



GHANA WHOLESALE ELECTRICITY MARKET BULLETIN

MARKET WATCH

Monthly Market Data Analysis

ISSUE NO. 40

1st April 2019 to 30th April 2019

This Bulletin covers major developments in the Wholesale Electricity Market (WEM) of Ghana from 1st April, 2019 to 30th April, 2019. It analyses the performance of the key WEM indicators against their benchmarks, and examines the likely implications of any discernable trends in the market. This edition of the WEM bulletin presents the continuation of the Draft Electricity Transmission Ancillary Services Pricing Policy and Guidelines of PURC for comments and inputs.

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 increased in April 2019 by 3.9%, from 2,650.2 MW in March 2019 to 2,752.6 MW. Also, the System Peak Load recorded in April 2019 was 3.8% higher than the 2,653 MW that was projected in the 2019 Electricity Supply Plan (ESP). Similarly, the Ghana Peak Load increased from 2,496 MW in March 2019 to 2,546.7 MW in April 2019 by 2%. The Ghana Peak Load recorded in April 2019 was 1.7% higher than the 2,503 MW that was projected in the 2019 ESP. Electricity import did not contribute to the System Peak Load but contributed 10 MW to the Ghana Peak Load in April 2019. The total electricity exported to CIE, CEB and SONABEL at the System Peak Load was 260 MW which was 73.3% higher than the 150 MW projected in the 2019 ESP.

A total of 1,564.11 GWh of electricity was supplied in April 2019, which was 6.6% higher than the 1,467.3 GWh that was projected in the 2019 ESP. Likewise, the total electricity of 1,465.52 GWh consumed domestically was higher than the 1,387.2 GWh that was projected in the 2019 ESP by 5.7%. A total of 93.77 GWh of electricity was exported to CIE, CEB and SONABEL in April 2019, which was 17.1% higher than the 80.1 GWh that was projected in the 2019 ESP.

The proportion of electricity generated from hydro sources in the total electricity supplied decreased from 47.1% in March 2019 to 40.9% in April 2019. Electricity generated from thermal sources contributed 58% of the total electricity supplied in April 2019 which was higher than the 51.9% recorded in March 2019. A total of 0.3% was supplied from the three solar power plants in April 2019.

Table 1. Projected and Actual Outturn of electricity demand and supply in March 2019 and April 2019.

	April 2019		March 2019	
	Projected	Actual Outturn	Projected	Actual Outturn
Total Supply (GWh)	1,467.2	1,557.3	1,355.3	1,451.4
Source by Power Plants (GWh)				
AKOSOMBO	364.9	499.0	341.4	584.3
KPONG	65.4	76.6	83.7	89.5
BUI	53.4	62.8	55.2	76.0
Sunon Asogli	268.5	181.3	271.9	191.5
TAPCO	93.5	51.6	161.5	44.1
TICO	195.8	78.8	67.7	94.2
TT1PP	-	19.1	-	-
CENIT	-	-	-	-
TT2PP	-	6.7	-	6.7
MRP	-	-	-	-
Karpowership	248.5	201.8	256.7	211.7
AMERI	83.6	144.3	154.0	137.6
KTPP	-	26.6	-	27.9
Trojan Power	-	-	-	-
CENPOWER	-	36.1	-	9.4
AKSA	89.0	123.8	55.0	126.5
BXC Solar	2.2	2.5	2.1	2.9
VRA Solar	0.2	0.3	0.3	0.3
Genser	-	34.0	-	37.8
Meinergy	2.2	-	2.3	-
Total Generation (GWh)	1,467.2	1,545.4	1,451.8	1,580.5
Imports (GWh)	-	12.0	-	13.5
Total Supply (GWh)	1,467.2	1,557.3	1,451.8	1,594.0
Deficit/Over supply (GWh)	-	90.1	-	142.2
Ghana Coincident Peak Load (MW)	2,491.0	2,546.7	2,503.0	2,496.6
System Coincident Peak Load (MW)	2,641.0	2,752.6	2,621.0	2,650.2

HIGHLIGHTS OF THE MONTH

There was a reduction in the rate of drop in the water level for both Akosombo GS and Bui GS in April 2019 due to a reduction in the total electricity supplied. The rate of drop for Akosombo GS reduced from 0.07 feet per day in March 2019 to 0.06 feet per day in April 2019. The rate of drop for Bui GS reduced from 0.15 feet per day in March 2019 to 0.13 feet per day in April 2019.

Liquid fuel consumption dominated the total fuel mix in April 2019 with a share of 49.6% which was higher than the 39.9% it recorded in March 2019. The share of natural gas consumed in the total fuel mix reduced from 54.2% in March 2019 to 45.3% in April 2019. The share of LPG in the total fuel mix reduced from 5.8% in March 2019 to 5.2% in April 2019.

ELECTRICITY DEMAND AND SUPPLY

Electricity Demand

There was an increase in the System Peak Load in April 2019 by 3.9%, from 2,650.2 MW in March 2019 to 2,752.6 MW. The increase in the System Peak Load was significantly due to an increase in domestic demand. The Ghana Peak Load increased by 2%, from 2,496.6 MW in March 2019 to 2,665.7 MW in April 2019. There was no electricity import at the System Peak Load but there was an electricity import of 10 MW at the Ghana Peak Load in April 2019. Out of the total electricity of 260 MW exported at the System Peak Load in April 2019, 9 MW was supplied to CIE, 144 MW was supplied to CEB and 107 MW was supplied to SONABEL in April 2019. Electricity generated from hydro sources contributed 40.3% of the System Peak Load and 36.2% of the Ghana Peak Load in April 2019. The Load Factor reduced in April 2019 from 78.8% in March 2019 to 76.7%. There was an increase of 6.6% in the average electricity demand in April 2019, from 2,145 MW in March 2019 to 2,172 MW.

