



GHANA WHOLESALE ELECTRICITY MARKET BULLETIN

MARKET WATCH

Monthly Market Data Analysis

ISSUE NO. 26: 1st February 2018 to 28th February 2018

This Bulletin covers major developments in the Wholesale Electricity Market (WEM) of Ghana from 1st February, 2018 to 28th February, 2018. It analyses the performance of the key WEM indicators against their benchmarks, and examines the likely implications of any discernable trends in the market. This edition of the WEM bulletin continues with the series on the financial sustainability of the Power Sector for December 2017, January 2018 and February 2018.

The Electricity Market Oversight Panel Secretariat would very much appreciate and welcome comments from readers on the Bulletin. Reasonable care has been taken to ensure the information contained in this Bulletin is accurate at the time of publication, nevertheless, any errors, omissions or inaccuracies therein are regretted.

HIGHLIGHTS OF THE MONTH

Overview of the Month

Electricity supply in February 2018 increased marginally from 41.3 GWh per day in January 2018 to 43.44 GWh per day in February 2018. The 5.08% increase in electricity supply was predominantly due to increase in generation from hydro sources as natural gas supply was curtailed in the Aboadze Power Enclave. Hydro generation increased from 13.65 GWh per day in January 2018 to 17.69 GWh per day in February 2018. The Akosombo GS, the Kpong GS and Bui GS all witnessed an increase in daily average generation by 25%, 26% and 61% respectively. As a result of increase in generation from Hydro sources, there was a corresponding increase in the rate of drop in the water level for both Akosombo dam and the Bui dam from 0.05 feet per day and 0.109 feet per day in January 2018 to 0.058 feet per day and 0.152 feet per day in February 2018. Electricity supply from thermal generation sources decreased from 27.65 GWh per day in January 2018 to 25.74 GWh per day in February 2018 except Karpowership and AKSA power plant which witnessed a significant increase in generation by 17.2% and 29.8% respectively.

There was a significant increase in liquid fuel consumption in February 2018 by 57.8%. The natural gas flow rate from AGPP dropped significantly from 93.53 MMSCF per day in January 2018 to 11.97 MMSCF per day in February 2018. In spite of the drop in flow rate from AGPP, there was an increase in flow rate from WAGP to Aboadze from no flow in January 2018 to 32.37 MMSCF per day in

Table 1. Projected and Actual Outturn of electricity demand and supply in January 2018 and February 2018

	February 2018		January 2018	
	Projected	Actual Outturn	Projected	Actual Outturn
Total Supply (GWh)	1,399.1	1,216.5	1,327.6	1,280.5
Source by Power Plants (GWh)				
AKOSOMBO	288.0	354.9	326.0	314.2
KPONG	57.0	66.8	51.0	58.6
BUI	71.0	73.8	57.0	50.5
Simon Asogli	180.0	15.8	118.0	137.4
TAPCO	162.0	81.7	89.0	88.4
TICO	182.0	101.4	174.0	170.4
TT1PP	-	-	60.0	-
CENIT	-	-	-	-
TT2PP	-	-	-	-
MRP	-	-	-	-
Karpowership	160.0	303.2	287.0	258.6
AMERI	145.0	3.1	92.0	89.2
KTPP	-	31.3	-	-
Trojan Power	-	-	-	-
CENPOWER	-	-	-	0.3
AKSA	132.0	140.9	71.0	108.6
BXC Solar	1.9	2.2	2.2	2.2
VRA Solar	0.2	0.3	0.4	0.2
Total Generation (GWh)	1,999.1	1,175.3	1,327.6	1,278.6
Imports (GWh)	-	41.3	-	1.9
Total Supply (GWh)	1,399.1	1,216.5	1,327.6	1,280.5
Deficit (GWh)	-	(182.5)	-	(47.1)
Ghana Coincident Peak Load (MW)	2,211.0	2,202.7	2,263.0	2,139.0
System Coincident Peak Load (MW)	2,384.0	2,268.7	2,306.0	2,172.3

HIGHLIGHTS OF THE MONTH

February 2018. Natural gas flow rate from WAGP to Tema reduced from 32.62 MMSCF per day in January 2018 to 5.35 MMSCF per day in February 2018.

There was an increase in the System Peak demand in February 2018 by 4.4% when comparing 2,172.3 MW in January 2018 to 2,268.7 MW in February 2018. Similarly, the Ghana Peak demand also increased by 3%, from 2,139 MW in January 2018 to 2,202.7 MW in February 2018.

Export of electricity increased significantly by 30.2% in February 2018 from 0.63 GWh per day in January 2018 to 0.82 GWh per day in February 2018. There was a significant increase in Import of electricity from 0.06 GWh per day in January 2018 to 1.47 GWh per day in February 2018.

Electricity Demand and Supply

Electricity Demand

The System Peak Load continues to increase in February 2018, from 2,172.3 MW in January 2018 to 2,268.7 MW in February 2018, representing an increase of 96.4 MW. Likewise, the Ghana Peak Load continues to increase from 2,139 MW in January 2018 to 2,202.7 MW in February 2018, representing an increment of 63.7 MW. Contribution to both the System Peak Load and the Ghana Peak Load from Hydro sources increased from 46.3% in January 2018 to 48.6% in February 2018 for the System Peak Load and 38.2% in January 2018 to 50.1% in February 2018 for the Ghana Peak Load while generation from thermal sources contributed the rest.

Electricity supply

Average electricity supply in February 2018 increased marginally by 5.2%, from 41.3 GWh per day in January 2018 to 43.4 GWh per day in February 2018. Contrary to this, there was a 5% reduction in the total electricity supplied in February 2018 (1,216.2 GWh) when compared with the total electricity supplied in January 2018 (1,280.33 GWh) due to greater number of days in January 2018 than in February 2018. The contribution from hydro sources in the total electricity supplied increased from 33.1% in January 2018 to 40.7% in February 2018. The contribution of generation from domestic sources in the total electricity supplied reduced from 99.9% in January 2018 to 96.6% in February 2018. There was a significant increase in import from La Cote D'Ivoire (CIE) from 1.92 GWh in January 2018 to 41.25 GWh in February 2018. The total electricity supplied in February 2018 was 1.8 GWh lower than the projected 1,218 GWh under the 2018 Electricity Supply Plan (ESP).

