GHANA WHOLESALE ELECTRICITY MARKET BULLETIN

MARKET WATCH

Monthly Market Data Analysis

ISSUE NO. 84 **1st April 2023 to 30th April 2023**

This Bulletin covers major developments in the Wholesale Electricity Market (WEM) of Ghana from 1st April, 2023 to 30th April, 2023. 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 Secretariat (EMOPS) would very much appreciate and welcome comments from readers on the Bulletin.

HIGHLIGHTS OF THE MONTH

The System Peak Load for April, 2023 was 3,487.40MW which was lower than the 3,582.00MW projected in the 2023 Electricity Supply Plan (ESP). The System Peak Load recorded was made up of 3,192.40MW of the domestic demand and 298MW of Export demand. The Ghana Peak Load which is Ghana's System demand excluding export for April, 2023 was 3,192.40MW which was lower than 3,232MW projected in the 2023 Electricity Supply Plan.

The electricity supply averaged 66.7GWh per day in April, 2023 and this value was slightly lower than 66.9Gwh per day projected in the 2023 ESP. A total of 1,999.82GWh was supplied in April,2023 which was lower than the 2,008.0GWh projected in the 2023 ESP. Electricity Export to our neighboring countries for the month totaled 203.6GWh and it was higher than the 190GWh projected in the 2023 Electricity Supply Plan.

The Regulated Market accounted for 79.19% of electricity purchased in the Ghana wholesale electricity market in April 2023. The De-regulated Market accounted for 6.4% in April 2023 whilst the Export Market accounted for the rest.

The Akosombo Dam water level decreased in April, 2023. The water level decreased from 268.24 feet in February, 2023 to 267.08 feet at the end of April, 2023 at a rate of 0.038 feet per day in April, 2023.

The water level for the Bui dam at the beginning of the month was 564.63 feet which decreased at a rate of 0.29 feet per day at the end of the month of April, 2023 at a water level of 556.2 feet.

Table 1. Projected and Actual Outturn of Electricity Demand and Supply in March, 2023 and April 2023.

	Mar-23		Apr-23	
	Projected	Actual	Projected	Actual
Total Supply (GWh)	2,053.8	2,077.7	2,008.0	1,999.8
Source by Power Plants (GWh)				
AKOSOMBO	500.0	548.0	420.0	589.8
KPONG	89.5	93.8	75.2	97.1
BUI	98.3	148.7	94.7	140.7
BUI Solar	11.9	7.5	13.0	7.3
Kaleo	1.6	3.0	1.9	3.7
Sunon Asogli	375.0	261.3	362.9	226.5
TAPCO	214.3	165.3	207.4	88.2
TICO	222.6	248.9	215.4	177.5
TT1PP	-	6.6	-	43.6
CENIT	12.6	19.4	-	5.2
TT2PP	6.3	6.0	6.3	3.4
Twin City	120.2	133.4	116.3	137.4
KARPOWER	65.9	167.7	183.6	228.1
AMERI	-	-	-	-
KTPP	63.2	63.2	61.2	30.5
CENPOWER	241.1	143.3	233.3	174.6
AKSA	25.0	58.0	9.0	37.4
Bridge Power	-	-	-	-
Total Domestic Supply (GWh)	2,047.5	2,074.1	2,000.2	1,990.9
Imports (GWh)	-	3.7	-	8.9
Total Supply (GWh)	2,047.5	2,077.7	2,000.2	1,999.8
Ghana Coincedent Peak Load (MW)	3,259.0	3,231.9	3,232.00	3,192.4
System Coincident Peak Load (MW)	3,609.0	3,513.9	3,582.0	3,487.4

HIGHLIGHTS OF THE MONTH

Natural gas remains the primary fossil fuel for the generation of electricity in the Ghana wholesale electricity market. The share of the natural gas used to generate electricity by thermal power plant was 95.6%. Natural gas remains the single point of failure in electricity generation in Ghana that needs serious attention in ensuring continuous supply.

ELECTRICITY TRADING

Electricity Demand

The System Peak Load for April, 2023 was 3,487.40MW as compared to 3,513.86MW in March, 2023. This was 0.75% lower than what was recorded in March, 2023. This decrease is attributable to a decrease in the domestic load.

