



GHANA WHOLESAL ELEC TRICIT Y MARKET BULLETIN

MARKET WATCH

Monthly Market Data Analysis

ISSUE NO. 18: 1st June 2017 to 30th June 2017

This Bulletin covers major developments in the Wholesale Electricity Market (WEM) of Ghana from 1st June 2017 to 30th June 2017. 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 bulletin presents the half year summary report of the Wholesale Electricity Market (WEM).

The Energy Commission (EC) would very much appreciate and welcome comments from readers on the Bulletin. Reasonable care has been taken to ensure that the information contained in this Bulletin is accurate at the time of publication, nevertheless, any errors, omissions or inaccuracies therein are regretted.

HIGHLIGHTS OF THE MONTH

Overview of the Month

The month of June 2017 witnessed the commencement of significant water inflows into the hydro dams. These significant inflows into the Bui Dam begun on the 26th June, 2017 while that of Akosombo Dam begun from 22nd June, 2017. These inflows together with reduced generation from the hydro power plant culminated in the reduced drop in the water level of the various Dams. The Akosombo Dam dropped by 0.21 ft in June 2017 compared to 1.61 ft recorded in May 2017. Similarly, the Bui Dam dropped by 0.03 ft in June 2017 compared to 2.23 ft in May 2017. The Akosombo GS generation also dropped by 24.3% from 12.53 GWh per day in May 2017 to 9.48 GWh per day in June 2017 while Bui GS generation dropped by 42.9% from 1.63 GWh per day in May 2017 to 0.93 GWh per day in June 2017. Generally, the hydro power plant generation dropped by 26.8% in June 2017 compared to May 2017.

Thermal power generation on the average increased by 13.1% from 22.55 GWh per day in May 2017 to 25.5 GWh per day in June 2017 due to the increased generation from the Sunon Asogli Power Plant (SAPP) and the TICO Power Plant. The SAPP increased its generation by 1.4 fold from 2.39 GWh per day in May 2017 to 5.71 GWh per day in June 2017 due to the significant increase in the LCO supply in June 2017. The TICO Power Plant generation also increased significantly by 59% from 3.71 GWh per day in May 2017 to 5.9 GWh per day in June 2017. Despite the increase in generation by some thermal power

Table 1 Projected and Actual Outturn of electricity demand and supply in June 2017

	June 2017		May 2017	
	Projected	Actual Outturn	Projected	Actual Outturn
Total Supply (GWh)	1,261.0	1,149.5	1,346.0	1,226.2
Source by Power Plants (GWh)				
AKOSOMBO	279.0	284.4	285.0	388.5
KPONG	55.0	59.1	57.0	68.2
BUI	69.0	28.0	71.0	50.5
Sunon Asogli	143.0	171.2	183.0	74.0
TAPCO	92.0	62.6	95.0	64.5
TICO	184.0	177.1	190.0	115.1
TT1PP	-	-	-	-
CENIT	-	-	-	-
TT2PP	-	-	-	-
MRP	-	-	-	-
Karpowership	150.0	151.1	155.0	158.0
AMERI	140.0	120.3	145.0	145.0
KTTP	-	4.7	-	23.2
Trojan Power	-	0.0	-	8.0
CENPOWER	-	-	-	-
AKSA	129.0	77.8	120.0	111.4
Total Generation (GWh)	1,241.0	1,136.2	1,301.0	1,206.2
Imports (GWh)	20.0	13.3	45.0	20.0
Total Supply (GWh)	1,261.0	1,149.5	1,346.0	1,226.2
Deficit (GWh)	-	(111.5)	-	(119.8)
Ghana Coincident Peak Load (MW)	2,050.0	2,077.6	2,105.0	2,129.2
System Coincident Peak Load (MW)	2,183.0	2,077.6	2,238.0	2,158.2

HIGHLIGHTS OF THE MONTH

plant, there were marginal reductions in others namely TAPCO, AKSA, KTPP, AMERI and Karpowership Power Plants. Natural gas supply disruptions reduced the electricity supplied by the Ameri Power Plant while TAPCO and Karpowership Power Plants were due to technical challenges to the plant. Reduced supply by AKSA and KTPP Power Plants were due to System demand.