Electricity supply

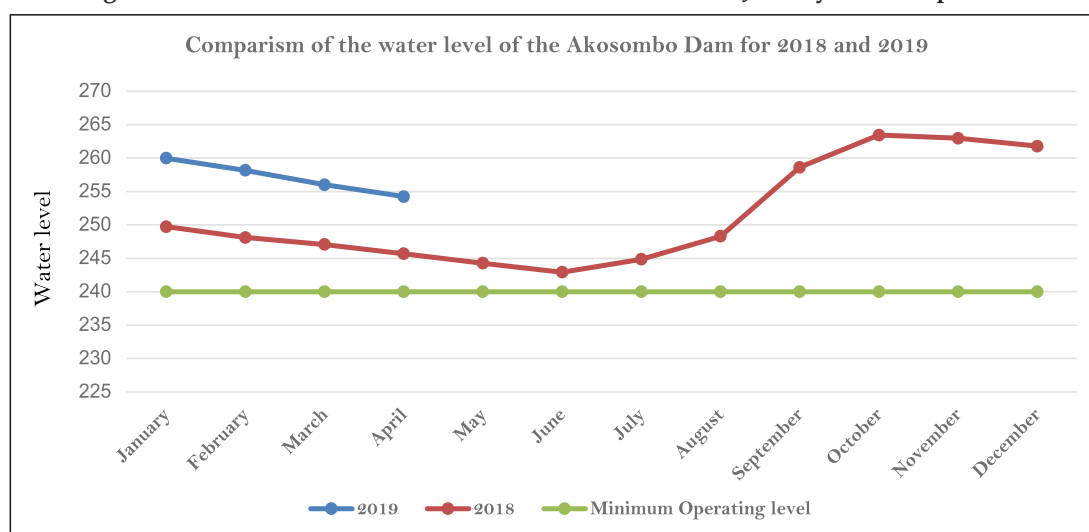
The average electricity supplied increased in April 2019 by 1%, from 51.48 GWh per day in March 2019 to 51.98 GWh per day. On the contrary, the total electricity supplied decreased by 2.3%, from 1,595.98 GWh in March 2019 to 1,559.29 GWh in April 2019. This was due to greater number of days in March than in April. Out of the total electricity supplied, 11.99 GWh was imported from CIE and the remaining 1,547.3 GWh was supplied from domestic sources. A total of 93.77 GWh of electricity was exported to CIE, CEB and SONABEL which was 5.8% higher than the 88.66 GWh that was exported in March 2019. Out of the total electricity exported, 5.63 GWh was supplied to CIE, 52.89 GWh was supplied to CEB and 35.25 GWh was supplied to SONABEL in April 2019. Electricity generation from hydro sources contributed 41.3% of the total electricity supplied from domestic sources and thermal contributing 58.4% in April 2019.

HYDRO DAM LEVELS

Akosombo Dam Water Level continued to drop in April 2019

The water level for the Akosombo dam continued to drop but at a reduced rate of 0.06 feet per day in April 2019, from 0.07 feet per day in March 2019. The water level of 256.04 feet recorded at the beginning of the month of April, dropped by 1.78 feet to 254.26 feet at the end of the month. The water level recorded at the end of the month was 14.26 feet above the minimum operating level of 240 feet and was 8.56 feet above the water level recorded at the same period in 2018.

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



Bui Dam Water Level continued to drop in April 2019

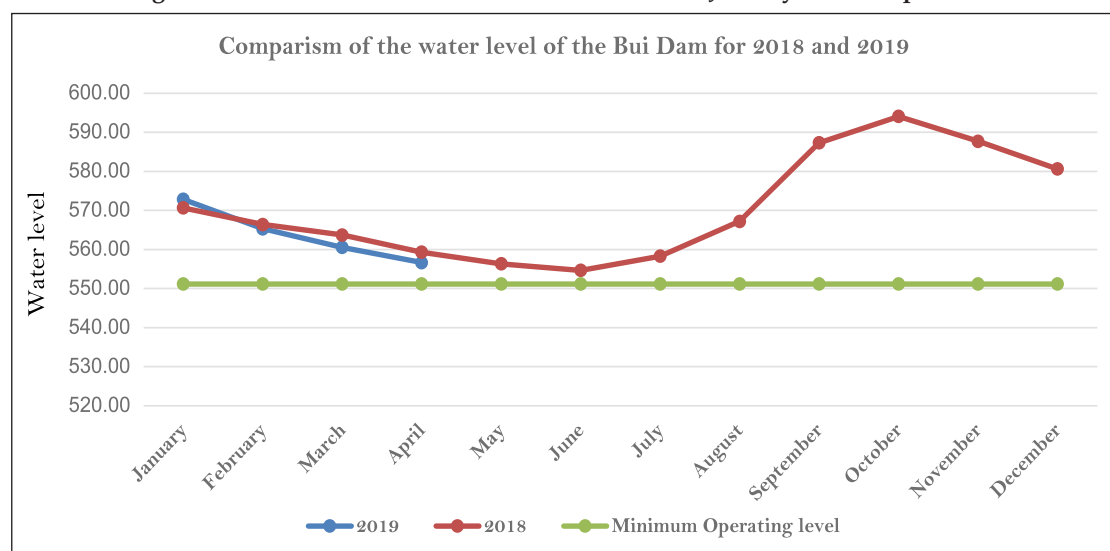
The Water level for the Bui dam continued to drop but at a reduced rate, from 0.15 feet per day in March 2019 to 0.13 feet per day

HIGHLIGHTS OF THE MONTH

in April 2019. The water level of 560.56 feet (170.86 m) recorded at the beginning of the month dropped by 3.9 feet (1.19 m) to a month end water level of 556.65 feet (169.67 m). The water level recorded at the end of the month was 5.47 feet (1.67 m) above the minimum operating level of the dam and was 2.66 feet (0.81 m) lower than the water level of 559.31 feet (170.48 m) recorded at the same period in 2018.

Figure 2 shows comparative end of month trajectory of the level of water in the Bui dam from January 2018 to April 2019.

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



FUEL SUPPLY FOR POWER GENERATION

Natural gas flow rate from WAGPCo increased in April 2019

There was an increase in natural gas supplied by WAGP in April 2019, from 43.08 MMSCFD in March 2019 to 57.93 MMSCFD. As a result, the total natural gas supplied increased from 1,335.62 MMSCF in March 2019 to 1,737.99 MMSCF in April 2019. The increase in the natural gas supplied by WAGP in April 2019 was due to the low natural gas supplied by GNPC and GNGC at Aboadze. The total natural gas supplied by WAGP constituted 48.5% of the total natural gas supplied which was the 35.4% it recorded in March 2019. The WAGP contributed 22% of the total fuel consumed in April 2019 which was greater than the 19.2% it recorded in March 2019.