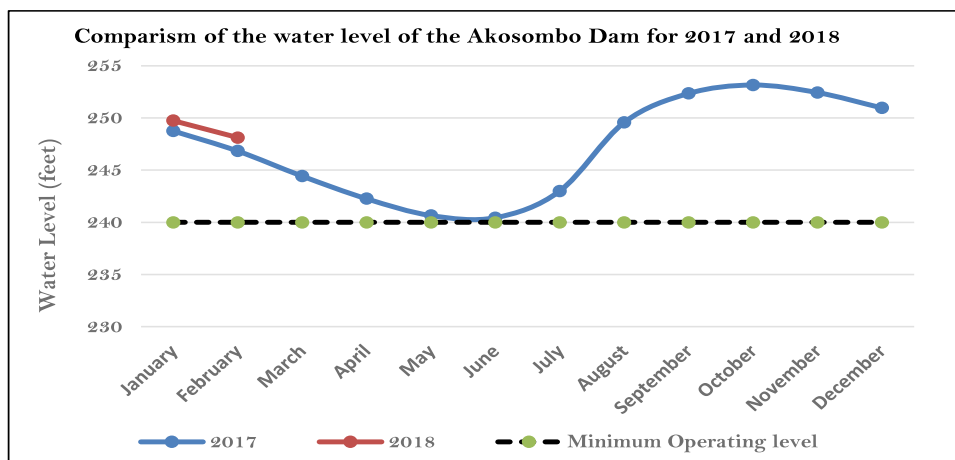
Hydro Dam Levels

Akosombo Dam Water Level continued to decline in February 2018

The water level of the Akosombo dam reduced at an increasing rate from 0.05 feet per day in January 2018 to 0.058 feet per day in February 2018. The water level at the beginning of the month of February 2018 of 249.75 feet reduced by 1.63 feet to 248.12 feet at the end of the month. The water level was 8.12 feet above minimum operating level of 240 feet and was 1.2 feet higher than the water level recorded for the end of February 2017.

Figure 1 shows comparative end of month trajectory of the level of water in the Akosombo dam from January 2017 to February 2018.

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

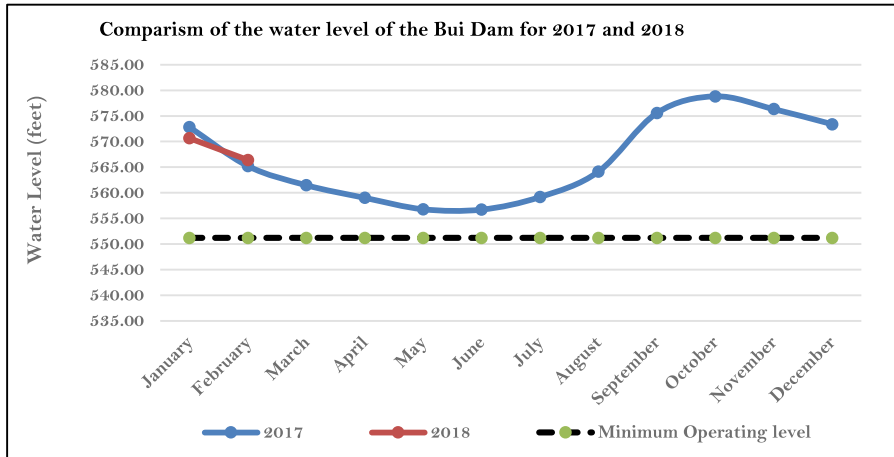


HIGHLIGHTS OF THE MONTH

Bui Dam Water Level continued to decline in February 2018

The Bui dam water level dropped at an increased rate, from 0.11 feet per day in January 2018 to 0.15 feet in February 2018. The water level reduced by 4.26 feet in February 2018 to obtain an end of month water level of 566.39 feet the end of month water level is 15.21 feet higher than the minimum operating water level of 551.18 feet and is 1.02 feet higher than the water level recorded for the same period in 2017. The water level for Bui dam has dropped by 7.64 feet from the 574.03 feet it recorded at the beginning of the year. Figure 2 shows comparative end of month trajectory of the level of water in the Bui dam from January 2017 to February 2018.

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



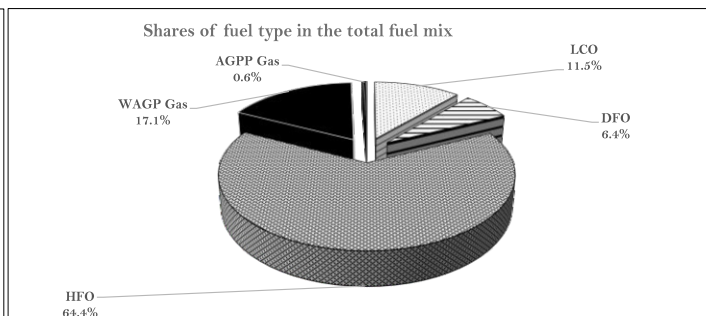
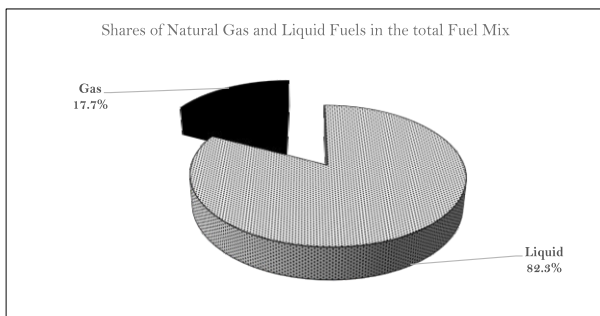
Fuel Supply for Power Generation

Liquid fuel consumption dominated the total fuel supply mix in February 2018. The share of Liquid fuel increased significantly from the 43% recorded in January 2018 to 82% in February 2018. The significant increase in the shares of liquid fuel in the total fuel supply is due to the curtailment of natural gas supply from the AGPP due to mandatory maintenance work and pipeline tie-in work. The share of LCO and DFO increased in the total fuel mix to 12% and 6% respectively in February 2018. The share of HFO in the total fuel supply mix increased in February 2018 from 42% it recorded in January 2018 to 64% in February 2018. The share of natural gas in the total fuel consumed reduced significantly from 57% in January to 18% in February 2018. Natural gas from AGPP contributed 1% of the total fuel mix in February 2018 and was significantly lower than the 41.5% it recorded in January 2018. The share of natural gas supply from WAGPCo in the total fuel mix increased from 15.4% in January 2018 to 17% in February.

Figure 3a and Figure 3b shows the shares of sources of fuel and fuel type in the generation fuel mix for electricity generation respectively.