The Ghana Peak Load decreased in April, 2023, compared to March, 2023. The Ghana Peak Load decreased by 1.2% from 3231.86MW to 3,192.40MW in April, 2023. The load factor for April, 2023 was 79.64%

Electricity export at the System Peak Load to CIE, CEB and SONABEL was 298MW in April, 2023. This was made up of 36MW, 107MW, 155MW for CIE, CEB and SONABEL respectively. The growth in export demand from March, 2023 to April 2023 is attributable to the increase in export demand to CEB and SONABEL.

The average electricity demand for April, 2023 was 2,750.16MW whilst the average electricity demand for March, 2023 was 2,774.03MW. The average electricity demand decreased in April, 2023.

The average electricity demand for regulated market in April, 2023 was 2,178.06MW. This could be attributable to the cold weather conditions that did not necessitate the need for cooling in April, 2023. For the regulated markets, ECG accounted for 87% of the average demand whilst NEDCO and enclave power accounted for an average of 11.59% and 1.6% respectively.

The average demand for the de-regulated market was 176.63MW for April, 2023. The Mines accounted for 91.5% whilst bulk customers accounted for 8.5% of the de-regulated market demand. Export markets recorded an average demand of 395.47MW. Export to neighboring countries accounted for 74.35% of for demand whilst VALCO accounted for 25.64%

Electricity supply

A total of 1,999.82GWh of electricity was supplied in April, 2023 which was lower than the 2,077.73GWh supplied in March, 2023. Electricity supply averaged 66.6GWh per day marginally lower than the 67.02GWh supplied in March, 2023. In addition, domestic supply accounted for 99.56% of the total generation while inadvertent imports from CIE accounted for 0.44%.

Electricity supplied by thermal plants in April, 2023 constituted 57.73% of the total electricity supplied. The contribution of electricity supplied from the solar power plant is 0.37% whilst hydro accounted for 41.46%. Hence, renewable energy accounted for 41.78% of the total supply in April, 2023. Thermal Plants have a larger share in the electricity mix.

A total of 1,508.08GWh of electricity was supplied to the Regulated Market in April, 2023 whilst de-regulated market and export were supplied with 122.29GWh and 273.82GWh respectively.

A total of 203.6GWh of electricity was supplied to the export market in our neighboring countries in April, 2023. Electricity export to CIE was 20.09GWh which was lower than the 30.40GWh recorded in March, 2023. Export to CEB in April, 2023 was 78.05GWh which was rather lower than what was recorded in March, 2023. SONABEL's share on electricity exported was 105.46GWh which was higher than the 103.29GWh recorded in March, 2023