Natural gas flow from GNGC decreased in April 2019.

The natural gas flow rate from GNGC to Aboadze Power Enclave reduced in April 2019, from 34.96 MMSCFD in March 2019 to 22.19 MMSCFD. Similarly, the total natural gas supplied by GNGC decreased from 978.97 MMSCF in March 2019 to 665.83 MMSCF April 2019. The low supply of natural gas from GNGC was due to the shutdown of the processing plant for the completion of the tie-in works. The total natural gas supplied by GNGC contributed 18.1% of the total natural gas consumed in April 2019 which was lower than the 25% it recorded in March 2019. In the total fuel mix, the share of natural gas consumed from AGPP constituted 8.2% in April 2019 which was lower than the 13.6% it recorded in March 2019.

Natural gas flow from GNPC decreased in April 2019

There was a reduction in the average flow rate of natural gas supplied by GNPC in April 2019, from 51.69 MMSCFD in March 2019 to 40.75 MMSCFD. Similarly, the total natural gas supplied by GNPC reduced from 1,550.68 MMSCF in March 2019 to 1,222.55 MMSCF in April 2019. The low supply of natural gas by GNPC was due to the completion of the tie-in works carried out in April 2019. The total natural gas supplied constituted 33.3% of the total natural gas consumed in April 2019, which was lower than the 39.6% it recorded in March 2019. The share of natural gas supplied by GNPC in the total fuel mix reduced from 21.5% in March 2019 to 15.1% in April 2019.

Liquid Fuel

Liquid fuel consumption increased in April 2019 by 44.9%, from 495,103 barrels in March 2019 to 717,576.94 barrels in April 2019. The increase in the total liquid fuel consumed was due to LCO and DFO consumption in April 2019. The share of LCO in the total liquid fuel increased from 6.6% in March 2019 to 31.4% in April 2019. The increase in LCO consumption increased in April 2019 due to increased electricity from CenPower and consumption by SAPP and TICO. In the total fuel mix, the share of LCO increased from 2.7% in March 2019 to 15.5% in April 2019. The share of HFO in the total liquid fuel consumed reduced from 93.2% in March 2019 to 64.4% in April 2019 due to reduced electricity generation from Karpowership and AKSA. Likewise, in the total fuel mix, the share of HFO reduced from 37.2% in March 2019 to 31.9% in April 2019. The share of DFO in the total fuel mix increased from 0.1% in March 2019 to 2.1% in April 2019. On the total liquid fuel consumed, the share of DFO increased from 0.2% in March 2019 to 4.2% in April 2019.

HIGHLIGHTS OF THE MONTH

Plant by Plant Highlights

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

The average electricity supplied by the Akosombo GS reduced by 11.8%, from 18.85 GWh per day in March 2019 to 16.64 GWh per day in April 2019. Similarly, the total electricity supplied by the hydro power plant reduced by 14.6%, from 584.32 GWh in March 2019 to 499.05 GWh in April 2019. The total electricity supplied by Akosombo GS constituted 32% of the total electricity supplied in April 2019 and was 36.8% higher than the 364.9 GWh that was projected in the 2019 ESP. The hydro power plant contributed 801.8 MW and 648.6 MW to the System Peak Load and the Ghana Peak Load respectively. The total load supplied by the power plant constituted 29.1% and 24.3% of the System Peak Load and the Ghana Peak Load respectively in April 2019.

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

Kpong GS recorded a reduction in its average electricity supplied in April 2019 by 11.6%, from 2.89 GWh per day in March 2019 to 2.55 GWh per day in April 2019. Similarly, the total electricity supplied by the hydro power plant reduced by 14.4%, from 89.53 GWh in March 2019 to 76.61 GWh in April 2019. The total electricity supplied by Kpong GS constituted 4.9% of the total electricity supplied in April 2019 and was 14.2% higher than the 65.4 GWh that was projected in the 2019 ESP. Kpong GS contributed 105 MW and 111 MW to the System Peak Load and the Ghana Peak Load respectively in April 2019. The total load supplied by the hydro power plant constituted 3.8% of the System Peak Load and 4.2% of the Ghana Peak Load.

Electricity supply by the Bui Generation Station (GS) decreased in April 2019

There was a reduction in the average electricity generated by the Bui GS in April 2019 by 14.6%, from 2.45 GWh per day in March 2019 to 2.09 GWh per day. Similarly, the total electricity supplied the hydro power plant reduced by 17.4%, from 76.04 GWh in March 2019 to 62.82 GWh in April 2019. The reduced electricity generated by the hydro power plant was due to low water level of the dam. The total electricity supplied by the power plant constituted 4% of the total electricity supplied in April 2019 and was 17.6% higher than the 53.4 GWh that was projected in the 2019 ESP. Bui GS contributed 202.4 MW to the System Peak Load and 204.4 MW to the Ghana Peak Load, translating into 7.4% of the System Peak Load and 7.7% of the Ghana Peak Load in April 2019.

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

The average electricity generated by SAPP in April 2019 increased by 42.4%, from 4.24 GWh per day in March 2019 to 6.04 GWh per day. Likewise, the total electricity supplied by the thermal power plant increased from 131.53 GWh in March 2019 to 181.28 GWh in April 2019. The total electricity supplied by SAPP constituted 11.6% of the total electricity supplied in April 2019, but it was 32.5% lower than the 268.5 GWh that was projected in the 2019 ESP. The thermal power plant contributed 297.1 MW to the System Peak Load and 158.1 MW to the Ghana Peak Load, translating into 10.8% of the System Peak Load and 5.9% of the Ghana Peak Load in April 2019. SAPP consumed a total of 758.07 MMSCF of natural gas, and 114,934 barrels of LCO at an estimated heat rate of 7,817.63 Btu/kWh in April 2019 which was lower than the 8,183.72 Btu/kWh it recorded in March 2019.

Ameri Energy Power Plant's generation increased in April 2019

There was an increase in the average electricity generated by the Ameri power plant in April 2019 by 8.3%, from 4.44 GWh per day in March 2019 to 4.81 GWh per day in April 2019. Likewise, the total electricity supplied by the thermal power plant increased from 137.65 GWh in March 2019 to 144.29 GWh in April 2019. The total electricity supplied by the thermal power plant constituted 9.3% of the total electricity supplied and was 72.6% higher than the 83.6 GWh that was projected in the 2019 ESP. Ameri contributed 218 MW to the System Peak Load and 208.6 MW to the Ghana Peak Load, representing 7.9% of the System Peak Load and 7.8% of the Ghana Peak Load in April 2019. The thermal power plant consumed a total of 1,416.58 MMSCF of natural gas, at an estimated heat rate of 10,102.52 Btu/kWh in April 2019 which was higher than the 10,012.27 Btu/kWh it recorded in March 2019.

