



GHANA WHOLESAL E ELECTRICITY MARKET BULLETIN

MARKET WATCH

Monthly Market Data Analysis

ISSUE NO. 50

1st February 2020 to 29th February 2020

This Bulletin covers major developments in the Wholesale Electricity Market (WEM) of Ghana from 1st February, 2020 to 29th February 2020. 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 analysis the impact of the WAPCo natural gas pipeline clean up on the Wholesale Electricity Market in January 2020 and February 2020.

The Electricity Market Oversight Panel (EMOP) 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

There was a marginal decline of 0.3% in the System Peak Load recorded in February 2020 compared to January 2020. The System Peak Load declined from 2,900.4MW in January 2020 to 2,892.9 MW in February 2020. On the contrary, there was an increase in the Ghana Peak Load for February 2020 compared to January 2020 by 4%. The Ghana Peak Load for February 2020 increased to 2,639.9 MW from 2,539.5 MW in January 2020 to 2,539.5 MW. The System Peak Load recorded in February 2020 was 3.2% lower than the 2,987 MW projected in the 2020 Electricity Supply Plan (ESP). Also, the Ghana Peak Load recorded in February 2020 was 0.6% lower than the 2,657 MW projected in the ESP for February 2020. A total of 253 MW was exported to CIE, CEB and SONABEL at the System Peak Load which is 23.3% lower than the 330 MW projected in the 2020 ESP. There was no electricity import from CIE at the System Peak Load for February 2020. The average electricity demand of 2,392.3 MW recorded in February 2020 was 10% higher than the 2,173.25 MW recorded in January 2020 but was 1.5% lower than the 2,428 MW projected in the 2020 ESP for February 2020.

There was a marginal decrease in electricity supply by 1% in February 2020. Electricity supply decreased from 58 GWh per day in January 2020 to 57.41 GWh per day in February 2020. Likewise, the total electricity supplied in February 2020 was 1.5% lower than the 1,690.2 GWh projected in the 2020 ESP. A total of 253 GWh of electricity was exported to CIE, CEB and SONABEL in February 2020, which was 61.1% higher than the 157 GWh projected in the 2020 ESP.

The share of electricity generated from hydro

Table 1. Projected and Actual Outturn of electricity demand and supply in January 2020 and February 2020.

	February 2020		January 2020	
	Projected	Actual Outturn	Projected	Actual Outturn
Total Supply (GWh)	1,690.2	1,665.0	1,616.3	1,682.9
Source by Power Plants (GWh)				
AKOSOMBO	431.0	368.9	495.0	497.9
BPONG	72.0	72.6	63.0	63.4
BUI	120.0	122.6	81.0	81.3
Simon Asogli	92.0	-	139.0	150.0
TAPCO	79.0	103.4	91.0	89.9
TICO	176.0	90.6	100.0	98.9
TT1PP	32.0	-	38.0	38.2
CENIT	-	-	46.0	45.4
TT2PP	-	-	5.0	5.4
Amandi	-	2.3	-	14.4
Karpowership	266.0	289.7	248.0	252.3
AMERI	130.0	126.7	134.0	134.9
KTPP	-	21.7	10.0	8.1
Trojan Power	-	-	-	-
CENPOWER	224.0	121.8	59.0	61.1
AKSA	64.0	90.2	93.0	93.7
Bridge Power	-	-	-	1.4
BXC Solar	2.0	2.0	2.0	2.2
Safisana	-	-	-	-
VRA Solar	0.2	0.3	0.3	0.3
Genser	-	35.5	-	38.9
Menergy	2.0	1.7	2.0	2.0
Total Generation (GWh)	1,690.2	1,659.9	1,616.3	1,679.6
Imports (GWh)	-	5.2	-	3.3
Total Supply (GWh)	1,690.2	1,665.0	1,616.3	1,682.9
Deficit/Over supply (GWh)	-	(25.2)	-	66.6
Ghana Coincident Peak Load (MW)	2,657.0	2,639.9	2,589.0	2,539.5
System Coincident Peak Load (MW)	2,987.0	2,892.9	2,919.0	2,900.4

HIGHLIGHTS OF THE MONTH

sources in the total electricity supplied increased from 38.2% in January 2020 to 46.9% in February 2020. Electricity generated from renewable energy reduced from 0.3% of the total electricity supplied in January 2020 to 0.14% in February 2020.

The rate of drop in the water level for the Akosombo GS increased by 28% in February 2020. The water level for the Akosombo Dam reduced from 0.05 feet per day in January 2020 to 0.064 feet per day in February 2020. Likewise, the rate of drop in the water level for the Bui dam increased in February 2020 by 61.5% compared to January 2020. The rate of drop in the water level increased from 0.13 feet per day in January 2020 to 0.21 feet per day in February 2020.

The West African Gas Pipeline Company (WAPCo) natural gas pipeline clean-up (PIGGING) which commenced on the 20th January 2020 was successfully completed by the 27th February 2020. The successful clean-up of the pipeline marks a significant milestone in the activities of the WAPCo. The PIGGING exercise which was meant to ensure the integrity of the natural pipeline and improve its reliability.

ELECTRICITY DEMAND AND SUPPLY

Electricity Demand

The System Peak Load for February 2020 reduced marginally by 0.3% from 2,900.4 MW in January 2020 to 2,892.9 MW in February 2020. There was no electricity import during the System Peak Load in January 2020. A total of 253 MW of electricity was exported to CIE, CEB and SONABEL during the System Peak Load in February 2020. Out of the total electricity exported, 31 MW was supplied to CIE, 79 MW to CEB and 143 MW to SONABEL in February 2020. Electricity generated from hydro sources contributed 42.8% of the System Peak Load and 46.9% of the Ghana Peak Load. The remaining 57.2% of the System Peak Load and 53.1% of the Ghana Peak Load was supplied from thermal sources. The Ghana Peak Load recorded in February 2020 increased by 4% from 2,539.5 MW in January 2020 to 2,639.9 MW in February 2020. Average electricity demand increased by 5.8%, from 2,260.9 MW in January 2020 to 2,392.3 MW in February 2020.

Average export demand for February 2020 decreased marginally by 0.6% compared to export demand for January 2020. Average Domestic demand increased by 6.6% from 2,014.01 MW in January 2020 to 2,145.99 MW in February 2020. Export demand decreased from 247.9 MW in January 2020 to 246.3 MW in February 2020. The System Load factor reduced from 75.9% in January 2020 to 75.5% in February 2020.

