GHANA WHOLESALE ELECTRICITY MARKET BULLETIN

MARKET WATCH

Monthly Market Data Analysis

ISSUE NO. 77 **1st May 2022 to 31st May 2022**

This Bulletin covers major developments in the Wholesale Electricity Market (WEM) of Ghana from 1st May 2022 to 31st May 2022. It analyses the performance of the key WEM indicators against their benchmarks and examines the likely implications of any discernable trends in the market.

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. The Electricity Market Oversight Panel (EMOP) would very much appreciate and welcome comments from readers on the Bulletin.

HIGHLIGHTS OF THE MONTH

The System Peak Load for May 2022 was 3,378 MW recorded on 16th May. This load was, however, 3.4% lower of the 3,497 MW projected in the 2022 Electricity Supply Plan (ESP). The System Peak Load recorded for the month was made of 3,068 MW of domestic demand and 310 MW of export demand. The domestic load of 3,068 MW happens to be the Ghana Peak Load for the month and was 4% lower than the 3,197 MW that was projected in the 2022 ESP.

In May 2022, the electricity supply averaged 63.94 GWh per day. This value was marginally lower than the 65.13 GWh per day projected in the 2022 ESP. A total of 1,982.22 GWh of electricity was supplied in May 2022 which was 1.8% lower than the 2,019 GWh projected in the 2022 ESP. Domestic power plants supplied 99.8% of the total electricity supply in May 2022 and the remaining 0.2% was from inadvertent imports from CIE. Electricity export for the month totaled 178.78 GWh and this was 4.2% higher than the 171.6 GWh projected in the 2022 ESP.

There was a 19% reduction in the rate of drop in the water level for the Akosombo GS. On the contrary, Bui GS increased by 14.8% for the month under review. The rate of drop in the water level for the Akosombo GS was 0.036 feet per day whilst that of the Bui GS was 0.096 feet per day compared to 0.045 feet per day and 0.085 feet per day for Akosombo GS and Bui GS respectively.

Natural gas continued to be the primary fossil fuel for the generation of electricity in the Ghana Wholesale Electricity Market in May 2022. The share of the natural gas used to generate electricity was 98.1% and this was

Table 1. Projected and Actual Outturn of Electricity Demand and Supply in April 2022 and May 2022.

	Apr-21		May-22	
	Projected	Actual	Projected	Actual
Total Supply (GWh)	2,036.3	1,946.4	2,019.0	1,982.2
Source by Power Plants (GWh)				
AKOSOMBO	467.7	517.6	482.1	560.2
KPONG	81.0	87.5	83.6	88.1
BUI	56.0	56.4	57.0	82.5
BUI Solar	5.4	6.1	5.4	9.0
Kaleo	1.8	1.7	1.5	2.8
Sunon Asogli	314.3	207.6	239.3	160.1
TAPCO	189.5	194.4	195.2	157.7
TICO	188.9	175.8	195.2	210.6
TT1PP	57.6	77.2	-	13.9
CENIT	61.2	30.8	63.2	43.6
TT2PP	9.2	11.9	9.5	16.7
Twin City	116.3	137.4	120.2	115.3
KARPOWER	275.4	172.7	284.6	172.4
AMERI	-	-	-	-
KTPP	-	14.6	63.2	70.3
CENPOWER	202.8	242.7	209.5	259.7
AKSA	9.2	8.8	9.5	15.6
Bridge Power	-	-	-	-
Total Domestic Supply (GWh)	2,036.3	1,943.3	2,019.0	1,978.2
Imports (GWh)	-	3.1	-	4.0
Total Supply (GWh)	2,036.3	1,946.4	2,019.0	1,982.2
Ghana Coincedent Peak Load (MW	3,126.0	3,149.0	3,167.0	3,068.0
System Coincident Peak Load (MW	3,456.0	3,415.5	3,497.0	3,378.0

higher than the 95.6% recorded in April 2022. Liquid fuel accounted for the remaining 1.9% in April 2022.

ELECTRICITY TRADING

Electricity Demand

A marginal reduction of 1.1% (37.8 MW) was recorded on the System Peak Load for May 2022, compared to the 3,415.8 MW recorded in April 2022 to 3,378 MW. This reduction is attributable to a decrease in the domestic load. Contrary to this, electricity export to CIE, CEB and SONABEL increased to 310 MW in May 2022, from 282 MW recorded in April 2022. Thermal power plants contributed 60.9% and the hydroelectric power plants contributed the remaining 39.1% of the System Peak Load recorded in May 2022.

The Ghana Peak Load reduced from 3,197.7 MW in March 2022, to 3,149 MW in April 2022 and to 3,068 MW in May 2022. This represent an average reduction of 2% over the last three (3) month. The reduction is attributable to the cold weather situation experience in May 2022.