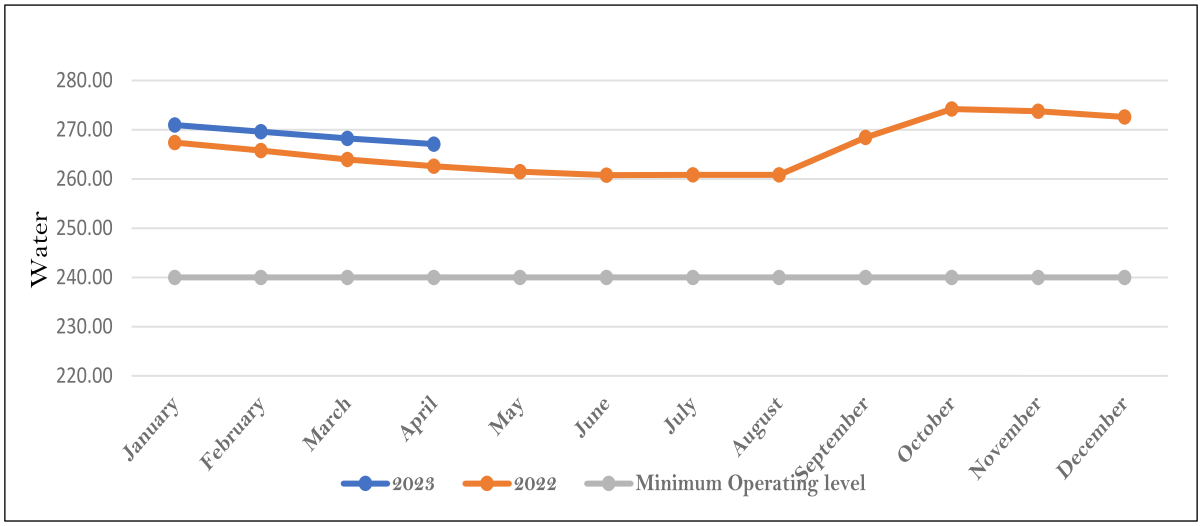
HYDRO DAM LEVELS

Akosombo water level decreased in April, 2023

The rate of drop in the water level for Akosombo GS increased marginally in April, 2023. The rate of drop water level increased to 0.038 feet per day in April, 2023 from 0.043 feet in March, 2023. This represents a 2.3% increase. In addition, the water level of 268.24 feet recorded at the beginning of the month dropped by 1.16 feet to 267.14 feet at the end of the month however between march 2023 and April, 2023 than what was recorded in the same period in 2022. The month end water level of the Akosombo dam was 4.48 feet above the water level recorded for the same period in 2022 and was 27.08 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 2022 to April 2023

Figure 1: Month-End Water Level for Akosombo Dam from January 2022 to April 2023.



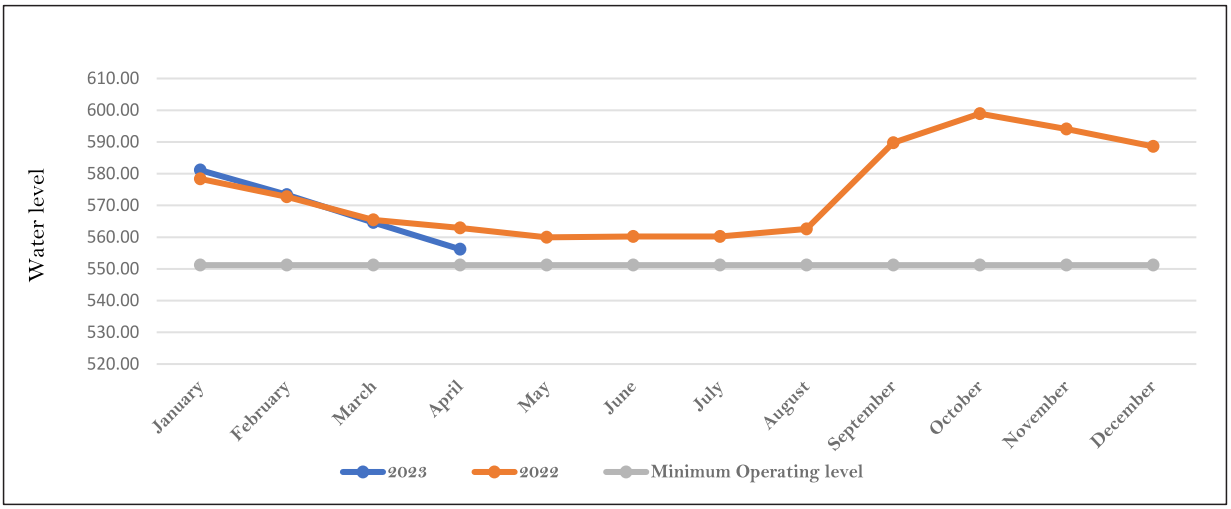
Bui dam water level decreased in April,2023

Bui dam water level decreased in April, 2023. There was a drop in the water level from 564.63 feet at the beginning of the month to 556.20 feet at the end of the month with a 8.43 feet decrease in water level at the end of April, 2023.

In April, 2023, the month end water level recorded was 6.73feet lower than what was recorded as the same period in 2022. However, the dam recorded 5.02 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 2022 to April 2023

Figure 2: Month-End Water Level for Bui Dam from January 2022 to April 2023



FUEL SUPPLY FOR POWER GENERATION

In April 2023, Natural Gas imports decreased

The supply of natural gas from Nigeria through the West African gas pipeline declined from 73.6MMSCFD in March, 2023 to 51.15MMSCFD in April 2023. This depicts a 30.5% decrease. On the average, gas imports accounted for 17.6% in the total fuel mix and 18.4% in the gas supply mix.

