Utility scale solar PV production has increased from 2.5 MW in 2013 to 22.5 MW in 2015. This was made up of 2.5 MW VRA Solar power plant and a 20 MW BXC solar PV power plant. The Independent Power Producers (IPP), BXC Solar power plant, in Utility Scale solar production gives meaning to GoG's power sector reforms programme which was initiated to promote private sector investments and IPP initiatives in Ghana's power sector. From 2013, total electricity supply from Utility Scale Solar PV was 70.1 GWh as at 2017. This was made up of 22.1% from the 2.5 MW VRA Solar PV power plant and 77.9% from the BXC Solar PV power plant.

Ghana also has a substantial amount of off-grid solar installation which has increased from 1.35 MW in 2014 to 5.35 MW in 2015, 6.59 MW in 2016 and 7.27 MW in 2017. Ghana also has 0.31 MW of mini grids powered by Solar PV.

The 2.5 MW Utility scale solar PV system is owned and operated by the Volta River Authority (VRA), located at the Kassena-Nankana East district specifically in Bolgatanga. The plant was commissioned in 2013 and it supplies electricity directly into the NEDCo sub-transmission network. This plant is made up of 8,622 polycrystalline solar panels each at 295 Wp capacity.

The BXC Solar power plant which is currently operational, was constructed within 18 months from April 2014 to October 2015. BXC was granted a Provisional License by the Energy Commission in June 2013. The installation consists of 80,000 solar panels each of 250Wp capacity. The power plant has 40 inverters each of 500 kW capacity and 20 transformers of 1,000

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kVA capacity each. Power is evacuated through a 33kV sub-station which is about 8km away from the power plant site. The power plant occupies a land area of 100 acres.

On the 15th September 2018, His Excellency, Nana Addo Danquah Akuffo-Addo commissioned a 20 MW Utility Scale solar power plant owned by Meienenergy Ghana Limited and located at Gomoa Amenfi in the Gomoa West District of the Central region. This brings to a total of 42.5 MW of Utility Scale solar PV installed in Ghana. The entire plant is situated on a 130.8 acres of land with 123.6 acres occupied by the PV Plant. Electricity from the plant is evacuated through a 33 kV transmission line from the plant to a break in point at an existing 33 kV transmission line at Kyerekwanta which is 18 km from the plant site. The Kyerekwanta line feeds into the Saltpond Bulk Supply Point (BSP). The power plant consists of 62,360 polycrystalline PV modules at 325 Wp each. These PV modules are connected to 390, 3 phase, 5 kW inverters and 12 transformers at 1,600 kVA each.

Utility Scale solar PV will account for about 0.8% of the total installed capacity in Ghana in 2019 and will supply 0.3% of the electricity to be consumed in 2019. Meienenergy and BXC is projected to generate 25 GWh each in 2019 while VRA solar is projected to generate 4.2 GWh. Utility scale solar PV growth is in line with government agenda of increasing renewable energy in the Ghana energy mix and to reduce further Ghana's carbon footprint when it comes to electricity generation. These plants provide energy close to their load centres thereby reducing technical losses. It is however good to note that solar PV provides intermittent power supply and has the tendency of reducing the power factor in the electrical system.

Acronyms

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

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