The average electricity demand for May 2022 was 2,664.27 MW and this was 1.4% lower than the 2,703.4 MW recorded in April 2022. The System Load Factor for May 2022 was 78.9% which was marginally lower than the 79.2% recorded in April 2022.

Electricity supply

The 63.94 GWh per day of average electricity supplied in May 2022 was 2% higher than the 62.69 GWh per day recorded in April 2022. Similarly, the 1,982.22 GWh of electricity supplied in May 2022 was 1.8% higher than the 1,946.42 GWh recorded in April 2022. Electricity supplied by the thermal power plants in May 2022 constituted 62.4% of the total electricity supplied and this was lower than the 65.5% recorded in April 2022. On the contrary, supply from the hydroelectric power plants increased in May 2022 with a share of 36.9%. This value was higher than the 34% recorded in April 2022. The contribution of the electricity supplied from the solar power plants increased marginally to 0.5% in May 2022, from 0.4% recorded in April 2022.

A reduction of 4.3% was recorded in the electricity exported in May 2022, from 186.72 GWh in April 2022. The decrease in electricity export in May 2022 was due to reduced export to CIE and CEB. Electricity export to CIE and CEB decreased from 22.35 GWh and 68.55 GWh in April 2022 to 16.69 GWh and 62.93 GWh in May 2022 respectively. Electricity export to SONABEL however increased by 3.5% from 95.82 GWh in April 2022 to 99.16 GWh in May 2022.

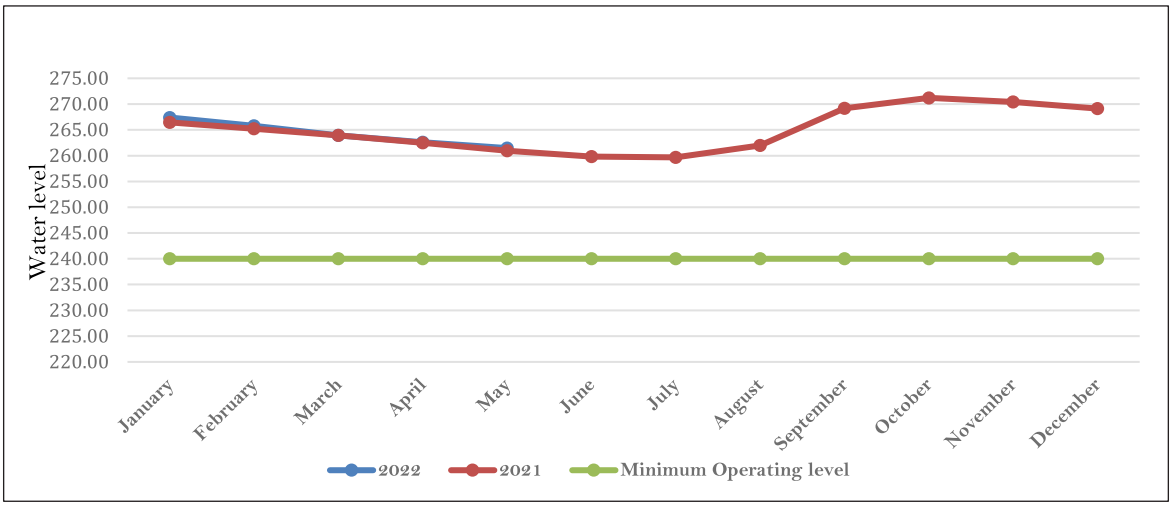
HYDRO DAM LEVELS

Akosombo dam water level continued to drop in May 2022

The rate of drop in the water level for the Akosombo GS reduced in May 2022. It reduced from 0.045 feet per day in April 2022 to 0.036 feet per day in May, representing a 19% reduction in the rate of drop. As a result, the water level of 262.6 feet recorded at the beginning of the month dropped by 1.13 feet to 261.47 feet at the end of the month which was lower than expected. The month-end water level of the Akosombo dam was 0.52 feet above the water level recorded for the same period in 2021 and was 21.41 feet above the minimum operating level of the dam.

Figure 1 shows the comparative end-of-month trajectory of the level of water in the Akosombo Dam from January 2021 to May 2022

Figure 1: Month-End Water Level for Akosombo Dam from January 2021 to May 2022.