Natural gas supply from domestic sources increased in April 2023

The average natural gas supply for April, 2023 was 222.90MMSCFD which was higher than the average gas supply of 220.92MMSCFD in March, 2023.This indicates a 0.89% increase. On the average natural gas from domestic sources accounted for 77.7% in the total fuel mix and 81.6% in the gas supply mix

Consumption of liquid fuel increased in April, 2023

In April, liquid fuel consumption was recorded as 89,023.21bbls made up 59,591.62bblsLCO and 29,431.59bbls DFO in April, 2023. On the average, liquid fuel accounted for an average of 1.4% in the total fuel mix. LCO accounted for 66.6% of the total liquid mix whilst DFO accounted for 33.4%. The plants responsible for the consumption of liquid fuels, LCO and DFO, in April, 2023 were Cenpower and KTPP respectively.

Monthly Market Data Analysis

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

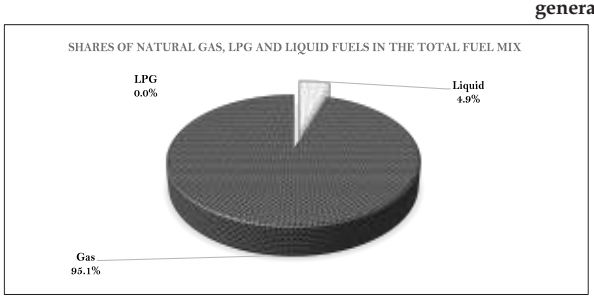


Figure 3b: Shares of fuel types in the generation fuel mix of power generation

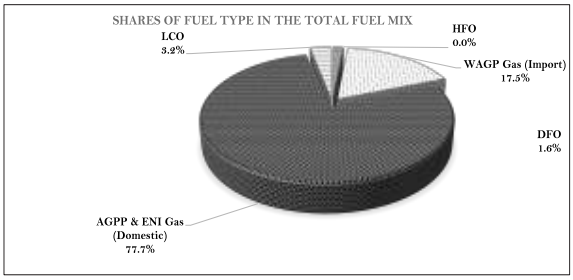


Figure 4a: Contribution of Natural Gas Supply by sources

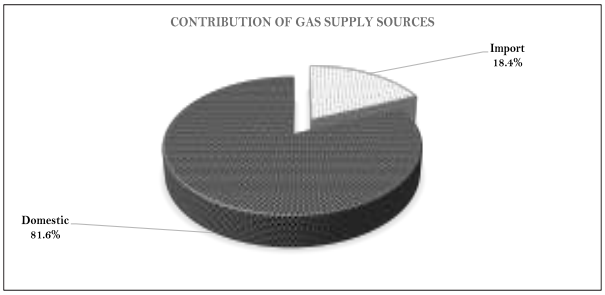


Figure 4b: Contribution of individual fuel in the liquid fuel supply

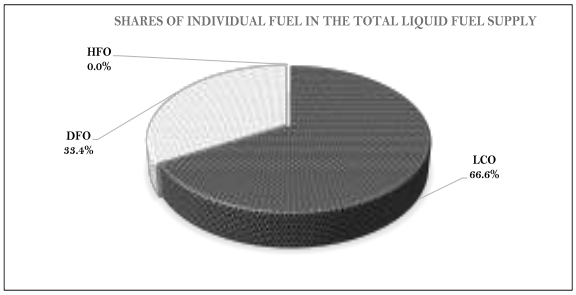


Figure 5a: Electricity Supply by sources

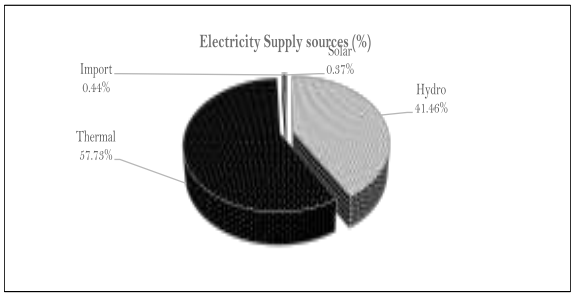
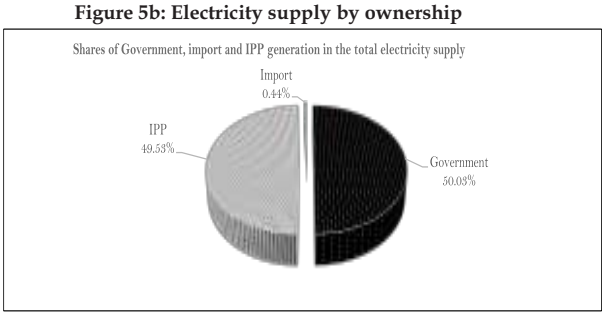