Electricity supply

The average electricity supplied in February 2020 increased by 5.8%, from 54.26 GWh per day in January 2020 to 57.41 GWh per day in February 2020. On the contrary, the total electricity supplied in February 2020 decreased from 1,682.09 GWh in January 2020 to 1,665.02 GWh due to the greater number of days in January than February. The total electricity supplied in February 2020 was made up of 5.17 GWh of from CIE and 1,659.85 GWh from domestic sources. Embedded generation contributed 2.4% of the total domestic supply. A total of 171.42 GWh was exported to CIE, CEB and SONABEL in February 2020. Out of the total electricity exported, 10.53 GWh was supplied to CIE, 89.12 GWh was supplied CEB and 71.77 GWh to SONABEL. Average domestic consumption increased by 6.5% from 1,498.42 GWh in January 2020 to 1,493.61 GWh in February 2020.

Electricity generated from hydro sources contributed 45.9% of the total electricity supplied in February 2020, higher than its contribution of 38.2% in January 2020. Thermal generation contributed 53.6% of the total electricity supplied in February 2020, which was lower than the 61.5% it supplied in January 2020. The energy import and solar generation contributed 0.3% and 0.2% respectively to the total electricity supplied in February 2020.

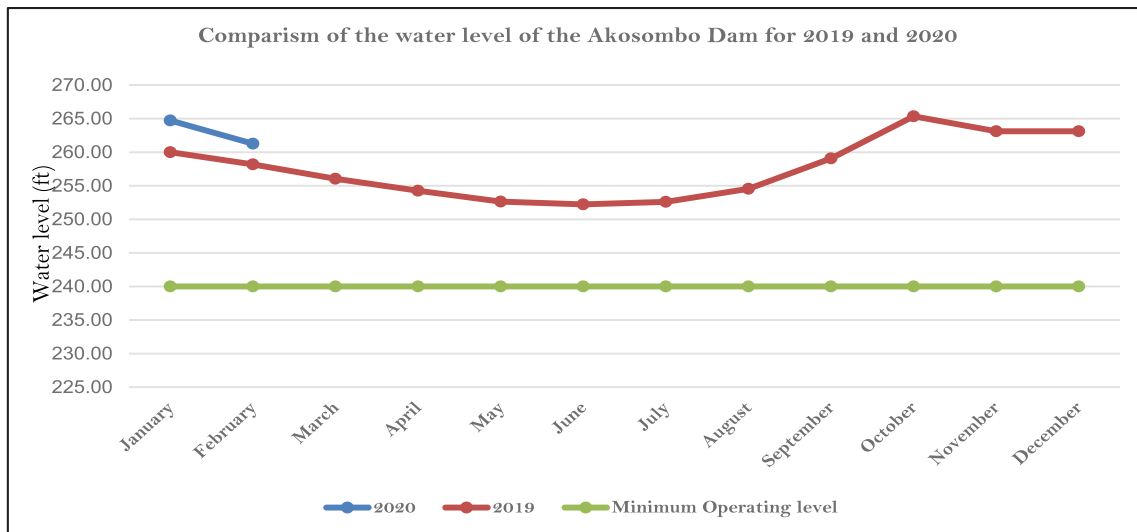
HYDRO DAM LEVELS

Akosombo Dam Water Level continued to drop in February 2020

The Akosombo dam recorded an increase in the rate of drop in the water level by 28%, from 0.05 feet per day in January 2020 to 0.064 feet per day in February 2020. The water level of the Akosombo dam dropped from 263.12 feet recorded at the beginning of the month to 261.27 feet at the end of the month. The water level recorded at the end of January 2020 was 3.09 feet above the water level recorded for the same period in 2019. Also, the water level recorded at the end of January 2020 was 21.27 feet above the minimum operating water level of the dam.

HIGHLIGHTS OF THE MONTH

Figure 1: Month-End Water Level for Akosombo Dam from January 2019 to February 2020.

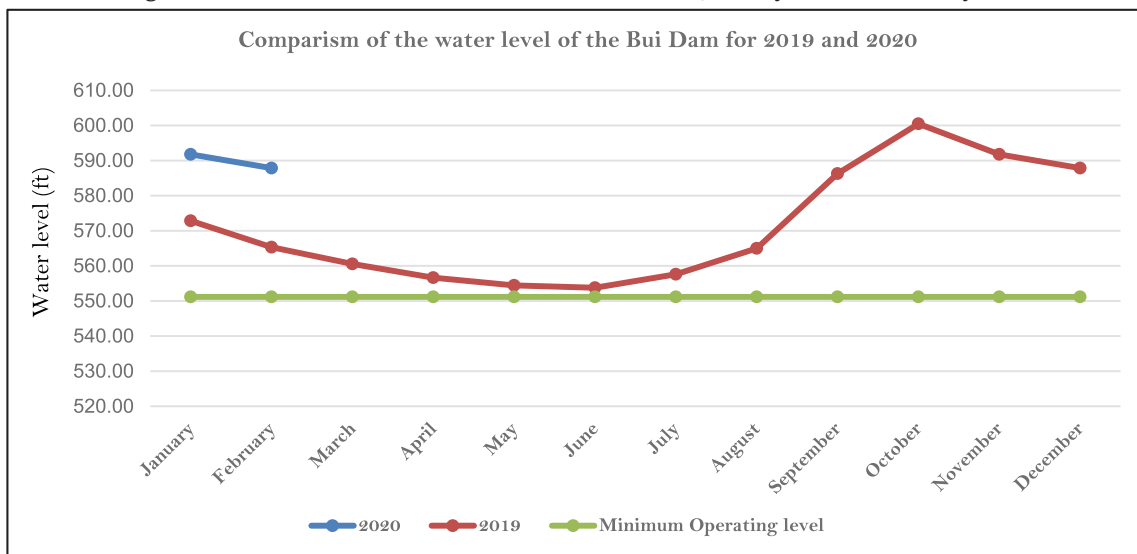


Bui Dam Water Level continued to drop at an increasing rate in February 2019

The Bui dam water level dropped at an increasing rate from 0.13 feet per day in January 2020 to 0.21 feet per day in February 2020. The water level at the beginning of the month stood at 587.86 feet which dropped to 581.76 feet at the end of the month. The water level recorded at the end of the month was 16.45 feet above the water level recorded for the same period in 2019. Also, the water level recorded at the end of the month was 35.08 feet above the minimum operating water level for the dam.