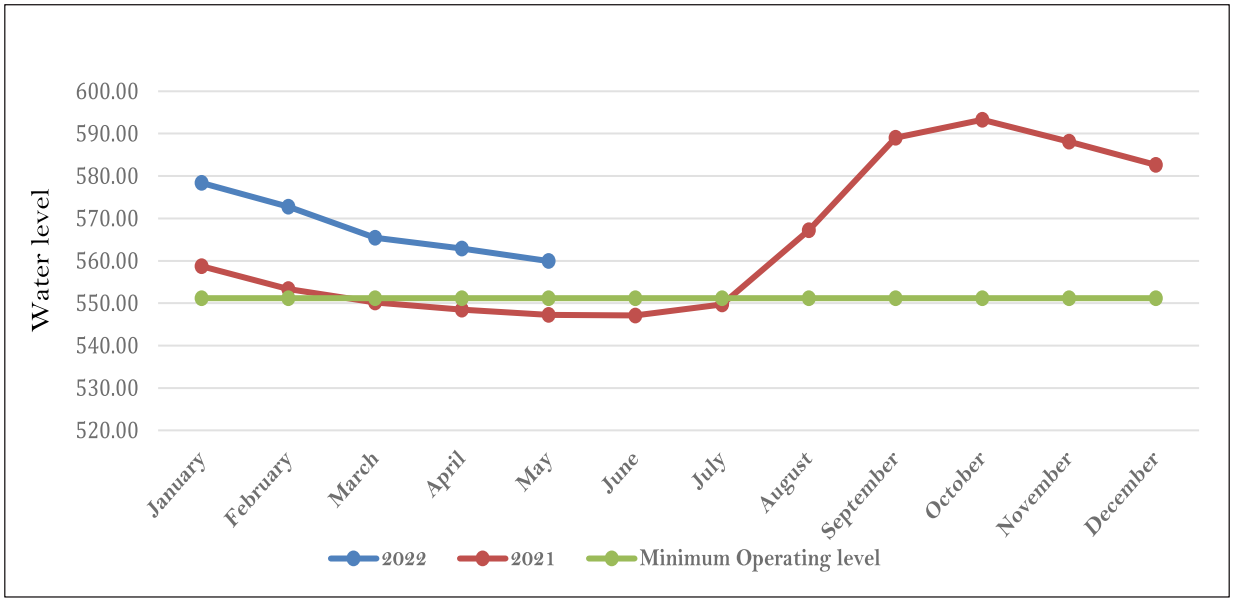
HIGHLIGHTS OF THE MONTH

Bui dam water level continued to drop in May 2022

The water level for the Bui GS continued to drop but at an increased rate of 0.096 feet per day in May 2022, from 0.085 feet per day in April 2022. By the end of the month, the water level for the dam had dropped by 2.99 feet from 562.93 feet at the beginning of the month. The month-end water level of the dam was 12.73 feet above the water level recorded for the same period in 2021 and was 7.82 feet above the minimum operating level of the dam.

Figure 2 shows the comparative end-of-month trajectory of the level of water in the Bui dam from January 2021 to May 2022.

Figure 2: Month-End Water Level for Bui Dam from January 2021 to May 2022



FUEL SUPPLY FOR POWER GENERATION

The Natural gas imported through the West Africa Gas Pipeline Company (WAPCo) increased in May 2022

The supply of natural gas from Nigeria through the West African gas pipeline averaged 70.34 MMSCFD in May 2022 representing an increase of 48.8% on the 47.28 MMSCFD recorded in April 2022. Total natural gas supplied in May 2022 was 2,180.5 MMSCF which was 53.7% higher than the 1,418.4 MMSCF recorded in April 2022. Consequently, to this increase, the share of the imported natural gas in the total fuel mix decreased marginally from 14.6% in April 2022 to 14.8% in May 2022. Also, its share in the total natural gas used for power generation decreased by 14.8% in May 2022, from 15.5% recorded in April 2022.

Natural gas supply from domestic sources decreased in May 2022

A reduction of 9.6% was recorded in the average natural gas supplied from domestic gas fields. Average gas supplied from the field reduced to 234.04 MMSCFD in May 2022, from 259.02 MMSCFD in April 2022. As a result, total natural gas supplied in May 2022 was 7,255.39 MMSCF, this was 6.6% lower than the 7,770.52 MMSCF recorded in April 2022. The share of the domestic natural gas in the total fuel mix, however, increased from 81.1% recorded in April 2022 to 83.6% in May 2022. With the total natural gas used for power generation, the share of domestic natural gas increased from 84.8% in April 2022 to 85.2% in May 2022.

The liquid fuel used for power generation decreased in May 2022

There was a significant reduction in the use of liquid fuel for power generation in May 2022. Total liquid fuel use reduced to 37,855 barrels in May 2022, from 89,023 barrels recorded in April 2022. The represent a 57% reduction over the quantity used in April 2022. The use of liquid fuel for power generation was at a low level due to the operation of the AKSA power plant on natural gas, hence there was no use of HFO in May 2022. The use of DFO mostly by KTPP constituted 60.9% of the liquid fuel used in May 2022 and this was higher than the 33.4% recorded in April 2022. In the total fuel mix, the share of DFO was 1.1% in May 2022 which was lower than the 1.5% recorded in April 2022. The share of LCO used constitute 0.7% of the total fuel used for power generation in May 2022 and this was lower than the 2.9% recorded in April 2022.