Figure 5b: Electricity supply by ownership



Peak Electricity Supply for April 2023		
Source of Supply	Generation at System Peak Load (MW)	Generation at Ghana Peak Load (MW)
AKOSOMBO	898.80	941.20
KPONG	142.00	144.00
BUI	328.00	225.30
BUI Solar	-	-
SEAP	351.10	355.00
TAPCO	104.00	103.00
TICO	340.00	342.00
TT1PP	-	107.00
CENIT	-	-
TT2PP	10.00	-
TWIN CITY	197.40	195.90
KARPOWER	415.10	423.40
AMERI	-	-
KTPP	194.00	194.00
Trojan Power	-	-
CENPOWER	272.00	360.00
AKSA	235.00	46.60
Bridge Power	-	-
IMPORT	-	-
Export to CIE at peak	36.00	4.00
Export to CEB at peak	107.00	111.00
Export to Sonabel	155.00	130.00
System Coincident Peak Load	3,487.40	
Ghana Coincedent Peak Load		3,192.40

April 2023 Average Monthly Natural Gas Flowrate (MMSCFD)	
Location	Monthly Average
Etoki	49.51
Tema WAGPCo	122.67
Aboadze WAGPCo	166.79
Aboadze GNGC	68.93
Reverse Flow	67.73
ENI	207.46

Hydro Dam Water level for April 2023			
	Beginning month (ft)	End month (ft)	Change in water level
Hydro Dam			(feet)
Akosombo	268.24	267.08	-1.16
Bui	564.63	556.20	-8.43

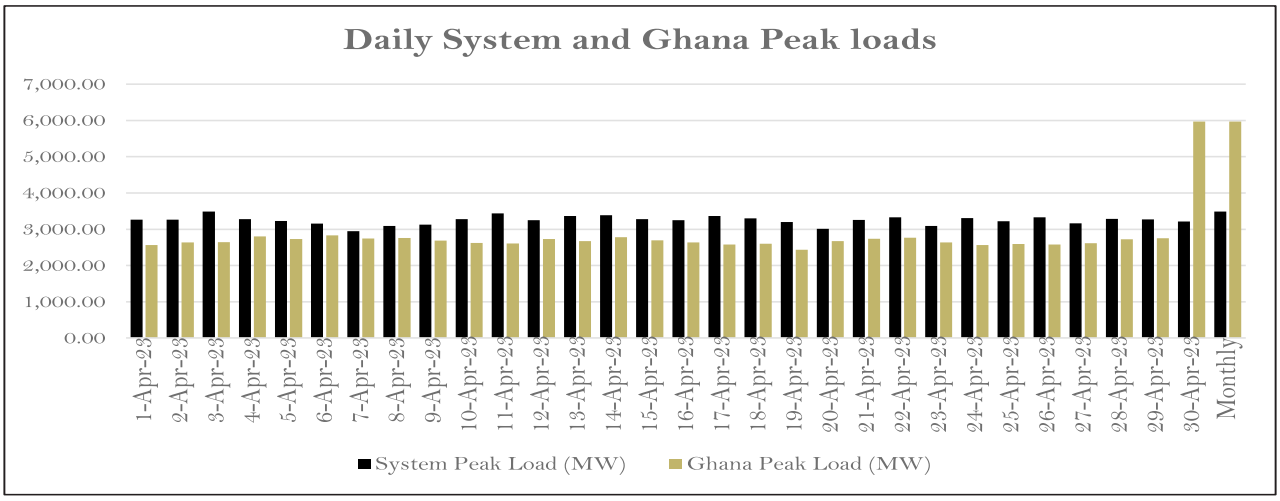
	Weekly Electricity Supply (GWh)				
	Week 1	Week 2	Week 3	Week 4	Total
AKOSOMBO	140.04	135.93	139.56	174.29	589.81
KPONG	23.65	22.83	22.31	28.28	97.06
BUI Hydro	46.45	33.79	30.25	30.16	140.66
Bui Solar	1.75	1.74	1.70	2.10	7.29
VRA Kaleo	0.74	0.90	0.98	1.07	3.70
SAPP	47.26	49.02	56.34	73.91	226.54
TAPCO	17.79	25.34	17.91	27.13	88.16
TICO	55.79	43.34	27.04	51.37	177.53
TT1PP	0.00	14.36	17.95	11.29	43.60
CENIT	0.00	0.00	0.00	5.21	5.21
TT2PP	1.29	0.00	0.16	1.92	3.36
Twin City	31.89	32.03	32.06	41.43	137.41
KARPOWER	63.69	54.69	60.98	48.72	228.07
AMERI	0.00	0.00	0.00	0.00	0.00
KTPP	6.16	6.61	6.68	11.10	30.55
Cenpower	12.39	42.61	50.62	69.00	174.62
AKSA	12.27	6.95	7.30	10.88	37.39
Bridge Power	0.00	0.00	0.00	0.00	0.00
Import	2.47	0.96	2.27	3.17	8.87
Total	463.61	471.09	474.10	591.02	1,999.82