Figure 2 shows comparative end of month trajectory of the level of water in the Bui dam from January 2019 to February 2020.

Figure 2: Month-End Water Level for Bui Dam from January 2019 to February 2020



FUEL SUPPLY FOR POWER GENERATION

Natural gas import from WAPCo decreased in February 2020

The natural gas flow rate from the West Africa Gas Pipeline Company (WAPCo) decreased by 5.5%, from 63.5 MMSCFD in January 2019 to 60 MMSCFD in February 2020. Consequently, the total natural gas supplied by WAGPCo decreased from 1,968.56 MMSCF in January 2020 to 1,740 MMSCF in February 2020. The share of WAPCo the total natural gas supply by WAPCo increased from 20.3% in January 2020 to 28.8% in February 2020. Similarly, the share of the total natural gas supplied by WAPCo in the total fuel mix increased from 17.5% in January 2020 to 22.1% in February 2020.

No Natural gas supply from GNGC as domestic supply decrease in February 2020.

There was no natural gas supply from the GNGC to the Aboadze Power Enclave for electricity generation in February 2020. This was to enable the offtake of natural gas by power plants in the Aboadze Power Enclave from the WAPCo. The WAPCo needed the offtake of an average of 70 MMSCFD of natural gas at the Aboadze Power Enclave to ensure the success of the natural gas clean up.

There was also a decrease in the average domestic supply of natural gas from an average of 193.63 MMSCFD in January 2020 to 141 MMSCFD in February 2020. A total of 4,095.95 MMSCFD of natural gas was supplied from domestic sources. Of the total of 4,095.95 MMSCFD of natural gas supplied, 53.9% was consumed by the Karpowership, 8.7% by Gneser power plants and the rest was consumed in the Aboadze Power Enclave.

HIGHLIGHTS OF THE MONTH

Liquid Fuel

There was a significant increase in the total liquid fuel consumed by 56.9%, from 215,859 barrels in January 2020 to 338,632 barrels in February 2020. The increase in liquid fuel consumption was due to the increased generation of Cenpower on LCO. The share HFO in the total liquid fuel consumed decreased from 60.8% in January 2020 to 39.1% in February 2020. In the total fuel mix, the share of HFO however increased from 8.3% in January 2020 to 9.1% in February 2020. On the contrary, the share of the total LCO consumed in the total liquid fuel increased from 24.7% in January 2020 to 45.5% in February 2020. Similarly, the share of LCO in the total fuel mix increased from 3.3% in January 2020 to 11.1% in February 2020. DFO consumption in the total liquid fuel consumption decreased marginally from 13.7% in January 2020 to 13.4% in February 2020. On the contrary, DFO consumption in the total fuel mix increased from 1.9% in January 2020 to 3.1% in February 2020.

Plant by Plant Highlights

Electricity Generation at the Akosombo Generation Station (GS) increased in February 2020

The average electricity generated by the Akosombo GS increased by 22.2%, from 16.06 GWh per day in January 2020 to 19.62 GWh per day in February 2020. Similarly, the total electricity supplied by the Akosombo hydro power plant increased from 497.89 GWh in January 2020 to 568.88 GWh in February 2020. The significant increase in the total electricity supplied by the Akosombo GS was due to the curtailment of natural gas supply by the WAPCo to power plants in Tema and Kpone. The total electricity supplied by the hydro power plant constituted 34.2% of the total electricity supplied in February 2020 and was 32% more than the 431 GWh projected in the 2020 ESP. The Akosombo GS contributed a total of 884.1 MW to both the System Peak Load and the Ghana Peak Load in January 2020. This translates into 30.6% of both peak loads.

Electricity supply by Kpong Generation Station (GS) increased in February 2020

There was an increase of 22% in the average electricity generated by the Kpong GS in February 2020, from 2.05 GWh per day in December 2019 to 2.50 GWh per day. Likewise, the total electricity supplied by the Kpong GS increased from 63.4 GWh in January 2020 to 72.56 GWh in February 2020. The total electricity supplied by the hydro power plant contributed 4.4% of the total electricity supplied in February 2020. The hydro power plant contributed 112 MW to both the System Peak Load and the Ghana Peak Load in February 2020 translating into 3.9% of both peak loads.

Electricity supply by the Bui Generation Station (GS) increased in February 2020.

The Bui GS electricity generation increased from 2.62 GWh per day in January 2020 to 4.23 GWh per day in February 2020. This translates into 61.1% increase in average generation. Similarly, the total electricity supplied by the Bui GS increased from 81.33 GWh in January 2020 to 122.59 GWh in February 2020. The total electricity generated by the hydro power plant constituted 7.4% of the total electricity supplied in February 2020 and was 2.2% higher than the 120 GWh projected in the 2020 ESP. The hydro power plant contributed 240.7 MW to both the System Peak Load and the Ghana Peak Load in February 2020, translating into 8.3% of both peak loads.

The Sunon Asogli Power Plant (SAPP) did not generate in February 2020

The Sunon Asogli power plant was offline in February 2020. The power plant was offline due to the curtailment of natural gas supply from the WAPCo for the clean-up of the natural gas pipeline. Even though the Sunon Asogli power plant phase II could operate on Light Crude Oil (LCO) due to inadequate stocks of LCO at the power plant site.

Ameri Energy Power Plant's generation increased in February 2020

There was a significant increase in the electricity generated by the Ameri power plant by 0.5% in February 2020 from 4.35 GWh per day in January 2020 to 4.37 GWh per day in February 2020. On the contrary, the total electricity supplied by the thermal power plant decreased from 134.87 GWh in January 2020 to 126.73 GWh in February 2020 due to the fewer number of days in February than in January. The total electricity supplied by the thermal power plant constituted 7.6% of the total electricity supplied in February 2020 and was 2.5% lower than the 130 GWh projected in the 2020 ESP. The Ameri power plant contributed 164.4 MW to the System Peak Load both the System Peak Load and the Ghana Peak Load in February 2020 translating into 5.7% of both peak loads. The thermal power plant consumed a total of 1,310 MMSCF of natural gas at an estimated heat rate of 10,606.86 Btu/kWh in February 2020, which was higher than the 10,272.91 Btu/kWh recorded in January 2020.