Monthly Market Data Analysis

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

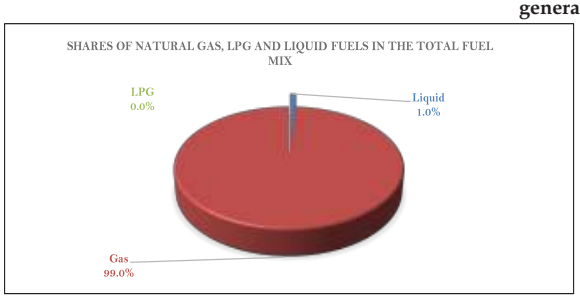


Figure 3b: Shares of fuel types in the generation fuel mix of power generation

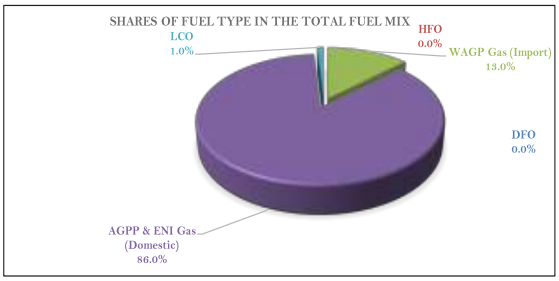


Figure 4a: Contribution of Natural Gas Supply by sources

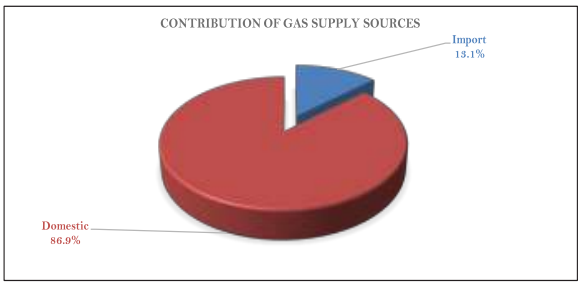


Figure 4b: Contribution of individual fuel in the liquid fuel supply

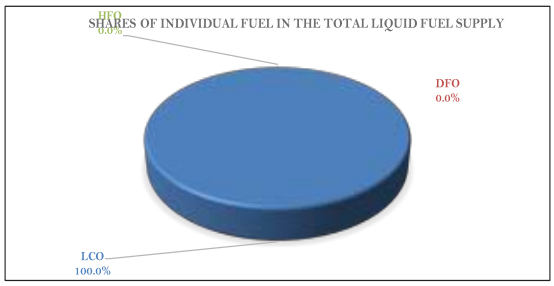


Figure 5a: Electricity Supply by sources

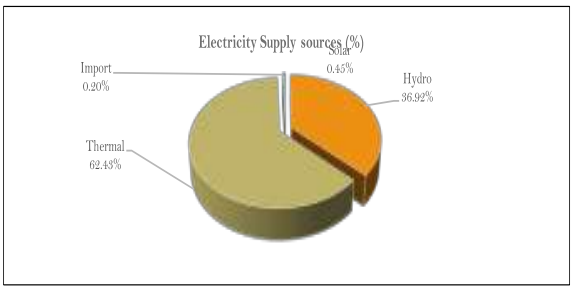
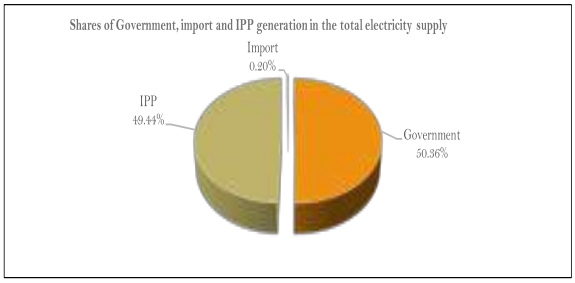


Figure 5b: Electricity supply by ownership



Peak Electricity Supply for May 2022		
Source of Supply	Generation at System Peak Load (MW)	Generation at Ghana Peak Load (MW)
AKOSOMBO	859.50	859.50
KPONG	133.40	133.40
BUI	327.00	327.00
BUI Solar	-	-
SEAP	178.70	178.70
TAPCO	261.00	261.00
TICO	338.00	338.00
TT1PP	-	-
CENIT	107.00	107.00
TT2PP	27.50	27.50
TWIN CITY	201.10	201.10
KARPOWER	344.10	344.10
AMERI	-	-
KTPP	203.00	203.00
Trojan Power	-	-
CENPOWER	369.00	369.00
AKSA	28.70	28.70
Bridge Power	-	-
IMPORT	-	-
Export to CIE at peak	10.00	10.00
Export to CEB at peak	136.00	136.00
Export to Sonabel	164.00	164.00
System Coincident Peak Load	3,378.00	
Ghana Coincedent Peak Load		3,068.00