Figure 3a: Shares of sources of fuel in total fuel mix for power generation

Figure 3b: Shares of fuel type in the generation fuel mix power generation



Natural gas flow rate from WAGPCo declined marginally in February 2018

Natural gas flow rate from Nigeria through the WAGP to Tema and Kpone decreased significantly from 32.62 MMSCF per day in January 2018 to 5.35 MMSCF per day in February 2018. On the contrary, the flow rate to the Aboadze Power Enclave increased significantly from no flow in January 2018 to 32.37 MMSCF per day in February 2018. Hence a total flow rate of 37.72 MMSCF was recorded from WAGP in February 2018. The total natural gas consumed from WAGP decreased marginally in February 2018 from 1,008.77 MMSCF in January 2018 to 977.81 MMSCF in February 2018. The natural gas consumed from WAGP constituted 97% of the total natural gas consumed and 18% of the total fuel mix in February 2018.

HIGHLIGHTS OF THE MONTH

Natural gas flow rate from GNGC decreased significantly in February 2018

The natural gas flow rate from the AGPP to the Aboadze Power Enclave decreased significantly from 93.53 MMSCF per day in January 2018 to 11.97 MMSCF per day in February 2018 as the gas flew for only a day. The total natural gas supplied from AGPP decreased significantly from 2,712.94 MMSCF in January 2018 to 33.22 MMSCF in February 2018. This low recording of natural gas flow rate and consumption was as a result of routine maintenance of the AGPP, including tie-in works at the Transmission Regulatory and Maintenance Station (TRMS) by ENI, Quantum and Marinus Energy on the gas processing plant at Takoradi. The share of natural gas from AGPP in the total fuel mix reduced from 42% in January 2018 to 1% in February 2018 and its share in the total natural gas consumed decreased from 73% in January 2018 to 3% in February 2018.

Figure 4a: Contribution of Gas Supply by sources

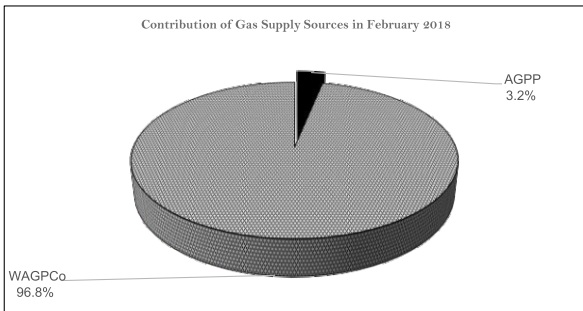
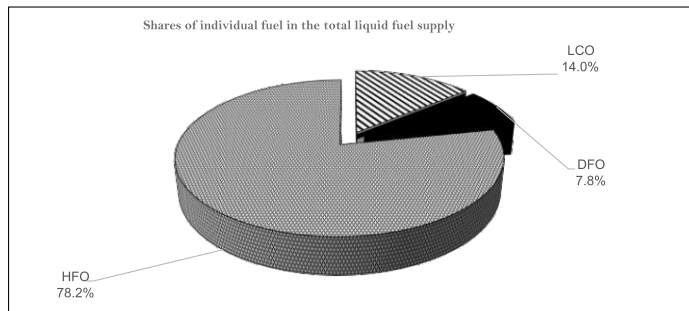


Figure 4b: Contribution of individual fuel in the liquid fuel supply



Liquid Fuel

The total liquid fuel consumption increased in February 2018 by 57.8% from 498,704.6 barrels in January 2018 to 787,140.79 barrels in February 2018. The share of LCO in the total liquid fuel consumed increased from 1% in January 2018 to 14% in February 2018 and 12% of the total fuel mix in February 2018. The consumption of DFO increased from no consumption in January 2018 to 8% of the total liquid fuel consumed and 6% of the total fuel mix in February 2018. HFO's share in the total liquid fuel consumed decreased from 99.2% in January 2018 to 78% in February 2018.

Plant by Plant Highlights

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

The Akosombo GS recorded an increase in its average generation in February 2018, from 10.1 GWh per day in January 2018 to 12.7 GWh per day in February 2018. Likewise, the total electricity generated from Akosombo GS was 354.9 GWh in February 2018 and was 12.9% higher than the 314.2 GWh generated in January 2018. The total electricity generated by Akosombo GS in the total electricity supplied increased from 24.5% in January 2018 to 29.2% in February 2018. The Akosombo GS generated 21.1% higher than the projected electricity generation of 293 GWh under the 2018 ESP. The Akosombo GS contributed 688 MW to both the System Peak Load and the Ghana Peak Load representing 30.3% of the System Peak Load and 31.2% of the Ghana Peak Load in February 2018.

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

The average generation from the Kpong GS increased by 26% in February 2018, from 1.89 GWh per day in January 2018 to 2.38 GWh per day in February 2018. Similarly, the total generation from the Kpong GS increased by 13.9% from the 58.59 GWh in January 2018 to 66.75 GWh in February 2018. The total electricity supplied constituted 5.5% of the total electricity supplied in February 2018 and was 48% higher than the projected 45 GWh under the 2018 ESP. The Kpong GS contributed 103 MW to meet both the System Peak Load and the Ghana Peak Load in February 2018 and it represents 4.54% of the System Peak Load and 4.68% of the Ghana Peak Load.

Electricity supply by the Bui Generation Station (GS) Increased significantly in February 2018

The Bui GS witnessed a significant increase of 62% in its average generation in February 2018, from the 1.6 GWh per day in January 2018 to 2.6 GWh per day in February 2018. Similarly, the total electricity generation of 73.8 GWh by the Bui GS in February 2018 was 46% higher than the 50.47 GWh it recorded in January 2018. The Bui GS' share in the total electricity supplied in February 2018 increased from 3.9% in January 2018 to 6.1% in February 2018. The total electricity generation from the Bui GS in February 2018 was 42% higher than the 52 GWh projection made under the 2018 ESP. The Bui GS contributed 312 MW to meet both the System Peak Load and the Ghana Peak Load which represent 13.7% of the System Peak Load and 14.16% of the Ghana Peak Load.