The Karpowership Power Plant's generation decreased in April 2019

The average electricity generated by the Karpowership reduced marginally by 1.5%, from 6.83 GWh per day in March 2019 to 6.73 GWh per day in April 2019. Similarly, the total electricity supplied by the power plant reduced by 4.7%, from 211.73 GWh in March 2019 to 201.76 GWh in April 2019. The total electricity generated by Karpowership constituted 12.9% of the total electricity supplied in April 2019, but was 18.8% lower than the 248.5 GWh that was projected in the 2019 ESP. Karpowership contributed 440.2 MW to the System Peak Load and 439.4 MW to the Ghana Peak Load, representing 16% of the System Peak Load and 16.5% of the Ghana Peak Load in April 2019. The thermal power plant consumed a total of 272,732.5 barrels of HFO at an estimated heat rate of 8,132.82 Btu/kWh in April 2019, which was marginally higher than the 8,173.91 Btu/kWh it recorded in March 2019.

AKSA Power Plant's generation increased in April 2019

The average electricity generated by AKSA power plant increased by 1.2%, from 4.08 GWh per day in March 2019 to 4.13 GWh per day in April 2019. On the contrary, the total electricity generated by the thermal power plant reduced by 2.1% in April 2019, from 126.46 GWh in March 2019 to 123.8 GWh. This was due to greater number of days in March than in April. The total electricity generated by AKSA constituted 7.9% of the total electricity supplied in April 2019 and was 39.1% higher than the 89 GWh that was projected in the 2019 ESP. The AKSA power plant contributed 281.7 MW and 305.6 MW to the System Peak Load and the Ghana Peak Load respectively. This represents 10.2% of the System Peak Load and 11.5% of the Ghana Peak Load in April 2019. A total of 167,216 barrels of HFO was consumed by the power plant at an estimated heat rate of 8,171.52 Btu/kWh in April 2019, which was marginally higher than the 8,169.97 Btu/kWh it recorded in March 2019.

Takoradi International Company (TICO) generation decreased in April 2019

There was a decrease in the average electricity generated by the TICO power plant in April 2019 by 13.5%, from 3.04 GWh per day in March 2019 to 2.63 GWh per day. Similarly, the total electricity supplied by the thermal power plant decreased by 16.3%, from 94.15 GWh in March 2019 to 78.83 GWh in April 2019. The total electricity supplied by TICO constituted 5.1% of the total electricity supplied in April 2019, but was 59.7% lower than the 195.8 GWh that was projected in the 2019 ESP. TICO supplied a load of 150 MW to the System Peak Load and 151 MW to the Ghana Peak Load, representing 5.5% of the System Peak Load and

HIGHLIGHTS OF THE MONTH

5.7% of the Ghana Peak Load in April 2019. A total of 541.72 MMSCF of natural gas, 24,401 barrels of LCO, and 93 barrels of DFO at an estimated heat rate of 8,715.16 Btu/kWh in April 2019. The heat rate recorded in April 2019 was higher than the 8,266.81 Btu/kWh recorded in March 2019.

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

The average electricity supplied by TAPCO increased in April 2019 by 20.9%, from 1.42 GWh per day in March 2019 to 1.72 GWh per day. Similarly, the total electricity supplied by the thermal power plant increased from 44.12 GWh in March 2019 to 51.63 GWh in April 2019. The total electricity supplied by TAPCO constituted 3.3% of the total electricity supplied in April 2019, but was lower than the 93.5 GWh projected in the 2019 ESP by 44.8%. TAPCO supplied 153 MW to the System Peak Load and 103 MW to the Ghana Peak Load, representing 5.6% of the System Peak Load and 3.9% of the Ghana Peak Load in April 2019. The thermal power plant consumed a total of 515.99 MMSCF of natural gas at an estimated heat rate of 10,284.46 Btu/kWh in April 2019 which was lower than the 11,108.95 Btu/kWh it recorded in March 2019.

Kpone Thermal Power Plant (KTPP) continued operation in April 2019

KTPP continued its operation in April 2019 for 18 days and generated a total of 26.64 GWh. The total electricity generated constituted 1.7% of the total electricity supplied on April 2019. KTPP contributed 60 MW and 193 MW to the System Peak Load and the Ghana Peak Load, representing 2.2% and 7.2% of the System peak Load and Ghana Peak Load respectively in April 2019. The thermal power plant consumed a total of 98.12 MMSCF of natural gas and 39,323 barrels of DFO at an estimated heat rate of 11,858.16 Btu/kWh.

Tema Thermal 1 Power Plant (TT1PP) operated in April 2019

TT1PP came back online and operated for 13 days in April 2019. The thermal power plant supplied a total of 19.08 GWh which constituted 1.2% of the total electricity supplied in April 2019. TT1PP consumed a total of 214.8 MMSCF of natural gas at an estimated heat rate of 12,017.34 Btu/kWh in April 2019.

Embedded Electricity Generation

Genser Power Plant's generation increased in April 2019

The average electricity generated by the Genser power plant increased in April 2019 by 6.2%, from 1.22 GWh per day in March 2019 to 1.29 GWh per day. Similarly, the total electricity generated by the thermal power plant increased from 37.75 GWh in March 2019 to 38.82 GWh in April 2019. The total electricity generated by the thermal power plant contributed 2.5% of the total electricity supplied in April 2019. The thermal power plant consumed a total of 9,452.67 tonnes of LPG at an estimated heat rate of 10,680.08 Btu/kWh in April 2019, which was lower than the 11,430.85 Btu/kWh it recorded in March 2019.

BXC Solar generation decreased in April 2019

The BXC Solar power plant recorded a reduction of 14.2% in the total electricity supplied in April 2019, from 2.88 GWh in March 2019 to 2.47 GWh in April 2019. The total electricity supplied by the solar power plant constituted 0.2% of the total electricity supplied in April 2019. The total electricity generated by the solar power plant was 12.4% higher than the 2.2 GWh projected in the 2019 ESP.