The Karpowership Power Plant's generation increased in February 2020

There was an increase in the total electricity supplied by the Karpowership by 26.9% in February 2020 from 8.14 GWh per day in January 2020 to 10.33 GWh per day in February 2020. The total electricity supplied by the thermal power plant increased from 252.26 GWh in January 2020 to 299.7 GWh in February 2020. The Karpowership's total electricity generated constituted 18% of the total electricity supplied in February 2020 and was 12.7% higher than the 266 GWh projected in the 2020 ESP. The thermal power plant contributed 420.7 MW to both the System Peak Load and the Ghana Peak Load in February 2020 translating into 14.5% of both peak loads. A total of 2,205.7 MMSCF of natural gas was consumed by the thermal power plant at an estimated heat rate of 8,102.94 Btu/kWh in February 2020, which was higher than the 8,034.2 Btu/kWh recorded in January 2020.

AKSA Power Plant's generation increased in February 2020

The AKSA power plant recorded a significant increase in electricity generated in February 2020 by 3%. The average electricity generated by the thermal power plant increased from 3.02 GWh per day in January 2020 to 3.11 GWh per day in February 2020. On the contrary, the total electricity supplied by the thermal power plant decreased from 93.06 GWh in January 2020 to 90.23 GWh in February 2020. The total electricity generated by the AKSA power plant contributed 5.4% of the total electricity supplied in February 2020 and was 41% higher than the 64 GWh projected in the 2020 ESP. AKSA contributed 289.8 MW both the System Peak Load and the Ghana Peak Load in February 2020 translating into 10% of both peak loads. The thermal power plant consumed a total of 121,920 barrels of HFO at an estimated heat rate of 8,175.12 Btu/kWh in February 2020, which was higher than the 8,158.96 Btu/kWh recorded in January 2020.

Takoradi International Company (TICO) generation decreased in February 2020

The average electricity generated by TICO reduced by 2.2%, from 3.19 GWh per day in January 2020 to 3.12 GWh in February 2020.

HIGHLIGHTS OF THE MONTH

Similarly, the total electricity generated by the thermal power plant reduced from 98.93 GWh in January 2020 to 90.56 GWh in February 2020. The total electricity generated by TICO constituted 5.4% of the total electricity supplied in February 2020 and was 48.5% lower than 176 GWh projected in the 2020 ESP. TICO contributed a total of 212 MW to both the System Peak Load and the Ghana Peak Load, representing 7.3% of both peak loads in February 2020. The thermal power plant consumed a total of 1,083.55 MMSCF of natural gas at an estimated heat rate of 12,276.09 Btu/kWh in February 2020, which was higher than the 9,379.16 Btu/kWh recorded in January 2020. Takoradi Power Company (TAPCO) Plant's generation increased in February 2020

The average electricity generated by TAPCO increased by 22.8%, from 2.9 GWh per day in January 2020 to 3.56 GWh per day in February 2020. The total electricity supplied by TAPCO increased from 89.86 GWh in January 2020 to 103.38 GWh in February 2020. The total electricity generated by the thermal power plant constituted 6.21% of the total electricity supplied in February 2020 and was 30.9% higher than the 79 GWh projected in the 2020 ESP. The thermal power plant contributed 153 MW to both the System Peak Load and the Ghana Peak Load, representing 5.3% of both peak loads in February 2020. A total of 853.54 MMSCF of natural gas was consumed by the thermal power plant at an estimated heat rate of 8,470.67 Btu/kWh in February 2020, which was higher than the 8,433.12 Btu/kWh recorded in January 2020.

Kpone Thermal Power Plant (KTPP) generation increased in February 2020

The KTPP generated an average of 0.75 GWh per day in February 2020. The power plant generated a total of 8.08 GWh in January 2020 compared to 21.7 GWh in February 2020. The total electricity generated constituted 1.3% of the total electricity supplied in February 2020. The power plant was projected to be offline in February 2020 in the 2020 ESP. The power plant contributed 101 MW to both the System Peak Load and the Ghana Peak Load, representing 3.5% of both peak loads in February 2020. The thermal power plant consumed a total of 45,579 barrels of DFO at an estimated heat rate of 11,281.51 Btu/kWh in February 2020 compared to 11,257.98 Btu/kWh in January 2020.

Tema Thermal 1 Power Plant's (TT1PP) offline in February 2020

The TT1PP was offline in February 2020. The power plant was offline due to the curtailment of natural gas supply from the WAPCo for the clean-up of the natural gas pipeline.

CENIT Power Plant's was offline in February 2020

The CENIT power plant was offline in February 2020 due to curtailment of natural gas supply from the reverse flow facility. This was due to the clean-up of the natural gas pipeline of WAPCo.

Cenpower generation increased in February 2020

Cenpower power plant generation increased by over one fold from 1.97 GWh per day in January 2020 to 4.19 GWh per day in February 2020. Consequently, total electricity generation increased from 61.01 GWh in January 2020 to 121.6 GWh in February 2020. The Cenpower power plant generation constituted 7.3% of the total electricity supply. The power plant contributed 179 MW to both the System Peak Load and the Ghana Peak Load, representing 6.2% of both peak loads in February 2020. The heart rate of the power plant increased from 8,645 Btu/kWh in January 2020 to 7,561.4 Btu/Kwh in February 2020.

Embedded Electricity Generation

Genser Power Plant's generation decreased in February 2020

The average electricity supplied by Genser power plant decreased by 3.3%, from 1.26 GWh per day in January 2020 to 1.22 GWh per day in February 2020. Similarly, the total electricity supplied by the thermal power plant decreased from 38.94 GWh in January 2020 to 35.49 GWh in February 2020. The total electricity supplied by the thermal power plant constituted 2.1% of the total electricity supplied in February 2020. A total of 364.69 MMSCF of natural gas at an estimated heat rate of 11,313.84 Btu/kWh in February 2020, which was higher than the 11,223.74 Btu/kWh in January 2020.

BXC Solar generation decreased in February 2020

There was a decrease in the total electricity supplied by the BXC solar power plant by 2.8%, from 0.072 GWh per day in January 2020 to 0.07 GWh per day in February 2020. Consequently, the total electricity generated by the power plant decreased from 2.24 GWh in January 2020 to 2.04 GWh in February 2020. The generation from BXC Solar constituted 0.12% of the total electricity supplied in February 2020.

Meinergy Solar generation decreased in February 2020

The Meinergy Solar power plant recorded an decrease from 0.065 GWh per day in January 2020 to 0.057 GWh per day in February 2020. Consequently, the total electricity generated by the power plant decreased from 2.01 GWh in January 2020 to 1.66 GWh in February 2020. The generation from Meinergy Solar constituted 0.1% of the total electricity supplied in February 2020.