Generation by the Sunon Asogli Power Plant (SAPP) dropped significantly in February 2018

There was a reduction in average electricity generation from the Sunon Asogli Power Plant (SAPP) in February 2018 by 87% from 4.4 GWh per day in January 2018 to 0.6 GWh per day in February 2018. The total electricity generated by SAPP in February 2018 (15.8 GWh) was 121.6 GWh lower than the 137.4 GWh it generated in January 2018. The SAPP generated 154.2 GWh lower than the 170 GWh projected under the 2018 ESP and contributed 1.3% of the total electricity supplied in February 2018. The power plant did not contribute to the System Peak Load and the Ghana Peak Load. The SAPP consumed 125.74 MMSCF of natural gas to generate the 15.8 GWh at a reduced heat rate of 8,713.92 Btu/kWh in February from 8,003.34 Btu/kWh in January 2018.

CENIT Power Plant continued to be offline in February 2018

The CENIT Power Plant was offline for the whole of February 2018 due to low levels of Light Crude Oil (LCO) stocks at the Tema power enclave and system demands. The Power Plant was also correctly projected to be offline in February 2018 under the 2018 ESP.

Ameri Energy Power Plant's generation dropped significantly in February 2018

Low supply of natural gas to the Ameri Power Plants limited its operations to four days in February 2018. The power plant witnessed a significant drop in the average electricity generated in February 2018 from 2.9 GWh per day in January 2018 to 0.1 GWh per day in February 2018. The Ameri Power Plant generated a total of 3.1 GWh in February 2018 and was significantly lower than the 89. GWh in January 2018. Ameri Power Plant did not contribute to both the System Peak Load and the Ghana Peak Load. The heat rate of the power plant reduced from the 10,178.76 Btu/kWh it recorded in January 2018 to 10,243.18 Btu/kWh in February 2018. The Ameri Power Plant was projected to be offline in February 2018.

HIGHLIGHTS OF THE MONTH

Kpone Thermal Power Plant (KTPP) generation increased in February 2018

The KTPP came back online in February 2018 due to system demand and generated an average of 1.1 GWh per day in February 2018. The Power Plant operated on DFO due to the diversion of natural gas from WAGPCo to the Aboadze Power Enclave for electricity generation to aid system stability. The total electricity generation of 31.4 GWh in February 2018 constituted 2.6% of the total electricity supplied and was 44.9% lower than the projected 57 GWh under the 2017 ESP. KTPP contributed 85 MW to both System Peak Load and the Ghana Peak Load, representing 3.8% of the System Peak Load and 3.9% of the Ghana Peak Load. The power plant consumed 66,985.48 barrels of DFO with its heat rate at 11,475.2 Btu/kWh in February 2018.

The Karpowership Power Plant generation increased in February 2018

The Karpowership average generation increased significantly by 30% in February 2018, from 8.3 GWh per day in January 2018 to 10.8 GWh per day in February 2018. The total generation from the power plant increased by 17.2% in February 2018 from 258.6 GWh in January 2018 to 303.2 GWh in February 2018. The total generation of 303.2 GWh by the power plant constituted 24.9% of the total electricity supplied in February 2018 and was 15.7% higher than the 262 GWh projected under the 2018 ESP. The Karpowership contributed 462.9 MW to meet both the System Peak Load and the Ghana Peak Load, representing 20.4% of the System Peak Load and 21% of the Ghana Peak Load. The Karpowership Power Plant consumed 407,371.82 barrels of HFO to generate the 303.2 GWh of electricity at reduced fuel efficiency from 8,119.89 Btu/kWh in January 2018 to 8,128.9 Btu/kWh in February 2018.

AKSA Power Plant's generation increased in February 2018

The AKSA Power Plant average electricity generation increased significantly by 43.7% in February 2018 from 3.5 GWh per day in January 2018 to 5 GWh per day in February 2018. The power plant generated a total of 140.9 GWh in February 2018 which was 29.8% higher than the 108.6 GWh it recorded in January 2018. The power plant supplied 11.6% of the total electricity supplied in February 2018. The 140.9 GWh of electricity generated by AKSA Power Plant was 5.9% higher than the 133 GWh projected under the 2018 ESP. The power plant contributed 225.8 MW to meet both the System Peak Load and the Ghana Peak Load, representing 10% of the System Peak Load and 10.3% of the Ghana Peak Load. A total of 190,461.84 barrels of HFO was consumed by the power plant to generate the 140.9 GWh of electricity at improved fuel efficiency of 8,178.71 Btu/kWh in February 2018 from 8,193.85 Btu/kWh.

Takoradi International Company (TICO) generation dropped significantly in February 2018

The TICO Power Plant average electricity generation dropped significantly in February 2018 by 34%, from 5.5 GWh per day in January 2018 to 3.6 GWh per day in February 2018. The power plant generated a total of 101.4 GWh in February 2018 and was significantly lower than the 170.4 GWh it recorded in January 2018. The TICO Power Plant total electricity generated contributed 8.6% of the total electricity supplied in February 2018 and was 44.6% lower than the projected 183 GWh under the 2018 ESP. The power plant contributed 163 MW to meet both the System Peak Load and the Ghana Peak Load, representing 7.2% of the System Peak Load and 7.4% of the Ghana Peak Load. A total of 154.03 MMSCF of natural gas and 122,499.97 barrels of LCO were consumed to generate the 101.4 GWh with a reduced fuel efficiency of 7,857.13 Btu/kWh in February 2018 from 7,650.66 Btu/kWh in January 2018.

Takoradi Power Company (TAPCO) Plant's average generation increased in February 2018

The daily average electricity generation from TAPCO power plant increased marginally from 2.85 GWh per day in January 2018 to 2.92 GWh per day in February 2018. Contrarily, TAPCO's total electricity generation of 81.7 GWh in February 2018 was marginally lower than the 88.4 GWh it recorded in January 2018 due to greater number of days in January than in February. The power plant contributed 23% of the total electricity supplied in February 2018 and its total generation was 61.7 GWh higher than the 20 GWh projected under the 2018 ESP. The power plant contributed 151 MW to meet both the System Peak Load and the Ghana Peak Load, representing 6.7% of the System Peak Load and 6.9% of the Ghana Peak Load. The TAPCO Power Plant consumed 698.04 MMSCF of natural gas with its fuel efficiency improving from 8,702.47 Btu/kWh in January 2018 to 8,248.38 Btu/kWh in February 2018.

Tema Thermal 1 Power Plant (TT1PP)'s was offline for February 2018

The TT1PP Power Plant was offline for the whole of February 2018 due to low gas volume from WAGP to power the plant and system demands. The Power Plant was also correctly projected to be offline in February 2018 under the 2018 ESP.