VRA Navrongo Solar generation decreased in April 2019

The VRA Solar power plant recorded a reduction in the total electricity supplied in April 2019 by 8.7%, from 0.31 GWh in March 2019 to 0.28 GWh. The total electricity supplied by the solar power plant constituted 0.02% of the total electricity supplied in April 2019 and was 40.6% higher than the 0.2 GWh that was projected in the 2019 ESP.

Electricity Exchange – Import decreased whilst Export increased in April 2019

The average electricity imported from CIE in April 2019 decreased by 8.6%, from 0.44 GWh per day in March 2019 to 0.4 GWh per day. Likewise, the total electricity imported decreased by 11.5%, from 13.55 GWh in March 2019 to 11.99 GWh in April 2019. The total electricity imported constituted 0.8% of the total electricity supplied. Electricity import did not contribute to the System Peak Load but contributed 10 MW to the Ghana Peak Load in April 2019.

There was an increase in the average total electricity exported to CIE, CEB and SONABEL by 9.3%, from 2.86 GWh per day in March 2019 to 3.13 GWh per day in April 2019. Average electricity export to CIE, CEB and SONABEL increased from 0.15 GWh per day, 1.756 GWh per day, and 0.95 GWh per day in March 2019 to 0.19 GWh per day, 1.76 GWh per day and 1.18 GWh per day in April 2019 respectively.

The total electricity exported to CIE, CEB and SONABEL increased by 5.8%, from 88.66 GWh in March 2019 to 93.77 GWh in April 2019. Out of the total electricity supplied, a total of 5.63 GWh, 52.89 GWh and 35.25 GWh were exported to CIE, CEB and SONABEL respectively in April 2019.

However, Ghana continued to be a net exporter of electricity in April 2019.

OPERATIONAL FACT SHEET

Monthly Market Data Analysis

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

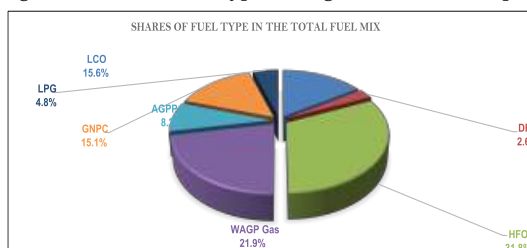
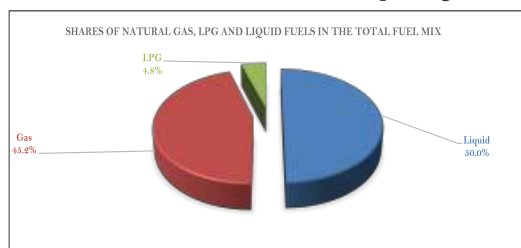


Figure 4a: Contribution of Natural Gas Supply by sources

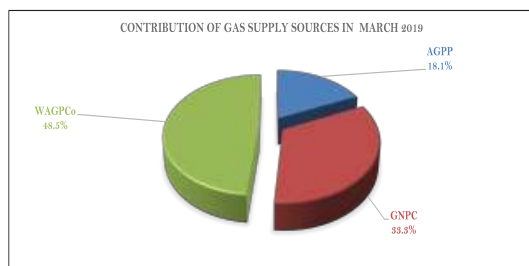
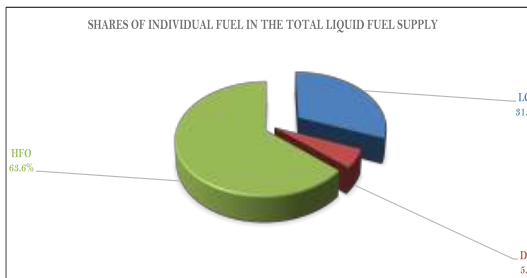


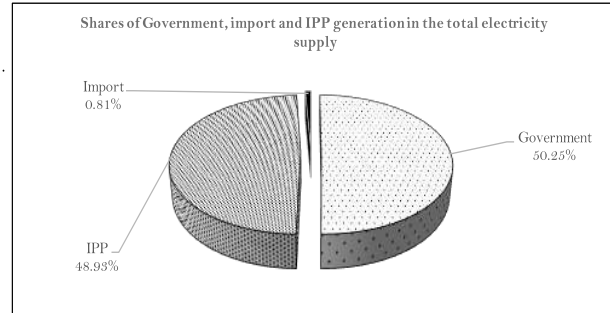
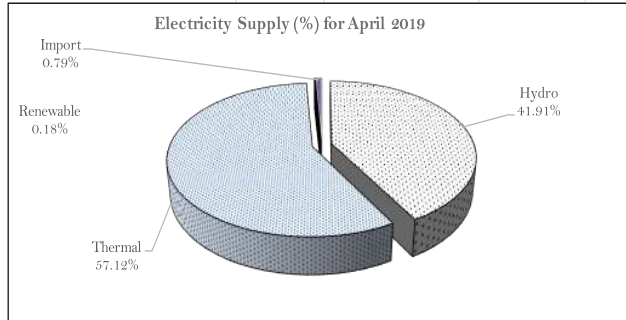
Figure 4b: Contribution of individual fuel in the liquid fuel supply



Peak Electricity Supply - April 2019			
Source of Supply	Generation at System Peak Load (MW)	Generation at Ghana Peak Load (MW)	Electricity Supply (GWh)
AKOSOMBO	801.80	648.60	499.05
KPONG	105.00	111.00	76.61
BUI	202.40	204.40	62.82
SEAP	297.10	158.10	181.28
TAPCO	153.00	103.00	51.63
TICO	150.00	151.00	78.83
TT1PP	-	-	19.08
CENIT	-	-	-
TT2PP	13.40	-	6.69
MRP	-	-	-
KARPOWER	440.20	439.40	201.76
AMERI	218.00	208.60	144.29
KTPP	60.00	193.00	26.64
Trojan Power	-	-	-
CENPOWER	30.00	133.00	36.13
AKSA	281.70	305.60	123.80
BXC Solar	-	-	2.47
Safisana	-	-	-
VRA Solar	-	-	0.28
Genser	-	-	34.00
IMPORT	-	10.00	11.99
Export to CIE at peak	9.00	-	52.89
Export to CEB at peak	144.00	78.00	5.63
Export to Sonabel	107.00	41.00	35.25
System Coincident Peak Load	2,752.60		
Ghana Coincident Peak Load		2,546.70	
Total Supply			1,557.34
Total Supply without export			1,463.57