Electricity Exchange – Import decreased whilst Export increased in November 2019

The average electricity import increased in February 2020 by 63.6%, from 0.11 GWh per day in January 2020 to 0.18 GWh per day in February 2020. Similarly, the total electricity imported from CIE increased from 3.33 GWh in January 2020 to 5.17 GWh in February 2020. The total electricity imported constituted 0.3% of the total electricity supplied in February 2020.

There was however a decrease in the total average electricity exported to CIE, CEB and SONABEL, from 5.95 GWh per day in January 2020 to 5.91 GWh per day in February 2020. Electricity exported to CIE, CEB and SONABEL decreased from 184.44 GWh in January 2020 to 171.42 GWh in February 2020. Of the total electricity exported, 54.8% was exported to CEB, 13.7% to CIE and 31.5% to SONABEL.

The total electricity exported to CIE, CEB and SONABEL increased by 58.9%, from 102.6 GWh in October 2019 to 162.98 GWh in November 2019. A total of 6.62 GWh, 102.68 GWh and 53.67 GWh were exported to CIE, CEB and SONABEL in November 2019 which were higher than the 2.88 GWh, 60.63 GWh and 39.09 GWh exported to CIE, CEB and SONABEL in October 2019 respectively.

Ghana continued to be a net exporter of electricity in February 2020.

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

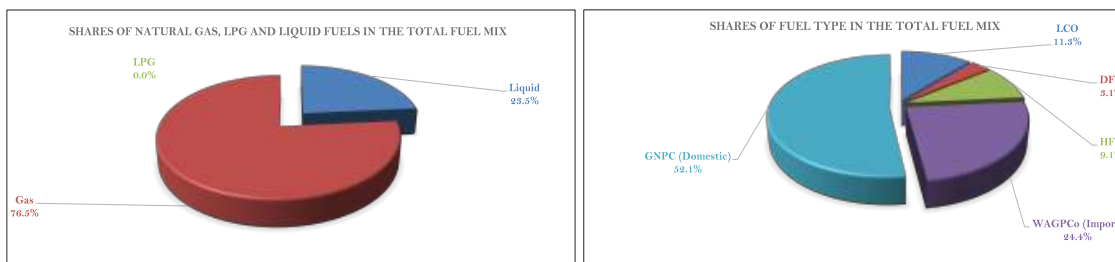
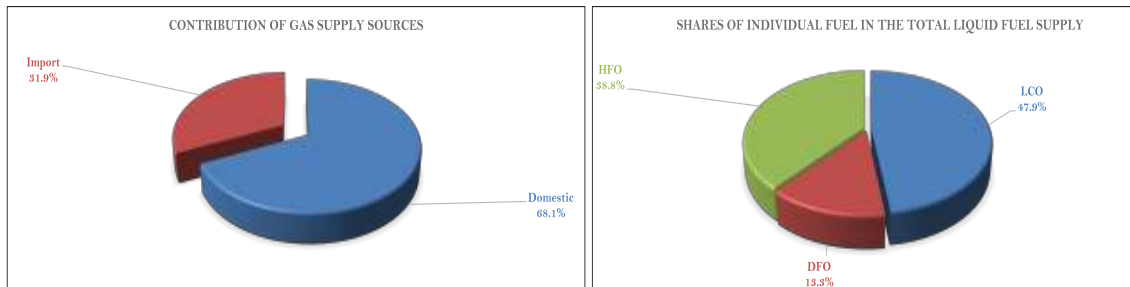


Figure 4a: Contribution of Natural Gas Supply by sources

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

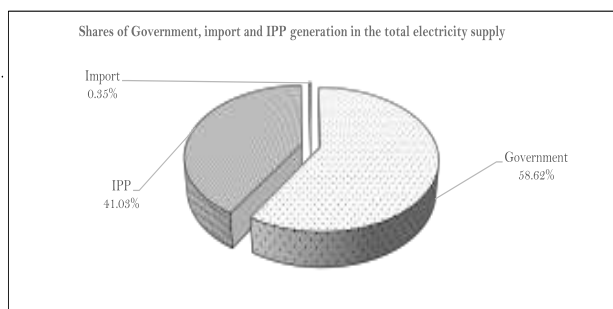
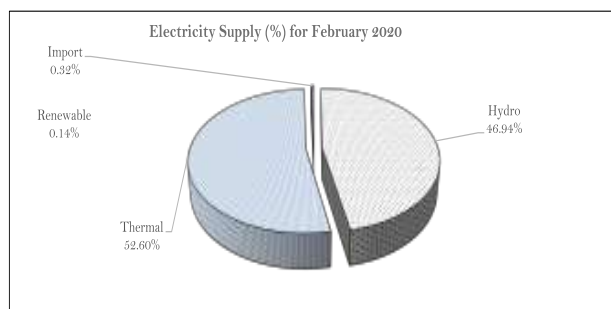


Peak Electricity Supply - February 2020			
Source of Supply	Generation at System Peak Load (MW)	Generation at Ghana Peak Load (MW)	Electricity Supply (GWh)
AKOSOMBO	884.10	884.10	568.88
KPONG	112.00	112.00	72.56
BUI	240.70	240.70	122.59
SEAP	-	-	-
TAPCO	153.00	153.00	103.38
TICO	212.00	212.00	90.56
TT1PP	-	-	-
CENIT	-	-	-
TT2PP	-	-	-
MRP	136.20	136.20	2.28
KARPOWER	420.70	420.70	299.70
AMERI	164.40	164.40	126.73
KTPP	101.00	101.00	21.70
Trojan Power	-	-	-
CENPOWER	179.00	179.00	121.60
AKSA	289.80	289.80	90.23
Bridge Power	-	-	-
BXC Solar	-	-	2.04
Safisana	-	-	-
VRA Solar	-	-	0.28
Genser	-	-	35.49
Meinergy	-	-	1.66
IMPORT	2,892.90	2,892.90	5.17
Export to CIE at peak	31.00	31.00	89.12
Export to CEB at peak	79.00	79.00	10.53
Export to Sonabel	143.00	143.00	71.77
System Coincident Peak Load	2,892.90		
Ghana Coincedent Peak Load		2,639.90	
Total Supply			1,664.85
Total Supply without export			1,493.43