Trojan Power Plant continued to be offline in February 2018

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

BXC Solar average generation increased in February 2018

There was a marginal increase in daily average generation from BXC Solar in February 2018 by 10.2% from 0.07 GWh in January 2018 to 0.08 GWh in February 2018. The total electricity generation of 2.15 GWh supplied in February 2018 was marginally lower than the 2.16 GWh it recorded in January 2018 due to greater number of days in January. The total electricity generated by BXC Solar in February 2018 was 13.2% higher than the projected 1.9 GWh under the 2018 ESP. The solar plant recorded a CUF of 16% in February 2018 and was marginally higher than the 14.5% recorded in January 2018.

Safi Sana generation dropped significantly in February 2018

There was a significant drop in daily average generation from Safi Sana in February 2018 from the 0.6 MWh in January 2018 to 0.4 MWh in February 2018. The power plant generated a total of 0.01 GWh in February 2018 which was 50% lower than the 0.02 GWh in January 2018. The Biogas plant recorded a CUF of 15% in February 2018 and was lower than the 27% recorded in January 2018.

VRA Navrongo Solar Power Plant average generation increased in February 2018

The daily average electricity generation from VRA Solar increased marginally by 3.8% in February 2018 from 5.2 MWh in January 2018 to 5.4 MWh. The total electricity of 0.15 GWh generated in February 2018 was 6.3% lower than the 0.16 GWh in January 2018 due to greater number of days in January. The total electricity of 0.15 GWh was 50% lower than the 0.3 GWh projected under the 2018 ESP. The CUF of the solar plant increased marginally to 8.9% in February 2018 from 8.8% in January 2018.

Electricity Exchange – Imports and Exports increased marginally while Ghana still remained a net importer of electricity

The average electricity import from La Cote D'Ivoire increased significantly from 0.06 GWh per day in January 2018 to 1.47 GWh per day in February 2018. Total import of 41.3 GWh in February 2018 was significantly higher than the 1.9 GWh imported in January 2018. Daily peak import in February 2018 reached a maximum of 110 MW and contributed 78 MW to both the System Peak Load and the Ghana Peak Load.

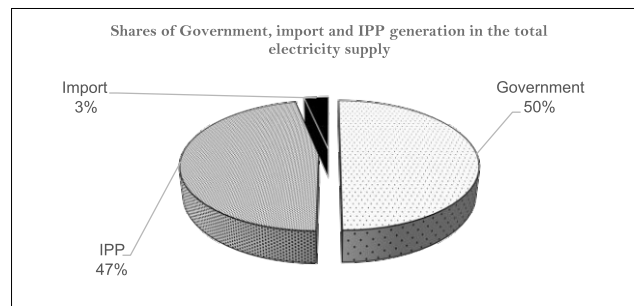
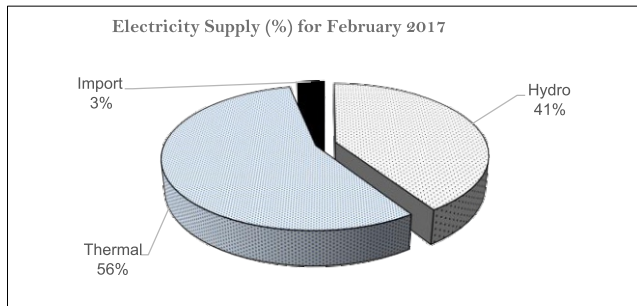
Daily electricity export to CEB increased significantly by 30.2%, from 0.63 GWh per day in January 2018 to 0.82 GWh per day in February 2018. A total of 23.05 GWh of electricity was exported in February 2018 and was 17.8% higher than the 19.57 GWh in January 2018. The total electricity exported was 0.95 GWh lower than the projected 24 GWh under the 2018 ESP. Ghana was a net importer of electricity in February 2018.

OPERATIONAL FACT SHEET

Peak Electricity Supply - February 2018			
Source of Supply	Generation at System Peak Load of February 2018 (MW)	Generation at Ghana Peak Load of February 2018 (MW)	Electricity Supply (GWh)
AKOSOMBO	688.00	688.00	354.86
KPONG	103.00	103.00	66.75
BUI	312.00	312.00	73.77
SAPP	-	-	15.81
TAPCO	151.00	151.00	81.68
TICO	163.00	163.00	101.41
TT1PP	-	-	-
CENIT	-	-	-
TT2PP	-	-	-
MRP	-	-	-
KARPOWER	462.90	462.90	303.19
AMERI	-	-	3.13
KTPP	85.00	85.00	31.35
Trojan Power	-	-	-
CENPOWER	-	-	-
AKSA	225.80	225.80	140.89
BXC Solar	-	-	2.15
IMPORT	78.00	78.00	41.25
Export		66.00	23.05
System Coincident Peak Load	2,268.70	-	-
Ghana Coincedent Peak Load	-	2,202.70	-
Total Supply	-	-	1,216.25
Total Supply without export	-	-	1,193.20

Ghana Electricity Demand		
		Feb-18
Maximum System Peak Load	MW	2,268.7
Minimum System Peak Load	MW	1,837.2
Average Peak Generation	MW	2,076.1
System Base Load	MW	1,265.4
Total Electricity	GWh	1,216.2
Load Factor (LF)	%	72.1