Ghana Electricity Demand & Supply		
		Apr-19
Maximum System Peak Load	MW	2,752.6
Minimum System Peak Load	MW	2,253.6
Average Peak Generation	MW	2,485.1
System Base Load	MW	1,300.9
Total Electricity	GWh	836.1
Load Factor (LF)	%	74.2

OPERATIONAL FACT SHEET



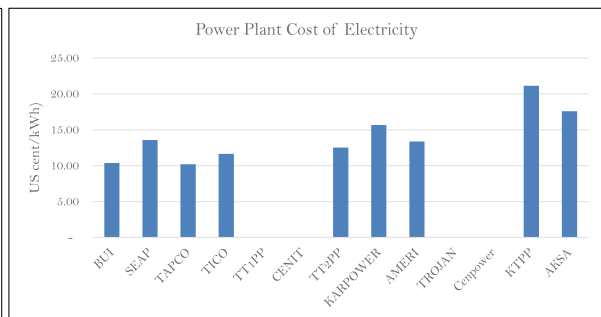
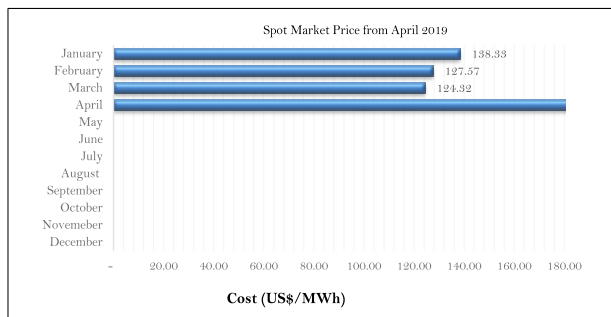
	Installed Capacity (MW)	Plant Capacity Utilization (%)	Electricity Generation (GWh)	Gas Consumption (MMBtu)	LCO Consumption (MMBtu)	DFO Consumption (MMBtu)	HFO Consumption (MMBtu)	LPG Consumption (MMBtu)
Akosombo	1,020.00	65.76	499.05	-	-	-	-	-
Kpong	160.00	64.36	76.61	-	-	-	-	-
Bui	400.00	21.11	62.82	-	-	-	-	-
SEAP	560.00	43.51	181.28	809,208.58	608,001.62	-	-	-
TAPCO	330.00	21.03	51.63	530,955.91	-	-	-	-
TICO	340.00	31.16	78.83	557,429.81	132,189.43	502.61	-	-
TT1PP	126.00	20.35	19.08	229,290.93	-	-	-	-
CENIT	126.00	-	-	-	-	-	-	-
TT2PP	49.50	18.16	6.69	86,293.54	-	-	-	-
KARPOWER	470.00	57.70	201.76	-	-	-	1,640,861.64	-
AMERI	250.00	77.57	144.29	1,457,662.30	-	-	-	-
Cenpower	350.00	13.87	36.13	-	558,987.52	8,221.87	-	-
TROJAN	56.00	-	-	-	-	-	-	-
KTPP	220.00	16.28	26.64	104,735.58	-	211,163.49	-	-
AKSA	360.00	46.22	123.80	-	-	-	1,011,658.22	-
GENSER	95.00	45.70	32.30	-	-	-	-	403,173.11
VRA Solar	2.50	14.93	0.28	-	-	-	-	-
BXC	20.00	12.10	1.80	-	-	-	-	-
Meinergy	20.00	9.00	1.34	-	-	-	-	-
Total	4,955.00	41.89	1,544.32	3,775,576.66	1,299,178.57	219,887.96	2,652,519.86	403,173.11

Location	Monthly Average
Etoki	66.46
Tema WAGPCo	38.99
Aboadze WAGPCo	19.03
Aboadze GNGC	67.35

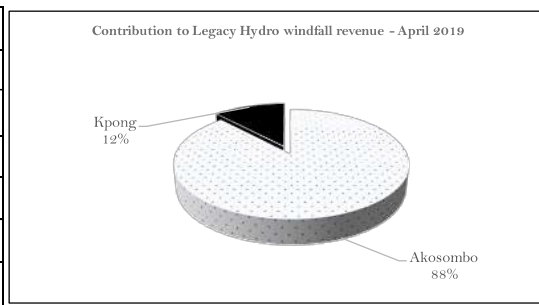
	Beginning month (ft)	End month (ft)	Change in water level (feet)
Hydro Dam			
Akosombo	256.04	254.26	-1.78
Bui	560.56	556.65	-3.90