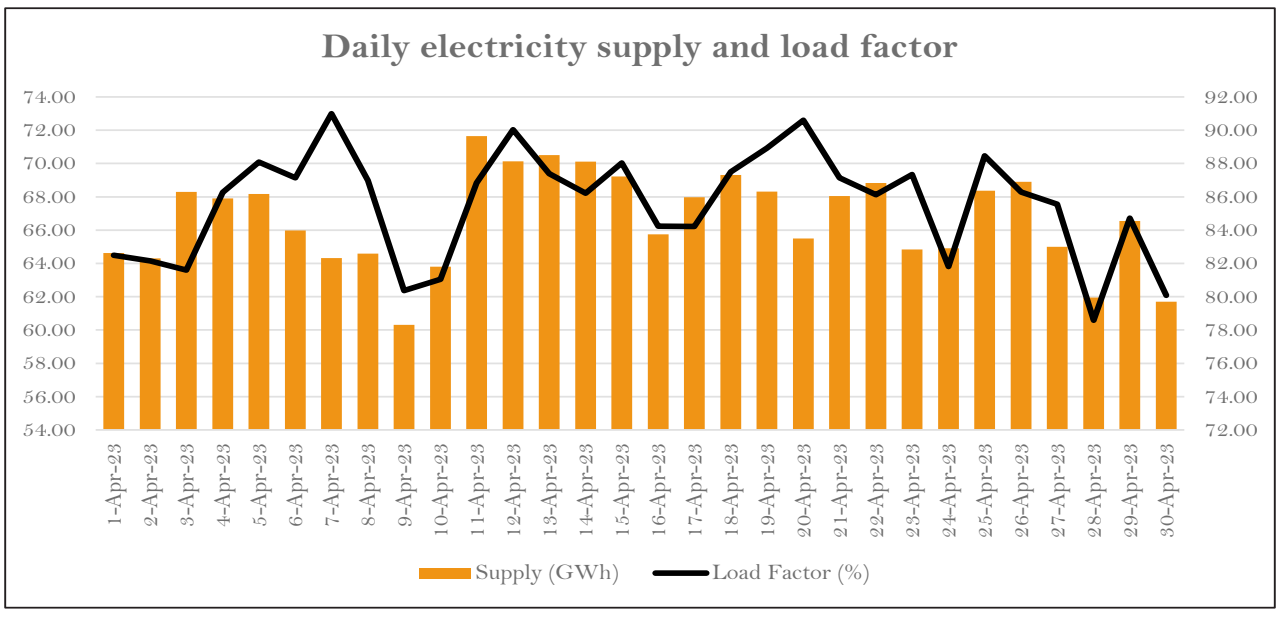
		Fuel Consumption (MMBtu)			
	Heat rate (Btu/kWh)	Natural gas	LCO	HFO	DFO
TAPCO	11,538.60	1,017,277.43	-	-	-
TICO	7,486.23	1,329,056.92	-	-	-
SAPP	7,866.47	1,782,034.42	-	-	-
TT2PP	11,447.52	38,502.58	-	-	-
TT1PP	12,275.55	535,158.84	-	-	-
CENIT	11,999.34	62,466.14	-	-	-
KARPOWERSHIP	8,132.28	1,854,720.04	-	-	-
AMERI PLANT	-	-	-	-	-
KPONE THERMAL	11,811.56	123,143.15	-	-	237,657.60
CENPOWER	7,891.33	1,196,554.54	11,287.27	-	170,144.48
AKSA ENERGY	8,522.47	271,214.83	-	47,454.70	-
Twin City	7,840.10	1,077,334.53	-	-	-
Bridgepower	-	-	-	-	-