OPERATIONAL FACT SHEET

May 2022 Average Monthly Natural Gas Flowrate (MMSCFD)	
Location	Monthly Average
Etoki	47.80
Tema WAGPCo	139.09
Aboadze WAGPCo	0.00
Aboadze GNGC	96.99
Reverse Flow	89.22

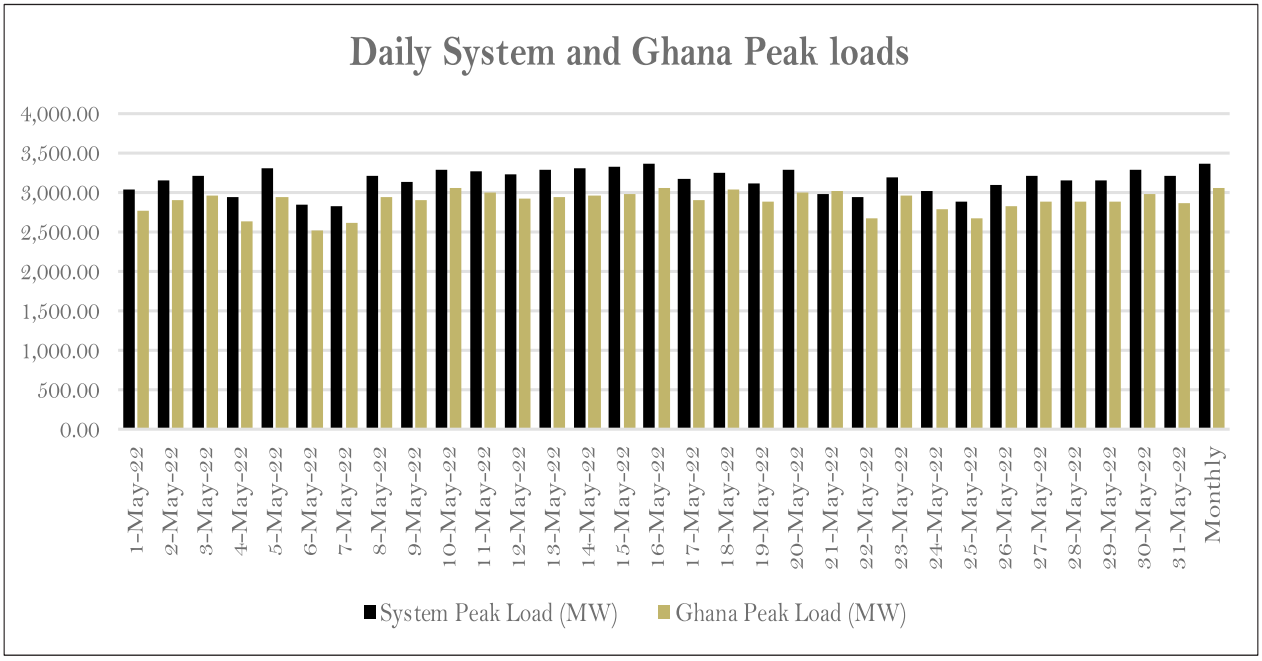
Hydro Dam Water level for May 2022			
	Beginning month (ft)	End month (ft)	Change in water level
Hydro Dam			(feet)
Akosombo	262.60	261.47	-1.13
Bui	562.93	559.94	-2.99