OPERATIONAL FACT SHEET



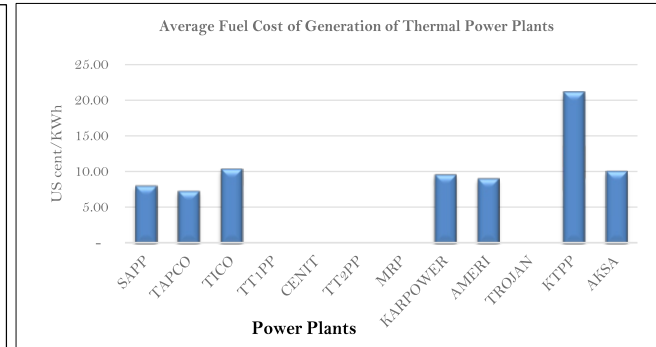
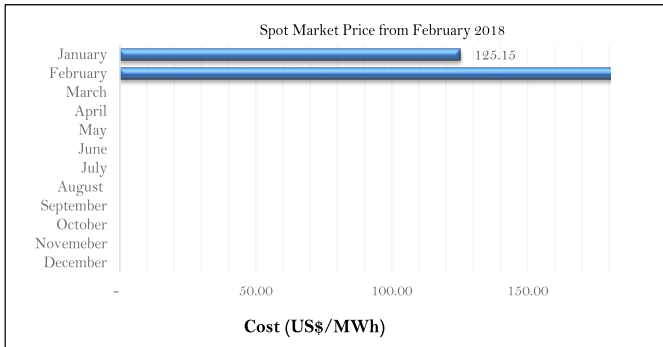
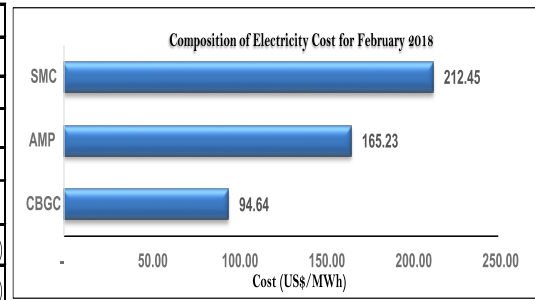
Power Plant Data for February 2018							
	Installed Capacity (MW)	Plant Capacity Utilization (%)	Electricity Generation (GWh)	Gas Consumption (MMBtu)	LCO Consumption (MMBtu)	DFO Consumption (MMBtu)	HFO Consumption (MMBtu)
Akosombo	1,020.00	46.76	354.86	-	-	-	-
Kpong	160.00	56.08	66.75	-	-	-	-
Bui	400.00	24.79	73.77	-	-	-	-
SEAP	560.00	3.79	15.81	137,725.29	-	-	-
TAPCO	330.00	33.27	81.68	673,752.47	-	-	-
TICO	340.00	40.09	101.41	148,675.56	648,135.12	395.12	-
TT1PP	126.00	-	-	-	-	-	-
CENIT	126.00	-	-	-	-	-	-
TT2PP	49.50	-	-	-	-	-	-
MRP	80.00	-	-	-	-	-	-
KARPOWER	470.00	86.70	303.19	-	-	-	2,464,599.51
AMERI	250.00	1.68	3.13	32,061.15	-	-	-
TROJAN	56.00	-	-	-	-	-	-
KTPP	220.00	19.15	31.35	-	-	358,754.43	-
AKSA	290.00	65.30	140.89	-	-	-	1,152,294.12
Total	4,477.50	35.21	1,172.84	992,214.48	648,135.12		2,464,599.51

Location	Monthly Average
Etoki	42.49
Tema WAGPCo	24.96
Aboadze WAGPCo	32.37
Aboadze GNGC	11.97

	Beginning month (ft)	End month (ft)	Change in water level (feet)
Hydro Dam			
Akosombo	249.75	248.12	-1.63
Bui	570.65	566.39	-4.26

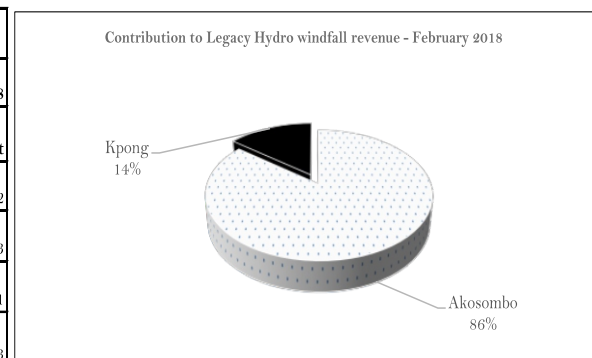
ECONOMIC FACT SHEET

		Feb-18	Jan-18	Change
Average Market Price (AMP)	US\$/MWh	165.23	131.39	33.84
System Marginal Cost (SMC)	US\$/MWh	212.45	125.15	87.30
Composite Bulk Generation Charge (CBGC)	US\$/MWh	94.64	94.64	-
Deviation of AMP from CBGC	US\$/MWh	(70.59)	(36.75)	(33.84)
Deviation of SMP from CBGC	US\$/MWh	(117.81)	(36.75)	(81.06)



Feb-18				
	Average Cost	Average SMP	Difference	Windfall Revenue
Power Plant	US\$/MWh	US\$/MWh	US\$/MWh	US\$/MWh
Akosombo	26.60	212.45	185.85	65,951,184.28
Kpong	45.86	212.45	166.59	11,120,185.02
Total	72.46	-	-	77,071,369.29

Average Fuel Prices		
		Feb-18
Fuel Type	Unit	Delivered Cost
Natural Gas	US\$/MMBtu	9.02
LCO	US\$/BBL	75.23
HFO	US\$/Tonne	417.81
DFO	US\$/Tonne	745.63



Other Market News and Trends

1.0 Financial Sustainability of the Power Sector

1.1 Ability to Recover Cost

1.1.1 Electricity generation unit cost

The ability to recover the cost of electricity generated (fixed cost and variable cost) in December 2017, January 2018 and February 2018 did increase from what was recorded in October 2017 and November 2017. The increase in the cost of bulk generation was as a result of increase in liquid fuel consumption in December 2017, January 2018 and February 2018. The cost of bulk generation was GHp11.04/kWh higher than the gazetted BGT of GHp35.97/kWh in December 2017 and GHp11.45/kWh in January 2018 and GHp10.5/kWh in February 2018. Likewise, the cost of bulk generation was US cent1.17/kWh higher than the US dollar equivalence of the BGT (US cent 9.48/kWh) in December 2017, US cent 1.26/kWh higher in January 2018 and US cents 1.02/kWh higher in February 2018.

Table 1.1.1 shows the comparison between the cost of generation of power plants for December 2017, January 2018 and February 2018 with the approve BGT tariff by the PURC showing the effect of exchange rate variability on the ability to recover cost. Analysis A presents the BGT in terms of GHp which is the predominate currency for payment in the regulated market. Analysis B presents the effect of exchange rate of the BGT.

Table 1.1.1 Comparison between cost of generation and PURC approve tariff for December 2017, January 2018 and February 2018

	Dec-17	Jan-18	Feb-18
Analysis A			
Cost of Generation (GHp/kWh)	47.01	47.41	46.42
PURC CBGT (GHp/kWh)	35.97	35.97	35.97
Difference (GHp/kWh)	-11.04	-11.45	-10.45
Analysis B			
Cost of Generation (USCent/kWh)	10.65	10.74	10.50
PURC CBGT (USCent/kWh)	9.48	9.48	9.48
Difference (USCent/kWh)	-1.17	-1.26	-1.02
Average Monthly Exchange rate (GHS/US\$)	4.42	4.41	4.42

The effect of exchange rate was not really influential as the average cost of generation was higher than PURC gazetted BGT of US Cent 9.48/kWh.