ECONOMIC FACT SHEET

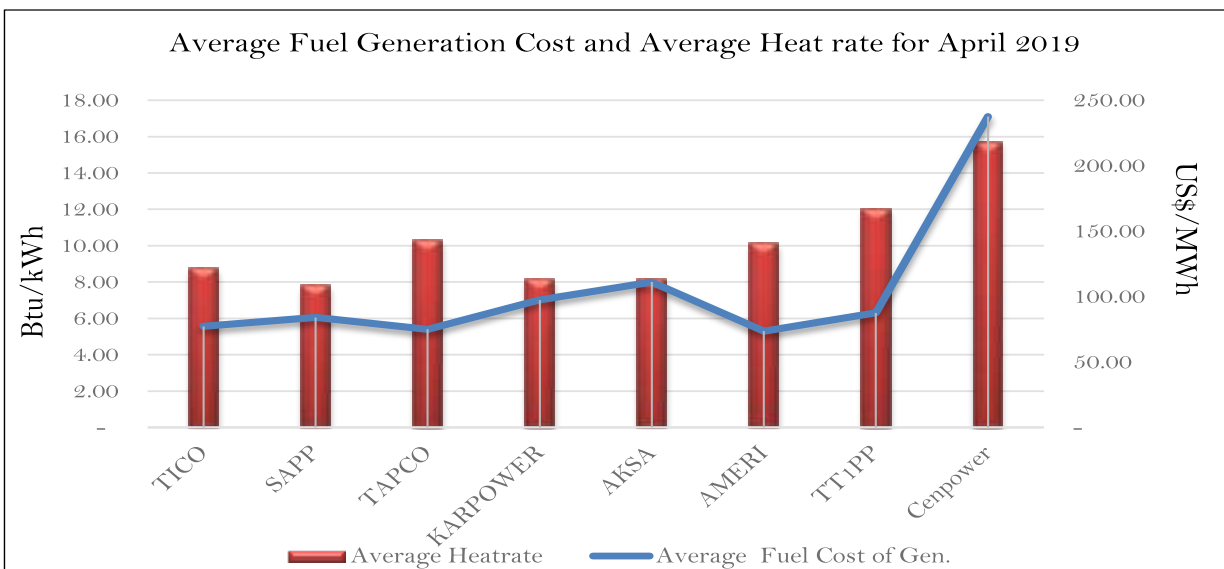
		Actual	Projected	Change
Average Market Energy Cost	US\$/MWh	130.47	93.55	36.92
Average Market Capacity Charge (AMCC)	US\$/MWh	36.29	36.13	0.16
Total Average Market Cost (TAC)	US\$/MWh	166.77	129.68	37.09
System Marginal Cost (SMC)	US\$/MWh	184.50	104.88	79.62
System Marginal Capacity Charge (SMCC)	US\$/MWh	23.95	23.95	-
Spot Market Price (SMP)	US\$/MWh	208.45	128.83	79.62
Composite Bulk Generation Charge (CBGC)	US\$/MWh	97.01	97.01	-
Deviation of TAC from CBGC	US\$/MWh	(69.76)	(32.67)	(37.09)
Deviation of SMP from CBGC	US\$/MWh	(111.44)	(31.82)	(79.62)



Average Fuel Prices		
Fuel Type	Unit	Delivered Cost
Natural Gas	US\$/MMBtu	7.29
LCO	US\$/BBL	81.21
HFO	US\$/Tonne	413.39
DFO	US\$/Tonne	788.07



	Gazetted Natural Gas Price	Weighted average Natural Gas Price	LCO	HFO	DFO
US\$/MMBTu	7.29	7.6	15.35	12.59	19.51



ECONOMIC FACT SHEET

Power Plant	Capacity Utilization (%)	Average Heat rate (Btu/KWh)	Average Fuel Cost of Generation (US\$/MWh)	Emission Factor (kgCO ₂ /kWh)
Akosombo	65.76	-	-	-
Kpong	64.36	-	-	-
Bui	21.11	-	-	-
SAPP	43.51	7,817.63	84.02	0.24
TAPCO	21.03	10,284.46	74.97	0.55
TICO	31.16	8,747.94	77.29	0.38
TT1PP	20.35	12,017.34	87.61	0.64
CENIT	-	-	-	-
TT2PP	18.16	12,905.83	94.08	0.68
KARPOWER	57.70	8,178.28	97.96	0.64
AMERI	77.57	10,102.52	73.65	0.54
TROJAN	-	-	-	-
KTPP	16.28	11,858.16	183.30	0.21
AKSA	46.22	8,171.52	111.07	0.64
Genser	45.70	11,499.52		0.73

		Wholesale Electricity Market Price Data - 2019 (UScent/kWh)			
		January	February	March	April
Average Market Price	Actual	14.14	14.26	13.87	16.68
	Projected	12.79	12.69	12.74	12.97
System Marginal price	Actual	17.02	16.07	14.77	20.85
	Projected	12.83	13.00	12.83	12.88

The EMOP Secretariat is presenting part two of a three part series on the Electricity Transmission Services Pricing Policy and Guidelines of the PURC for comments from stakeholders. Kindly forward your comments to the EMOP Secretariat at the Energy Commission.

DRAFT ELECTRICITY TRANSMISSION ANCILLARY SERVICES PRICING POLICY AND GUIDELINES

1 Definitions

1.1 Operating Reserves

Operating Reserves shall mean the generation capability above firm system demand that are required to adequately meet regulation, load forecasting error, mismatch between generation and demand, equipment forced outages and scheduled outage. Operating Reserves shall consist of:

- a) Spinning Reserves; and
- b) Non-spinning Reserves

1.2 Spinning Reserve

Spinning Reserves shall mean that portion of generation which is unloaded and is synchronised and ready to automatically serve additional demand and fully available within 10 minutes.

1.3 Non-Spinning Reserves

Non-spinning reserve shall mean that generating capacity not operating or synchronised to the system but which is available to serve demand within thirty (30) minutes of being requested to do so in the event when spinning reserves are insufficient. It can also be provided by interruptible load that can be removed within 10 minutes.

1.4 Regulation

Regulation shall mean the use of on-line generating units equipped with Automatic Generation Control (AGC) also known as Load Frequency Control (LFC) to effect change in output as quickly as possible (MW/minute). Regulation is intended to achieve the following objectives:

- a) maintain interconnection frequency
- b) manage differences between Actual and Scheduled Power Flows
- c) match Generation to Load

1.5 Load Following

Load following shall mean the process of regulating generation by selected generating units to follow the changes in demand. In other words, Load Following implies the use of an online generation equipment to track intra- and inter-hour changes in customer loads or matching generation to load. Load following services are intended to achieve the following objectives:

- a) maintain interconnection frequency
- b) maintain generation/load balance
- c) track moment-to-moment fluctuations in load
- d) follow the longer-term (e.g., hourly) changes in load

1.6 Voltage and Frequency Control

1.6.1 Primary Voltage Control

Primary voltage control shall mean the use of automatic voltage regulator (AVR), static voltage compensators (SVC) and other controllable devices to control and maintain voltage at generating bus.

1.6.2 Secondary Voltage Control

Secondary voltage control shall mean the use of centralised automatic control by the System Operator to coordinate actions in order to manage the injection of reactive power within the NITS.

1.6.3 Primary Frequency Control

Primary Frequency Control (Governor Action) shall mean governor responds to grid frequency disturbances when operating in straight droop governor mode

1.6.4 Secondary Frequency Control

Secondary Frequency Control shall mean actions taken by System Operator/Regulator intended to address grid frequency disturbances

For purposes of this policy guidelines, voltage control shall refer to control of imbalance in the production and consumption of reactive power. Frequency control on the other hand, shall refer to control of imbalance in the production and consumption of active power

1.6.5 Voltage Limits in the NITS

NITS voltage magnitude shall be kept within the following limits:

- (a) + - 5% of the nominal voltage at all times under Normal State;
 - (b) + - 10% of the nominal voltage under Alert State for a period not exceeding 10 minutes;
 - (c) + - 10% of the nominal voltage under Emergency State for a period not exceeding 30 minutes
- Imbalance in phase voltage magnitude shall not exceed 3%.