There was a significant reduction in electricity demand in June 2017 by 76.53 GWh from 1,226.63 GWh in May 2017 to 1,150.1 GWh in June 2017. This translate to a reduced capacity of 106 MW (capacity of TT1PP) primarily due to the cold weather experienced in the raining season which lead to the reduction in the use of cooling equipment in households.

The power system experienced a partial collapse on the 12th June 2016 during a nationwide rainfall when the 330kV Takoradi Thermal-Volta line tripped with a number of transmission lines. The ensuing power swings following the tripping of the transmission lines caused the generating units that were in service at Bui, TICO, TAPCO, Ameri, Sunon Asogli, AKSA and Karpower to trip. All units in service at Akosombo and Kpong GS remained in operation after the partial collapse supplying a total load of 464MW.

Import reduced by 32% from 0.65 GWh per day in May 2017 to 0.44 GWh per day in June 2017. Likewise, export reduced from 0.38 GWh per day in May 2017 to 0.19 GWh per day in June 2017.

Electricity Demand and Supply

Electricity Demand

The System Peak Load (Ghana Peak Load plus Import) decreased marginally by 80.6 MW from 2,158.2 MW in May 2017 to 2,077.6 MW in June 2017. Similarly the Ghana Peak Load (Domestic Peak Load including VALCO minus Export) decreased marginally by 51.6 MW from 2,158.2 MW in May 2017 to 2,077.6 MW in June 2017. The System Peak Load in June 2017 was lower (4.8%) than the projected System Peak load of 2,138 MW under the 2017 ESP, while the Ghana Peak Load was marginally lower (1.3%) than the projected Ghana Peak Load of 2,050 MW for June 2017 under the 2017 ESP.

Electricity supply

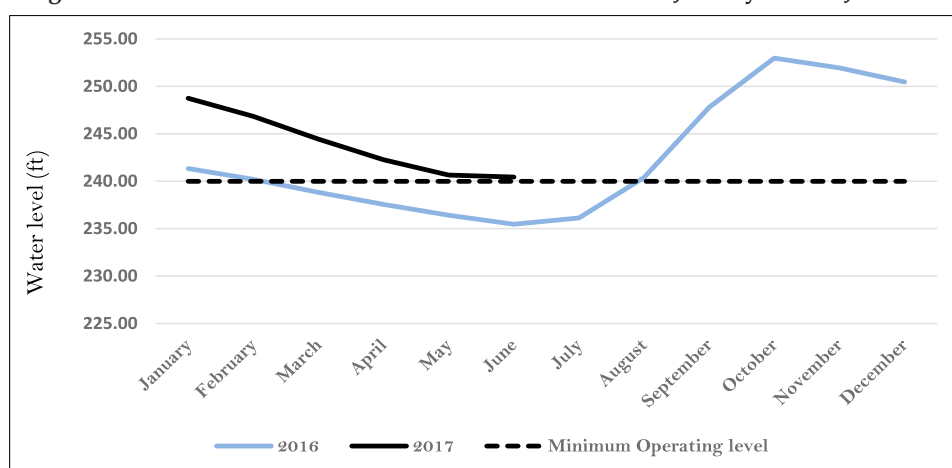
The average daily electricity supplied to meet Ghana's requirement decreased marginally to 38.34 GWh per day in June 2017 from 39.56 GWh per day recorded in May 2017. The total electricity supplied in June 2017 was 1,221.8 GWh consisting of 1,203.83 GWh from domestic generation and 17.98 GWh of imports from La Cote D'Ivoire. The total supply of electricity in June 2017 was 111.5 GWh lower than the 1,261 GWh projected under the Electricity Supply Plan (ESP) developed for the year 2017. This represents an 8.8% deviation between the outturn and the projection.