The ability to recover cost was clearly not meet in December 2017, January 2018 and February 2018.

1.2 Ability to reliably meet demand

1.2.1 Ratio of installed capacity to Demand and Capacity Factor

The ratio of installed capacity to demand measures the extent to which our installed capacity adequately meets demand. This ratio was adequately met in December 2017, January 2018 and February 2018. The ratio was found to be 2.6, 2.6 and 2.4 for December 2017, January 2018 and February 2018 respectively. The relative increase in demand in February 2018 caused the ratio of installed capacity to demand to be less than the 2.6 recorded for both December 2017 and January 2018. Ghana's installed capacity could still meet more than twice of Ghana's demand in December 2017, January 2018 and February 2018. The ratio compares positively with the average Upper Middle Income countries, OECD countries, and the average for the globe.

The capacity factor of a power system measures the extent to which the supply system is being utilized. The capacity factor has dropped from 42% in November 2017 to 38% in December 2017 and increased marginally to 39% in January 2018 and 41% in February 2018. An average of 39% of the power system that was being utilized was marginally higher than the average capacity factor for low middle income countries and less than the 50% average for the globe, South Sahara African Countries, lower and upper middle income countries.

Table 1.2.1 Ratio of installed capacity to demand and capacity factor for December 2017, January 2018 and February 2018

	Ghana			World	SSA	OECD	Income Non-OECD	Upper Middle Income	Lower Middle Income	Low Income
	Dec-17	Jan-18	Feb-18							
Ratio of Installed capacity to Deman	2.6	2.6	2.4	2.60	2.20	2.30	2.50	2.40	3.10	2.90
Capacity Factor	0.38	0.39	0.41	0.50	0.50	0.50	0.50	0.50	0.50	0.40

1.2.2 Reserve Margin

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

Table 1.2.2 Average Constrained and unconstrained reserve margin

Reserve Margin	Dec-17	Jan-18	Feb-18
Constrained Reserve Margin (%)	26.91	26.38	15.33
Unconstrained Reserve Margin (%)	51.41	50.56	48.37

The constrained reserve margin witnessed a marginal increment from the 25.95% in November 2017 to 26.91% in December 2018 and 26.38% in January 2018 but reduced significantly in February 2018 to 15.33%. The significant drop in constrained reserve margin in February 2018 was as a result of lack of natural gas flow from GNGC to the Aboadze enclave. The improved reserve margin compares favorably with the 18% to 25% recommended by the International Energy Agency (IEA). There was however an average of 27% capacity unavailable due to technical and fuel supply challenges.

1.3 Ability to make investments

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

The capacity annual growth indicator measures the annual growth in the installed capacity as a means of our ability to make investment in the power sector. The installed capacity grew by 23.6% between December 2016 and December 2017, 17.7% between January 2017 and January 2018 and 12.3% between February 2017 and February 2018. These measures are considerably higher than the average for SSA, Upper Middle Income; Lower Middle Income and Low Middle Income Countries.

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

	Ghana			SSA	High Income Non-OECD	Upper Middle Income	Lower Middle Income	Low Income
	Dec-17	Jan-18	Feb-18					
Capacity Annual growth (%)	23.64	17.68	12.26	3.10	3.10	2.70	3.90	3.40
Ratio of installed capacity growth to demand growth	28.57	9.10	2.60	0.20	0.60	0.70	0.30	0.02

A high growth in capacity will not be significant if it is not able to meet the required demand. The indicator that measures the ability of the growth in capacity to meet the growth in demand is the ratio of the growth in installed capacity to growth in demand. The ratio of installed capacity growth to demand growth increased significantly from 11.16 in November 2017 to 28.57 in December 2017 and decreased to 9.1 in January 2018 and 2.6 in February 2018. The ratio was higher than the average for the World, OECD countries and all the Economic Classes of the world.

1.4 Ability to operate according to environmental and social norms

1.4.1 Emission factor and Fossil fuel dependency

The increase in supply of electricity from Hydro sources ensured a reduction in thermal generation in February 2018. Fossil fuel dependency reduced to 59.27% in February 2018 from the 67% recorded in January 2018 and 69% in December 2017. The fossil fuel dependency in February 2018 compares favorably with the average for the globe and Lower middle income countries and that of December 2017 and January 2018 were significantly higher than SSA and Lower Middle Income countries.

The emission factor has been relatively constant since July 2017 to February 2018; it has been fluctuating between 0.34kgCO₂/kWh and 0.35kgCO₂/kWh. The emission factor for December 2017 and January 2018 was 0.35kgCO₂/kWh and 0.34kgCO₂/kWh in February 2018. The emission factor in February 2018 was marginally lower than that of December 2017 and January 2018 due to lower fossil fuel dependency. The emission factors were relatively lower than the average for the World, SSA and Lower Middle Income countries.

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

Table 1.4.1 Emission Factor and Fossil fuel dependency for the third quarter of 2017

	Ghana			World	SSA	High Income Non-OECD	Upper Middle Income	Lower Middle Income	Low Income
	Dec-17	Jan-18	Feb-18						
Emission Factor (KgCO ₂ /kWh)	0.35	0.35	0.34	0.60	0.50	0.90	0.70	0.50	0.30
Fossil Fuel Dependency (%)	69	67	59.3	60.70	45.30	84.40	66.40	59.40	40.60

1.4 Conclusions

The installed capacity of Ghana continues to be more than two folds of our required demand even though there has been a relative increase in demand from 2,134.9MW in December 2017 to 2,268.7MW in February 2018. The ratio of installed capacity growth to demand growth increased significantly to 28.6% in December 2017. The relative increase in demand in January 2018 and February 2018 reduced the ratio to 9.1 and 2.6 respectively. The capacity annual growth dropped from the average of 23% from October 2017 to 17.68% and 12.26% in January 2018 and February 2018 respectively. Capacity factor increased from 38% in December 2017 to 41% in February 2018 due to relative increase in demand. The constrained reserve margin for December 2017 and January 2018 was above the recommended range by IEA but that of February 2018 was 15.3% lower than the range due to fuel supply challenges. The emission factor is still relatively stable between 0.33kgCO₂/kWh and 0.35kgCO₂/kWh as at February 2018. An emission factor of 0.35kgCO₂/kWh was recorded for both December 2017 and January 2018 and 0.34kgCO₂/kWh for February 2018.