1.6.6 Frequency Limits in the NITS

NITS frequency shall be maintained as follows:

- (a) Between 49.8 to 50.2 Hz at all times, under Normal State of operation;
- (b) Between 49.5 to 50.5 Hz for period not exceeding ten (10) minutes under Alert State;
- (c) Between 49.0 to 51.0 Hz for a period not exceeding thirty (30) minutes under Emergency State

1.7. Power Factor and Reactive Power Limits

Power factor and reactive power control shall be defined to mean the following limits in the NITS.

- (a) Distribution Utilities, Grid Participants and all off-takers of power from the NITS shall maintain their power factor at values not less than 0.90 at all times
- (b) All generating units shall be operable between power factors of 0.85 lagging and 0.95 leading.

1.8. Synchronisation

Synchronisation shall mean the process of connecting two previously separated alternating current apparatuses after matching frequency, voltage, phase angles like paralleling a generator to the electric system.

1.9. System Restart (Black Start) Capability

System restart (Black Start) capability shall mean the ability of a power plant to restart or restore power supply from an auxiliary source located on site without having to draw power from the grid/ external source in the event of system collapse. The objective is to re-start other generators or energise part of transmission grid towards restoration of the system.

1.0 LEGAL AUTHORITY

The legal mandates under which these policies have been developed are contained in the provisions of the Energy Commission Act 541, Public Utilities Regulatory Commission Act 538 and associated rules, regulations, guidelines and codes of practices.

2.1 Primary Legal Mandates

Section 23 of the Energy Commission Act, 1997, Act 541 provides for the establishment of a national interconnected transmission system to be operated by a transmission utility. The EC Act further provides that tariffs to be charged by the Electricity Transmission Utility shall be subject to approval by the PURC. Section 16 and 18 of the PURC Act 538 provides for the manner in which the tariffs for transmission services shall be developed including preparation of guidelines for such services. As one of the key transmission services to be provided by the transmission utility, ancillary services are required to ensure greater supply reliability to meet demand. The nature of these services has been identified in the secondary legislation under the EC Act, Act 541 and the Public Utilities Regulatory Commission Act, 1997, Act 538.

2.2 Secondary Legal Mandates

The secondary legal mandates are those legal provisions under subsidiary legislation, rules, regulations, codes and guidelines derived from the primary legal mandates provided in the EC Act and PURC Act.

Other Market News and Trends

2.2.1 Electricity Regulations, 2008, LI 1937

Section 3 (2) states that “The Grid Code shall provide for regulations for minimum reserve margins to satisfy demand”

2.2.2 Electricity Supply and Distribution (Technical and Operational) Rules, 2005, LI 1816

Section 10 of the LI provides for Power Factor Limits for customers and the mandate of suppliers to impose a power factor surcharge on customers. PURC is also mandated to determine power factor surcharge where customers fail to install compensators to improve factor to at least 0.9.

2.2.3 Electricity Transmission (Technical, Operational and Standards of Performance) Rules, 2008, LI 1934

Section 9 of the LI 1934 requires Distribution Utilities and Bulk customers to procure and deploy adequate reactive electricity compensation and other devices to meet obligations under this LI and the Grid Code.

2.2.4 National Electricity Grid Code

The National Electricity Grid Code, 2009 establishes the requirements, procedures, practices and standards that shall govern the development, operation, maintenance and use of high voltage transmission system in Ghana with the purpose to ensure that the National Interconnected Transmission System (NITS) provides fair, transparent, non-discriminatory, safe, reliable, secure and cost efficient delivery of electrical energy. The following key provisions of the Grid Code relate to the provision of ancillary services in the NITS:

Articles 9.23 and 9.26: Provides for ETU to determine the amount of non-spinning reserve that shall ensure system reliability provided that it is not spinning reserve and can be synchronized and put on load within 30 minutes.

Article 9.24: Provides for the level of non-spinning reserves which shall be a function of largest generating units and load blocks on the system as well as combined system demand.

Article 9.28: Provides for reactive power requirements at all NITS nodes, feeders and substations which must have power factor of 0.9 lagging and unity.

Article 9.34: States that all generating units must be capable of power factor of 0.85 lagging and 0.95 leading

Article 9.42: Provides for compensation payments that the normal provision of reactive power requirements by any generating plant shall be without compensation but dispatch instructions for operation beyond the standard requirement shall attract compensation payments from the ETU as provided for under the Electricity Market Rules.

Acronyms

AGPP = Atuabu Gas Processing Plant

CBGC = Composite Bulk Generation Charge

DFO = Distillate Fuel Oil

ECG = Electricity Company of Ghana

ESP = Electricity Supply Plan

GHp = Ghana Pesewa

GWh = Giga-watt Hours

KTPP = Kpone Thermal Power Plant

MRP = Mine Reserve Plant

LCO = Light Crude Oil

LTA = Long Term Average

MMscf = Million Standard Cubic Feet

NITS = National Interconnected Transmission System

SAPP = Sunon Asogli Power Plant

SNEP = Strategic National Energy Plan

TT2PP = Tema Thermal 2 Power Plant

VRA = Volta River Authority

WAGP = West African Gas Pipeline

Btu = British Thermal Units

CUF = Capacity Utilization Factor

EC = Energy Commission

EMOP = Electricity Market Oversight Panel

FPSO = Floating Production, Storage and Offloading

GNGC = Ghana National Gas Company

HFO = Heavy Fuel Oil

kWh = Kilo-watt hours

LEAP = Long-range Energy Alternative Planning

LI = Legislative Instrument

MW = Megawatt

MWh = Mega-watt hours

PV = Photovoltaic

SMP = System Marginal Price

TEN = Tweneboa, Enyenra, Ntomme

TT2PP = Tema Thermal 2 Power Plant

WAGPCo = West African Gas Pipeline Company

WEM = Wholesale Electricity Market

For any enquiries please contact the:

EMOP Secretariat, Energy Commission, Accra.

Tel: 0302 813756/7/9 **E-mail:** emop@energycom.gov.gh