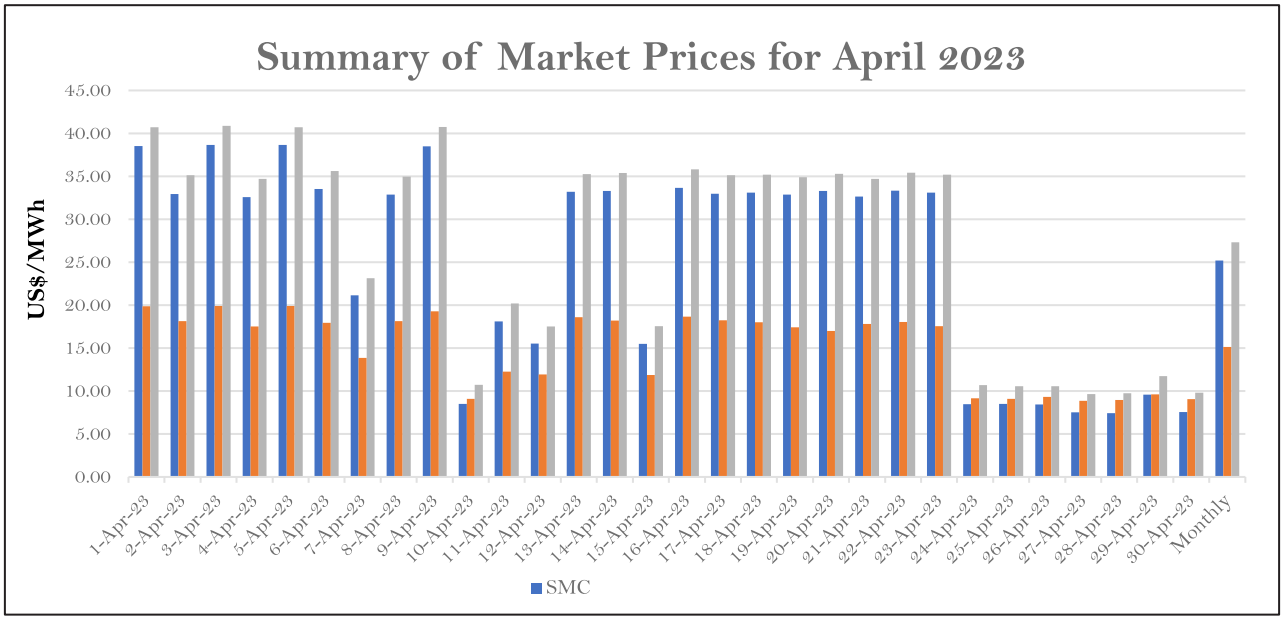
Monthly Average Electricity Prices in the WEM				
		Apr-23	Mar-22	Change
Average Market Price (AMP)	US$/MWh	151.36	88.15	63.21
System Marginal Cost (SMC)	US$/MWh	251.98	87.77	164.21
System Marginal Price (SMP)	US$/MWh	273.18	109.59	163.59

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	27.42
CENPOWER	10.21
AKSA ENERGY	7.91
Twin City	6.08
Bridgepower	0.00

	Month Average fuel prices					
	Gazetted Natural Gas Price	Weighted average natural gas price	LCO	HFO	DFO	LPG
US$/MMBtu	6.08	6.69	22.37	18.37	38.48	17.96






Summary of Market Prices for April 2023
US$/MWh
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
1-Apr-23
2-Apr-23
3-Apr-23
4-Apr-23
5-Apr-23
6-Apr-23
7-Apr-23
8-Apr-23
9-Apr-23
10-Apr-23
11-Apr-23
12-Apr-23
13-Apr-23
14-Apr-23
15-Apr-23
16-Apr-23
17-Apr-23
18-Apr-23
19-Apr-23
20-Apr-23
21-Apr-23
22-Apr-23
23-Apr-23
24-Apr-23
25-Apr-23
26-Apr-23
27-Apr-23
28-Apr-23
29-Apr-23
30-Apr-23
Monthly
SMC

Bui Power Authority Adds 5MW Floating Solar to Existing Plant in Ghana

In a significant move towards sustainable energy generation, the Bui Power Authority in Ghana has successfully integrated a 5-megawatt (MW) floating solar power plant into its existing hydroelectric facility. This innovative addition showcases the country's commitment to harnessing renewable energy sources and marks a milestone in the nation's efforts to combat climate change while meeting its growing energy demands.