OPERATIONAL FACT SHEET

Average Monthly Flowrate (MMSCFD)	
Location	Monthly Average
Etoki	52.06
Tema WAGPCo	5.79
Aboadze WAGPCo	53.87
Aboadze GNGC	56.91
Reverse Flow	1.73

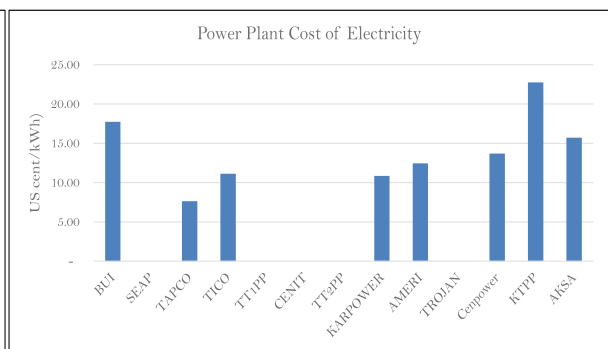
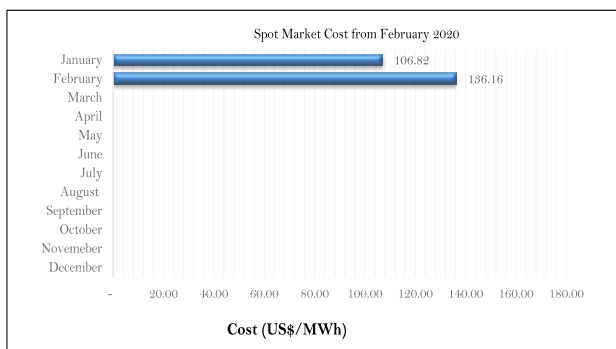
Feb-20			
	Beginning month (ft)	End month (ft)	Change in water level (feet)
Hydro Dam			
Akosombo	263.12	261.27	-1.85
Bui	587.86	581.76	-6.10



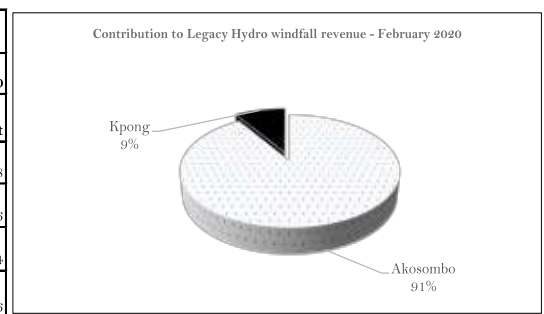
Power Plant Data February 2020								
	Installed Capacity (MW)	Plant Capacity Utilization (%)	Electricity Generation (GWh)	Natural Gas Consumption (MMBtu)	LCO Consumption (MMBtu)	DFO Consumption (MMBtu)	HFO Consumption (MMBtu)	LPG Consumption (MMBtu)
Akosombo	1,020.00	74.96	568.88	-	-	-	-	-
Kpong	160.00	60.95	72.56	-	-	-	-	-
Bui	400.00	41.19	122.59	-	-	-	-	-
SEAP	560.00	-	-	-	-	-	-	-
TAPCO	330.00	42.11	103.38	875,732.24	-	-	-	-
TICO	340.00	35.80	90.56	1,111,722.56	-	-	-	-
TT1PP	126.00	-	-	-	-	-	-	-
CENIT	126.00	-	-	-	-	-	-	-
TT2PP	87.00	-	-	-	-	-	-	-
KARPOWER	470.00	85.71	299.70	2,428,480.94	-	-	-	-
AMERI	250.00	68.14	126.73	1,344,239.52	-	-	-	-
Cenpower	370.00	44.24	121.77	-	911,500.68	7,948.71	-	-
TROJAN	56.00	-	-	-	-	-	-	-
KTPP	220.00	13.26	21.70	-	-	244,761.45	-	-
AKSA	360.00	33.69	90.23	-	-	-	737,615.23	-
Amandi	-	-	2.28	27,239.84	-	-	-	-
Bridge Power	-	-	-	-	-	-	-	-
GENSER	95.00	50.21	35.49	401,528.26	-	-	-	-
VRA Solar	2.50	15.22	0.28	-	-	-	-	-
BXC	20.00	13.74	2.04	-	-	-	-	-
Meinergy	20.00	11.18	1.66	-	-	-	-	-
Total	5,012.50	44.51	1,659.85	6,188,943.37	911,500.68	252,710.16	737,615.23	-

ECONOMIC FACT SHEET

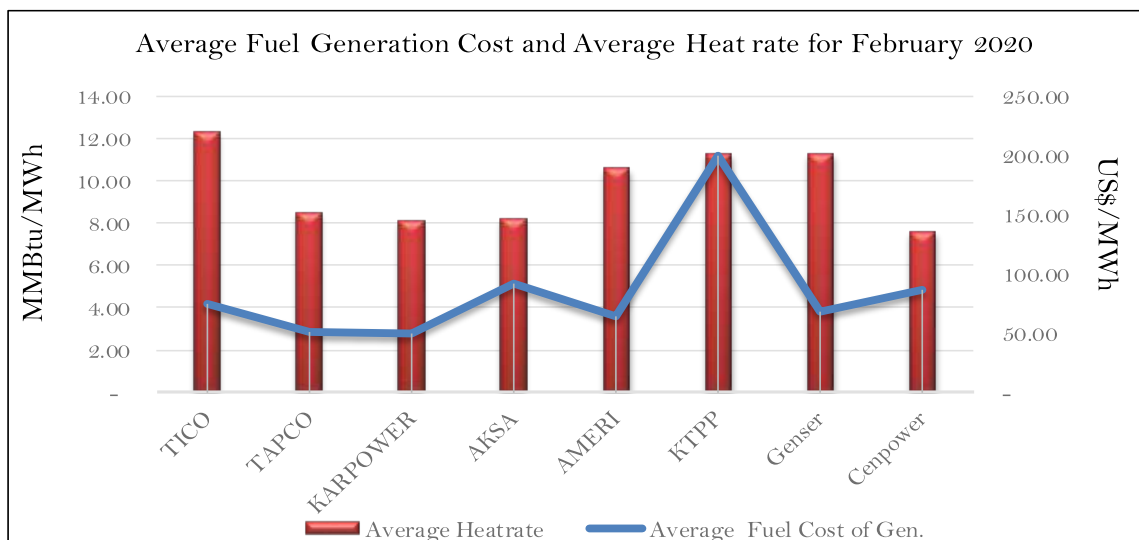
		Actual	Projected	Change
Average Market Energy Cost	US\$/MWh	90.40	48.97	41.43
Average Market Capacity Charge (AMCC)	US\$/MWh	39.92	34.25	5.67
Total Average Market Cost (TAC)	US\$/MWh	130.31	83.22	47.10
System Marginal Cost (SMC)	US\$/MWh	112.21	112.21	-
System Marginal Capacity Charge (SMCC)	US\$/MWh	23.95	23.95	-
Spot Market Price (SMP)	US\$/MWh	136.16	136.16	-
Composite Bulk Generation Charge (CBGC)	US\$/MWh	87.17	87.17	-
Deviation of TAC from CBGC	US\$/MWh	(43.14)	3.95	(47.10)
Deviation of SMP from CBGC	US\$/MWh	(48.99)	(48.99)	-