2.0 Performance Indicators of Power Plants

2.1 Capacity Utilization Factor (CUF)

There was a general increase in CUF of the hydro power plants in February 2018 due to increase in electricity supply. The CUF of Akosombo GS increased from 41.41% in January 2018 to 46.76% in February 2018. Similarly, the CUF of Kpong GS and Bui GS increased from 49.22% and 17% respectively in January 2018 to 56.1% and 24.79% respectively in February 2018.

Thermal power plants witnessed a general reduction in CUF in February 2018, except Karpowership and AKSA because of relatively constant supply of HFO. The CUF of SAPP, TAPCO, TICO and Ameri power plants dropped from 32.98%, 36.01%, 67.36% and 47.98% respectively in January 2018 to 3.79%, 33.27%, 40.09% and 1.6% respectively in February 2018. Karpowership had a significant increase in CUF from 73.96% in January 2018 to 86.7% in February 2018. The CUF of AKSA power plant increased from 50.31% in January 2018 to 65.3% in February 2018.

The System Load Factor (LF) increased marginally from 79.2% in January 2018 to 79.8% in February 2018.

The Plant utilisation factors of the various plants are contained in table 2.1.

Table 2.1.1: Power Plant Capacity Utilization, Average heat rate and Average Fuel Cost of Generation

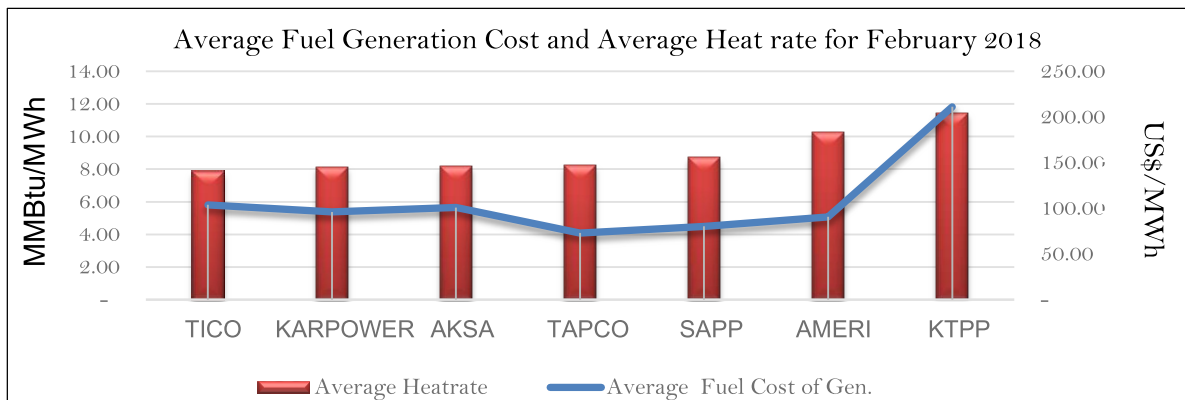
Power Plant	Capacity Utilization (%)	Average Heat rate (Btu/KWh)	Average Fuel Cost of Generation (US\$/MWh)
Akosombo	46.76	-	-
Kpong	56.08	-	-
Bui	24.79	-	-
SAPP	3.79	8,713.92	80.17
TAPCO	33.27	8,248.38	72.92
TICO	40.09	7,861.03	103.83
TT1PP	-	-	-
CENIT	-	-	-
TT2PP	-	-	-
MRP	-	-	-
KARPOWER	86.70	8,128.90	96.05
AMERI	1.68	10,243.18	90.55
TROJAN	-	-	-
KTPP	19.15	11,444.65	211.25
AKSA	65.30	8,178.71	100.87

2.2 Heat Rate (Fuel Efficiency)

There was a general reduction in fuel efficiency of the thermal power plants in February 2018 except TAPCO and AKSA power plant. The TICO power plant had a reduction of 3% in its fuel efficiency of 7,650.66 Btu/kWh in January 2018 to 7,857.13 Btu/kWh in February 2018. Likewise, Ameri, SAPP and the Karpowership witnessed a reduction in fuel efficiency from 10,178.76 Btu/kWh, 8,003.34 Btu/kWh and 8,119.89 Btu/kWh in January 2018 to 10,243.18 Btu/kWh, 8,713.92 Btu/kWh and 8,128.9 Btu/kWh in February 2018. The TAPCO power plant had an improvement of 5.2% in its fuel efficiency from 8,702.47 Btu/kWh in January 2018 to 8,248.38 Btu/kWh in February 2018. Similarly, the AKSA power plant had a marginal improvement of 0.2% in fuel efficiency from 8,193.85 Btu/kWh in January 2018 to 8,178.71 Btu/kWh in February 2018. KTPP operated in February 2018 with a fuel efficiency of 11,475.2 Btu/kWh.

Figure 2.1 shows the ranking of the thermal power plants based on their efficiency levels with their corresponding fuel cost of electricity generation. The chart indicates the effect of fuel prices on the cost of generation of the thermal power plants.

Figure 2.1: Fuel efficiency ranking of thermal power plants with their respective fuel cost of generation.



2.3 Average Fuel Cost of Electricity Generation

There was a general increase in the average fuel cost of generation for thermal power plants in February 2018 from an average of US\$84.39/MWh in January 2018 to US\$107.95/MWh. The increase in average fuel cost of generation was as a result of increase in liquid fuel consumption and reduced fuel efficiency of some of the thermal plants. The TICO power plant witnessed the most increase in its average fuel cost of electricity generation by 53.37% from US\$67.63/MWh in January 2018 to US\$103.83/MWh in February 2018. The average fuel cost of electricity generation of SAPP, TAPCO, and AMERI power plant had an increase of 7.39%, 6.08% and 0.63% from US\$74.65/MWh, US\$68.74/MWh and US\$89.98/MWh in January 2018 to US\$80.17/MWh, US\$72.92/MWh and US\$90.55/MWh in February 2018 respectively. Contrarily, Karpowership and AKSA power plant had reductions in their average fuel cost of electricity generation from US\$100.11/MWh, and US\$105.25/MWh in January 2018 to US\$96.05/MWh and US\$100.87/MWh in February 2018 respectively due to the relative cheaper cost of HFO compared to LCO. The average fuel cost of electricity generation for KTPP was US\$211.25/MWh in February 2018, the higher cost was due to the use of DFO which cost \$18.5/MMBtu compared to \$11.82/MMBtu for HFO and \$14.2/MMBtu for LCO.

Acronyms

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

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