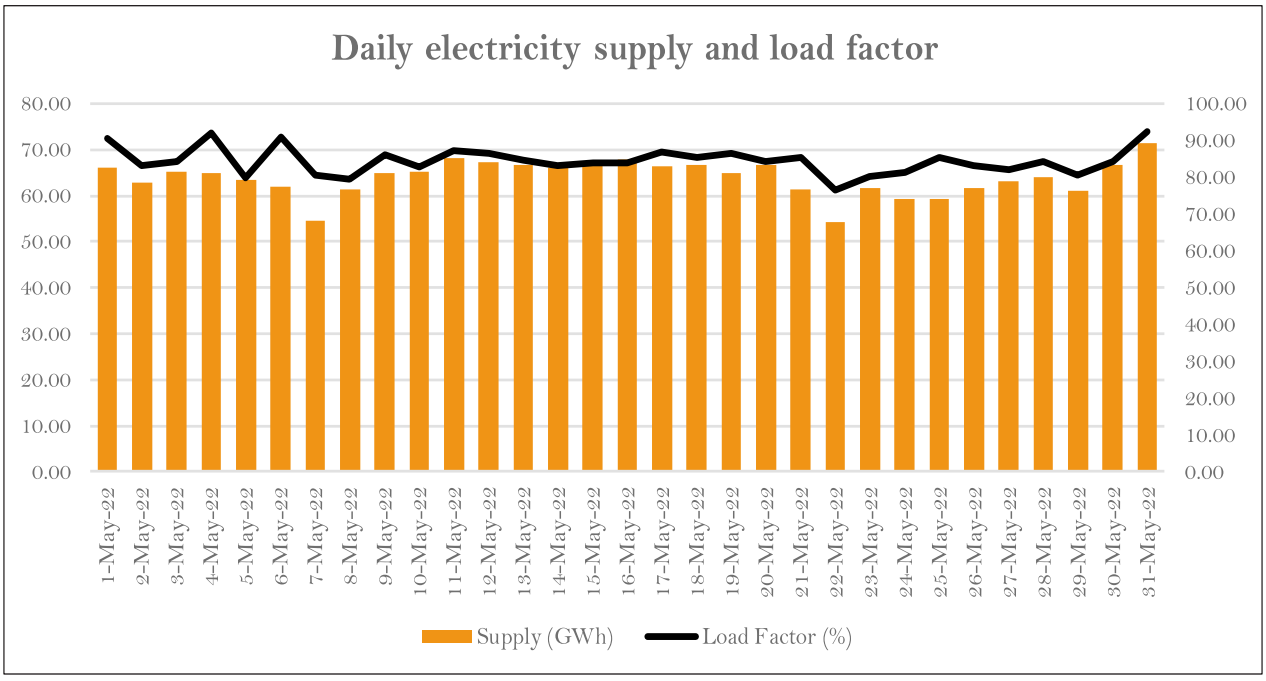
	Weekly Electricity Supply (GWh)				
	Week 1	Week 2	Week 3	Week 4	Total
AKOSOMBO	123.70	133.41	127.69	175.40	560.19
KPONG	20.92	20.36	18.78	28.00	88.06
BUI Hydro	12.67	23.88	19.84	26.08	82.47
Bui Solar	1.56	1.63	3.72	2.04	8.95
VRA Kaleo	1.33	0.34	0.55	0.59	2.82
SAPP	34.56	32.56	29.81	63.20	160.13
TAPCO	46.39	38.73	42.05	30.53	157.71
TICO	52.24	31.77	51.88	74.71	210.60
TT1PP	8.56	0.00	0.00	5.31	13.87
CENIT	2.58	1.36	18.08	21.55	43.57
TT2PP	3.73	2.58	4.37	6.04	16.72
Twin City	11.67	29.17	32.87	41.57	115.28
KARPOWER	47.05	62.01	26.72	36.59	172.37
AMERI	0.00	0.00	0.00	0.00	0.00
KTPP	9.66	21.64	19.37	19.59	70.26
Cenpower	59.20	55.52	60.48	84.47	259.67
AKSA	2.51	4.35	3.73	4.98	15.57
Bridge Power	0.00	0.00	0.00	0.00	0.00
Import	0.99	0.72	0.67	1.61	3.99
Total	439.32	460.04	460.62	622.25	1,982.22

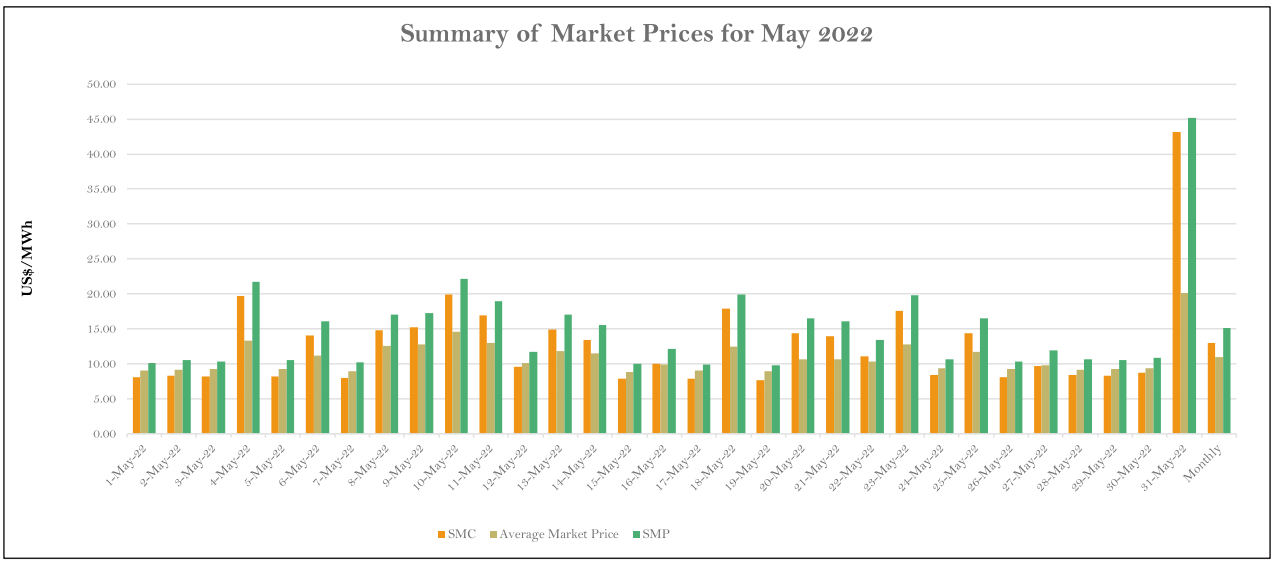
		Fuel Consumption (MMBtu)			
	Heat rate (Btu/kWh)	Natural gas	LCO	HFO	DFO
TAPCO	10,014.99	1,579,423.63	-	-	-
TICO	8,662.03	1,824,187.67	-	-	-
SAPP	7,737.18	1,238,981.33	-	-	-
TT2PP	11,650.01	194,804.42	-	-	-
TT1PP	12,937.55	179,379.17	-	-	-
CENIT	12,335.30	537,446.48	-	-	-
KARPOWERSHIP	7,940.77	1,368,769.47	-	-	-
AMERI PLANT	-	-	-	-	-
KPONE THERMAL	11,638.97	695,374.73	-	-	122,381.76
CENPOWER	7,903.64	1,972,660.78	79,082.13	-	623.64
AKSA ENERGY	8,946.80	139,280.16	-	-	-
Twin City	7,996.55	921,804.42	-	-	-
Bridgepower	-	-	-	-	-