Average Fuel Prices		
		Feb-20
Fuel Type	Unit	Delivered Cost
Natural Gas	US\$/MMBtu	6.08
LCO	US\$/BBL	60.66
HFO	US\$/Tonne	372.44
DFO	US\$/Tonne	714.66



	Gazetted Natural Gas Price	Weighted average Natural Gas Price	LCO	HFO	DFO
US\$/MMBTu	6.08	7.08	11.46	11.29	17.69



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	74.96	-	-	-
Kpong	60.95	-	-	-
Bui	41.19	-	-	-
SAPP	-	-	-	-
TAPCO	42.11	8,470.67	51.50	0.45
TICO	35.80	12,276.09	74.64	0.65
TT1PP	-	-	-	-
CENIT	-	-	-	-
TT2PP	-	-	-	-
KARPOWER	85.71	8,102.94	49.27	-
AMERI	68.14	10,606.86	64.49	0.56
TROJAN	-	-	-	-
KTPP	13.26	11,281.51	199.59	0.60
AKSA	33.69	8,175.12	92.32	0.64
Cenpower	44.17	7,561.40	85.94	0.56
Genser	50.21	11,313.84	68.79	0.60

WAPCo Offshore Pipeline Cleaning and its Impact On The Electricity Market

The West African Gas Pipeline Company Limited (WAPCo) are the owners and operators of the West African Gas Pipeline (WAGP). The WAGP is a 678 kilometer gas pipeline links into the existing Escravos-Lagos pipeline at the Nigeria Gas Company's Itoki Natural Gas Export Terminal in Nigeria and proceeds to a beachhead in Lagos. From there it moves offshore to Takoradi, in Ghana, with gas delivery laterals from the main line extending to Cotonou (Benin), Lome (Togo) and Tema (Ghana). The Escravos-Lagos pipeline system has a capacity of 800 MMscfd, and the WAPCo system will initially carry a volume of 170MMscfd and peak over time at a capacity of 460MMscfd.

The main pipeline is 20 inches in diameter. Cotonou and Lome laterals are 8 inches respectively while the Tema lateral is 18 inches. The termination point at Takoradi (Aboadze) forms part of the main pipeline. WAGP transports purified natural gas free of heavy hydrocarbons, liquids and water, ideally suited as fuel for power plants and industrial applications. Eighty-five per cent of the gas is for power generation and the remaining for Industrial Applications. The Volta River Authority's Takoradi Thermal Power Plant in Ghana, CEB of Benin and Togo are WAPCo's foundation customers.

The West African Gas Pipeline Company Limited (WAPCo) operators of the West African Gas Pipeline (WAGP) has in consultation with its stakeholders in Ghana, Togo, Benin and Nigeria decided to embark on a cleaning and inspection its offshore pipeline from Nigeria to Ghana, often referred to as "pigging" in the pipeline industry. Pigging among others is intended to protect the integrity of WAPCo's offshore pipeline which is the main critical asset of the company transporting natural gas within the four (4) west African States of Nigeria, Benin, Togo and Ghana. The exercise commenced on 20th January 2020 and ended by 27th February 2020.

Pigging of the pipeline will involves cleaning and an in-line inspection of the offshore pipeline from Nigeria to Ghana using multiple cleaning pigs and an intelligent pig for data gathering. The pig will be launched from our Lagos Beach Compressor Station (LBCS) in Badagry, Nigeria and will be received at our Takoradi Regulating & Metering Station (R&MS) in Ghana.

As a result of the pigging exercise, reverse flow of gas from Takoradi to Tema as well as the supply of gas through the laterals to the various gas processing facilities in Tema, Lome and Cotonou will be curtailed, gas will, however, be supplied in sufficient quantities from the east to Takoradi to facilitate the pigging process. Apart from cleaning the pipeline of debris, pigging will provide information on the condition of the pipeline to inform decisions on effective maintenance of the pipeline to prolong its lifespan and to improve safety of our operation. Effluents from the pigging will be discharged in Takoradi where WAPCo has arranged for the effluent to be managed in line with the Ghana Environmental Protection Agency prescribed processes and procedures.

The pipeline clean-up is a regulatory requirement and critical operational integrity requirement for the operation of the natural gas pipeline. The Periodic cleaning of the line is also needed for it to be more efficient and reliable in delivering gas to needed customers. Without this work, there is the risk losing the pipeline completely.

In 2014, the WAPCo increased the Regulating and Metering Station (RMS) at Tema from 70 MMSCFD to 140 MMSCFD. With the increasing need for natural gas through the reverse flow mechanism, there was the need to increase the capacity of the RMS station in Tema. With support from the Ghana National Petroleum Company (GNPC) and ENI, the WAPCo will use the period of the pipeline clean up to increase the capacity of the RMS in Tema from 140 MMSCFD to 234 MMSCFD. This will make it possible to reverse over 100 MMCSFD of natural gas from the oil and gas fields in to west to Tema and Kpone.

The pipeline clean-up all though important and forms part of the regulatory requirement, has an impact on the reliability, quality of electricity supply and cost of electricity supply.