The Bui Hydroelectric Power Plant, located on the Black Volta River in the Bono Region of Ghana, has been a key pillar of the country's energy infrastructure since its commissioning in 2013. With its large reservoir and capacity to generate 400 MW of electricity, the hydropower plant has been a critical asset in supplying clean energy to the nation.

The decision to integrate floating solar technology into the existing hydropower infrastructure was driven by the Bui Power Authority's commitment to diversify its energy sources and capitalize on the region's abundant sunlight. The addition of the 5MW floating solar plant is expected to enhance the overall power generation capacity and create a more balanced energy mix for Ghana.

The floating solar plant consists of an array of photovoltaic panels that are strategically positioned on the surface of the reservoir, effectively utilizing the water body to anchor the panels. This approach not only optimizes land use but also results in improved solar panel efficiency due to the cooling effect of the water.

Some key highlights of the 5MW floating solar project are as follows:

1. ***Clean Energy Generation***

The floating solar panels will harness the abundant solar energy in the region, complementing the hydropower output and reducing the plant's reliance on non-renewable energy sources and this will contribute to the generation of clean energy.

2. ***Grid Stability and Flexibility***

The combination of hydro and solar power will provide a more stable and reliable electricity supply. As sunlight shines during the day, the hydroelectric reservoir can be used to store water, ensuring a consistent power supply even during periods of lower solar generation.

3 ***Environmental Benefits***

By opting for floating solar technology, the Bui Power Authority has minimized land use and preserved ecosystems around the reservoir. This eco-friendly approach aligns with Ghana's commitment to sustainability and environmental conservation.

4. ***Job Creation and Economic Growth***

The installation and maintenance of the floating solar plant have created employment opportunities for the local population, stimulating economic growth in the region.

5. ***Carbon Emission Reduction***

By incorporating renewable energy into their energy mix, Ghana takes a significant step towards reducing its carbon footprint and achieving its climate goals outlined in international agreements.

In conclusion, the successful integration of the 5MW floating solar plant into the Bui Hydroelectric Power Plant by BPA represents a remarkable achievement for Ghana's energy sector. It does not only showcase the country's ability to embrace cutting-edge technologies but also serves as an inspiration for other nations seeking to transition to cleaner and more sustainable energy solutions. With this new addition, Ghana sets a precedent for utilizing its natural resources effectively and sustainably, contributing to the global effort to combat climate change and secure a greener future for generations to come.

Acronyms

AGPP = Atuabu Gas Processing Plant
Btu = British Thermal Units
CBGC = Composite Bulk Generation Charge
CUF = Capacity Utilization Factor
DFO = Distillate Fuel Oil
EC = Energy Commission
ECG = Electricity Company of Ghana
EMOP = Electricity Market Oversight Panel
ESP – Electricity Supply Plan
FPSO = Floating Production, Storage and Offloading
GHp = Ghana Pesewa
GNGC = Ghana National Gas Company
GWh = Giga-watt Hours
HFO = Heavy Fuel Oil
KTPP = Kpone Thermal Power Plant
kWh = Kilo-watt hours
MRP = Mine Reserve Plant
LEAP = Long-range Energy Alternative Planning
LCO = Light Crude Oil
LI = Legislative Instrument
LTA = Long Term Average
MW = Megawatt
MMscf = Million Standard Cubic Feet
MWh = Mega-watt hours
NITS = National Interconnected Transmission System
PV = Photovoltaic
SAPP = Sunon Asogli Power Plant
SMP = System Marginal Price
SNEP = Strategic National Energy Plan
TEN = Tweneboa, Enyenra, Ntomme
TT1PP = Tema Thermal 1 Power Plant
TT2PP = Tema Thermal 2 Power Plant
VRA = Volta River Authority
WAGPCo – West African Gas Pipeline Company
WAGP = West African Gas Pipeline
WEM = Wholesale Electricity Market

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