	Month Average fuel prices					
	Gazetted Natural Gas Price	Weighted average natural gas price	LCO	HFO	DFO	LPG
US$/MMBtu	6.08	6.76	22.37	18.37	38.48	17.96

Power Plants	Average fuel price (US$/MMBtu)
TAPCO	6.08
TICO	6.08
SAPP	6.08
TT2PP	6.08
TT1PP	6.08
CENIT	6.08
KARPOWERSHIP	6.08
AMERI PLANT	0.00
KPONE THERMAL	10.93
CENPOWER	6.72
AKSA ENERGY	6.08
Twin City	6.08
Bridgepower	0.00





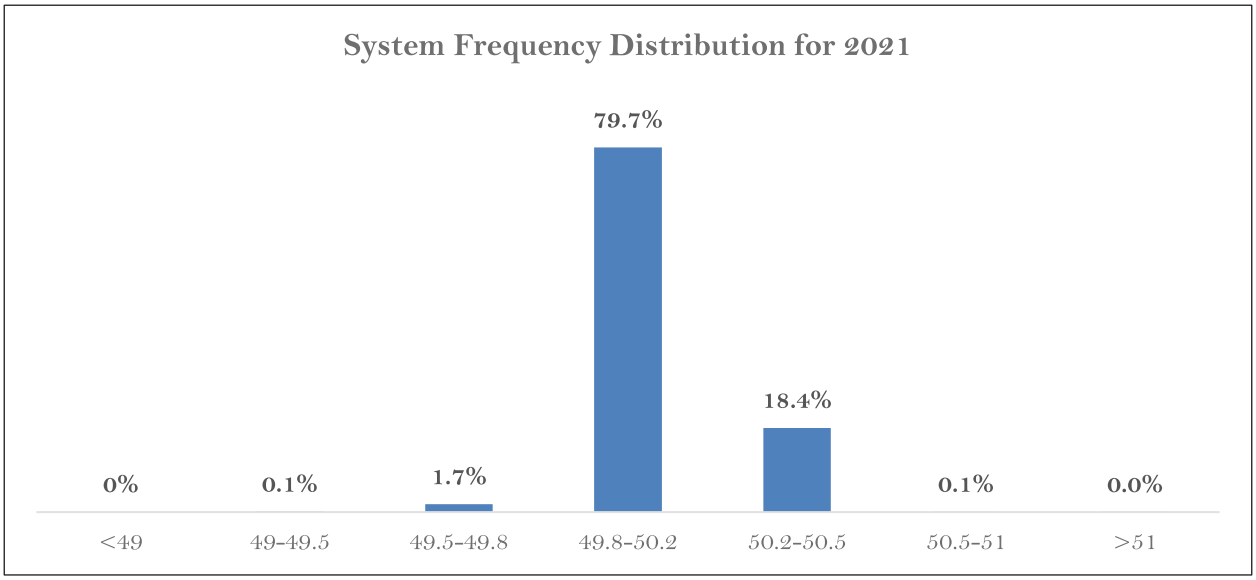


Monthly Average Electricity Prices in the WEM				
		May-22	Apr-22	Change
Average Market Price (AMP)	US$/MWh	109.37	124.83	-15.46
System Marginal Cost (SMC)	US$/MWh	129.22	177.90	-48.67
System Marginal Price (SMP)	US$/MWh	150.70	199.38	-48.69

Performance of the Wholesale Electricity Market (WEM) in 2021

Quality of supply

The Ghana Electricity Grid Code stipulate that in the normal state of the NITS, system frequency shall be maintained between 49.8 Hz and 50.2 Hz whiles the NITS voltage shall be kept with ±5% of the normal voltage at all times. In 2021, system frequency was in the normal range 79.7% of the time compared to 78.5% in 2020.