As at the end of February 2020, Ghana had a total installed capacity of 4,819 MW on the National Interconnected Transmission System (NITS). Of this total, 3,239 MW of the installed capacity are thermal power plant and the rest are hydro power generators. A total of 1,849 MW of the installed capacity are located in the Tema and Kpone. Apart from the 200 MW Sunon Asogli Phase I power plant which operates on only natural gas, all the other 1,649 MW thermal power plants are dual fuel fired mainly on Light Crude Oil (LCO) and natural gas except the Kpone Thermal Power Plant which operates on Natural gas and Distillate Fuel Oil (DFO). A total of 1,390 MW is located in the Takoradi (West) all of which a dual fuel fired excepted for Ameri Power Plant which operates on only natural gas. The Takoradi Thermal Company (TAPCo) had one of its Gas turbine unavailable due to vibration and the Takoradi International Company also had its steam turbine offline due to jammed shaft. Also, the Ameri Power Plant had 8 out of it 10 units available as two units were unavailable. There was therefore a combined loss of 320 MW in the west due to technical challenges thereby reducing the capacity in the west from 1,390 MW to 1,070 MW.

In Tema, TT2PP had technical challenges to some of its unit limiting it capacity to 40 MW. Limited liquid fuel supply, zero

Other Market News and Trends

supply of natural gas from WAPCo and zero supply of natural gas through the reverse flow facility meant that a number of power plant were offline in Tema and Kpone. This included TT1PP (126 MW), CENIT (126 MW), Sunon Asogli Power Plant (560 MW), TT2PP (40 MW) and Cenpower Plant (185 MW). Therefore, capacity left in the Tema and Kpone reduced from 1,849 MW to 765 MW. Operationally, a total of 3,038 MW were available for electricity generation. This is made up of 710 MW in Tema and Kpone, 1,020 MW in the East and 1,308 MW of hydro generation capacity.

The System Peak Load of Ghana recorded in February 2020 was 2,900 MW. With the current operational capacity, Ghana has 138 MW as reserve capacity, that is, 4.5% reserve capacity. It is therefore not surprising that there were periods of load shedding during the pipeline cleaning period. Load shedding ranging between 50 MW and 150 MW was shed between 22nd January 2020 and 29th February 2020. Aside from the reliability challenges, quality of electricity supplied was also an issue. Voltages in Tema and Kpone were generally not optimal.

There is therefore the need for high reliability of power plant and natural gas supply from the oil fields in order to minimize the impact of the pipeline clean up on electricity supply reliability. There is the need for liquid fuel supply to the Tema Thermal Power Enclave for the generation of CENIT and TT1PP which together can supply 200 MW.

The use of liquid fuels such as LCO, HFO and DFO comes at a higher cost in January 2020 and February 2020 compared to natural gas. LCO Freight On Board (FOB) prices has generally reduced in the first two months of 2020 compared to December 2019. In January 2020, LCO reduced to USD65.65/bbl compared to USD73.22/bbl in December 2019. In February, 2020, LCO prices reduced to USD55.66/bbl. In energy terms, LCO prices have reduced from USD13.84/MMBtu in December 2019 to USD12.98/MMBtu in January 2020 and USD11.46/MMBtu in February 2020. This is however higher than the weighted average natural gas price gazetted by the PURC of USD6.08/MMBtu. Table 1 shows the comparison between LCO prices and natural gas prices from December 2019 to February 2020.

Table 1: comparison of LCO and natural gas prices from December 2019 to February 2020.

Month	LCO (USD/MMBtu)	Natural gas (USD/MMBtu)	Difference (USD/MMBtu)
December 2019	13.84	6.08	7.76
January 2020	12.98	6.08	6.9
February 2020	11.46	6.08	5.38

Freight On Board (FOB) prices of HFO prices on the other hand increased from USD432.52/tonne in December 2019 to USD460.9/tonne in January 2020. The price reduced to USD372.44/tonne in February 2020. The HFO prices used for electricity generation at the power plant site increased from USD13/MMBtu in December 2019 to USD13.76/MMBtu in January 2020 but reduced to USD11.4/MMBtu in February 2020. These prices were however higher than the natural gas price of USD6.08/MMBtu gazetted by the PURC. Table 2 shows the comparison between HFO prices and natural gas prices from December 2019 to February 2020.

Table 2: comparison of HFO and natural gas prices from December 2019 to February 2020.

Month	HFO (USD/MMBtu)	Natural gas (USD/MMBtu)	Difference (USD/MMBtu)
December 2019	13.04	6.08	6.96
January 2020	13.76	6.08	7.68
February 2020	11.40	6.08	5.32

Just like the HFO prices, DFO prices increased from USD 730.97/Tonne in December 2019 to USD 763.89/Tonne in January 2020 but reduced to USD 714.66/Tonne in February 2020. These prices corresponds to USD 18.1/MMBtu in December 2019, USD 18.91/MMBtu in January 2020 and USD 17.69/MMBtu in February 2020. Table 3 shows the comparison between DFO prices and natural gas prices from December 2019 to February 2020.

Table 3: comparison of DFO and natural gas prices from December 2019 to February 2020.

Month	DFO (USD/MMBtu)	Natural gas (USD/MMBtu)	Difference (USD/MMBtu)
December 2019	18.10	6.08	12.02
January 2020	18.91	6.08	12.83
February 2020	17.69	6.08	11.61

The higher cost of liquid fuels compared to natural gas infers that use of these fuel instead of natural gas will have an impact on the wholesale electricity prices. Using the embedded cost of Akosombo and Kpong power plants, the weighted average cost of electricity in December 2019 was UScent 7.23/kWh. The weighted average cost of electricity for January 2020 increased to UScent 8.23/kWh, representing a 13.8% increase in the cost. The weighted cost of electricity increased by 7.9% in February 2020 to UScent 7.88/kWh compared to December 2020. The lower increase in the average cost of electricity in February 2020 was due to the increase in hydro generation in February 2020 compared to December 2019. Hydro share of

Other Market News and Trends

the total electricity supply increased from 35% in December 2019 to 38.2% in January 2020 and 46.9% in February 2020. So far, 20% of the 2020 legacy hydro supply has been used in January 2020 and February 2020 to make up for shortfalls in supply from the thermal power plants.

Pipeline cleaning is an important activity in the maintenance of natural gas pipeline and to secure the integrity of the pipeline. The clean-up process is also a regulatory requirement which is needed to be performed. The pigging process resulted in supply unreliability and quality due to load imbalance between the load generation centres and load serving centres. This was due to the inadequate liquid fuel available in the Tema and Kpone. The use of liquid fuel also caused an increase in the average electricity cost by 13.8% and 7.9% in January 2020 and February 2020 respectively compared to December 2019.

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 Pesewa</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, Enyenra, 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>

For any enquiries please contact the:
EMOP Secretariat, Energy Commission, Accra.
Tel: 0302 813756/7/9 **E-mail:** emop@energycom.gov.gh