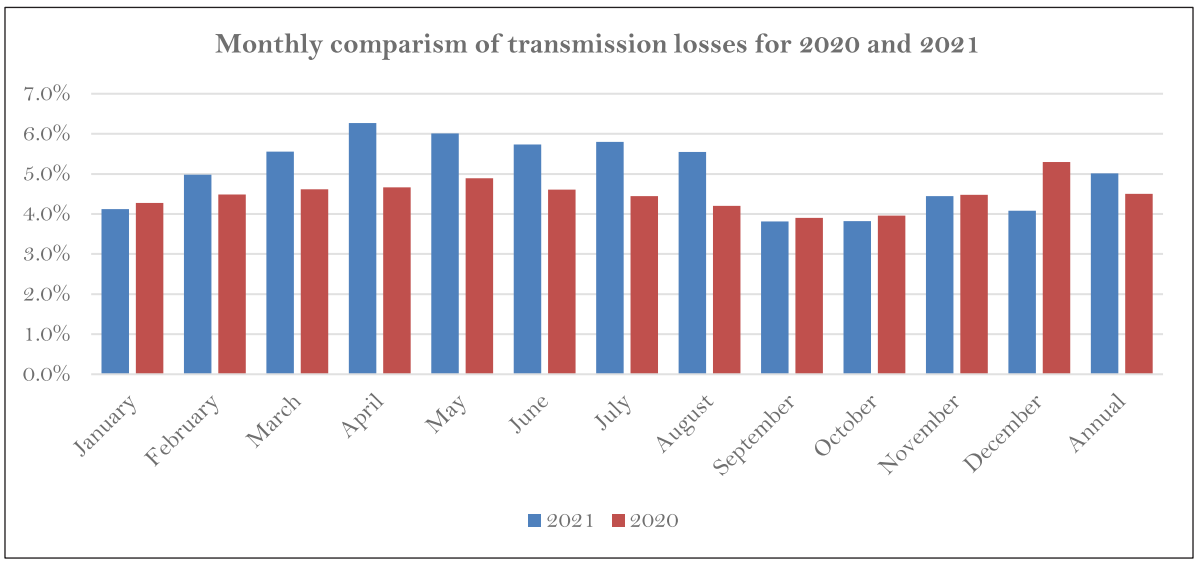


The voltages at major Bulk Supply Points (BSP) at peak were largely within normal limits except Mallam and Kumasi stations. For the first half of 2021, voltages at the Mallam substation below normal voltages 49.3% of the period. This is attributable to the period of upgrade works on the 161 kV Accra Central to Mallam and Achimota to Mallam transmission lines. Likewise, voltages in Kumasi was below voltage 27.7% of the period in the first quarter of 2021. This is attributable to periods when Bui water levels was low and thereby had to be shut down during the off-peak period with only one unit available for some peak periods.

Transmission System Performance

The PURC benchmarks the average availability of feeders in the NITS at 95%. The NITS system in 2021 had a feeder availability of 99.8%, 4.8% higher than the PURC benchmark. On transmission line availability, transmission lines recorded an average availability of 98.9%. The 69 kV line recorded the highest availability of 99.7% with the 225 kV line recording the lowest of 96.3%. The 330 kV and 161 kV line had an average availability of 98.8% and 98.9% respectively.

The was an increase in transmission losses in 2021 compared to 2020. Average transmission losses in 2021 was 5% compared to 4.5% in 2020On a monthly bases, there was a gradual decline in transmission loses from 5% in February 2021, 6.3% in April 2021 to 3.8% in October 2021 and 4.1% in December 2021. This is contrary to observations made in 2020. Transmission losses in 2022 increase gradually from 4.3% in January 2022 to 5.3% in December 2022.



ECONOMIC FACT SHEET

The Ghana Power System in the year 2021 experienced several disturbances caused mostly by transmission line faults and gas supply related trips, leading to supply interruptions to various consumers on the power system. In all, there were 16 disturbances caused by transmission line faults and 8 fuel related disturbances. These disturbances underscore the need for increase investments into the transmission network and natural gas supply security as enumerated in the October 2021 edition of the bulletin.

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

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