Hydro Dam Levels

Akosombo Dam Water Level dropped in June 2017 but at a reduced rate

The rate of drop in the water level of the Akosombo dam reduced from 0.052 feet per day in May 2017 to 0.007 feet per day in June 2017. The reduced drop rate was due to significant inflows into the Akosombo Dam which begun from the 22nd June 2017 and the lower generation from the Aksombo GS as a result of adequate generation from thermal sources. The water level dropped by 0.21 feet in June 2017 from 240.66 feet at the beginning of the month to 240.45 feet at the end of the month. The water level at the end of June 2017 was also higher than the level at the same time in June 2016 by about 4.98 feet and 0.45 feet above the minimum operating level of 240 feet. Figure 1 shows comparative end of month trajectory of the level of water in the Akosombo dam from January 2016 to June 2017.

Figure 1: Month-End Water Level for Akosombo Dam from January 2016 to June 2017

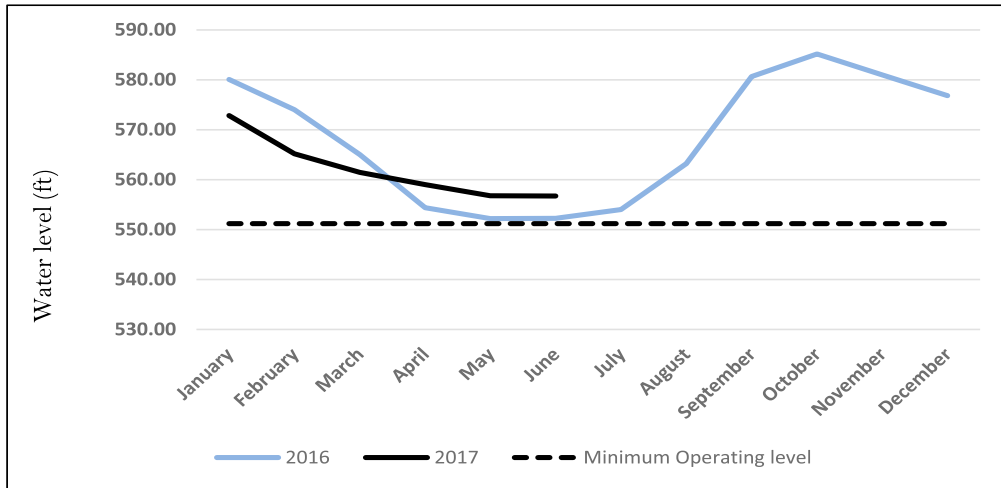


HIGHLIGHTS OF THE MONTH

Bui Dam Water Level declines at a reduced rate

The Bui dam water level also witnessed a significant reduction in the rate of drop in June 2017 from 0.072 feet per day in May 2017 to 0.002 feet per day in June 2017. The reduction in the rate of drop was due to the significant inflows into the Bui dam which begun on the 26th June 2017 and the significant reduction in generation from the Bui GS as a result of adequate available thermal power plant generation capacity to meet demand for the month. The water level dropped by 0.07 feet in June 2017 from 2.23 feet in May 2017. The water level dropped from 556.78 feet level at the beginning of the month to 556.71 feet at end of the month. The water level at the end of the month for Bui GS (556.71 feet) was above the level of the dam at the same period in June 2016 (552.25 feet) by 4.46 feet. Figure 2 shows comparative end of month trajectory of the level of water in the Bui dam from January 2016 to June 2017.

Figure 2: Month-End Water Level for Bui Dam from January 2016 to June 2017



Fuel Supply for Power Generation

Liquid fuel continued to dominate the fuel supply mix in June 2017 but its shares in the fuel supply mix reduced from 57% in May 2017 to 54% in June 2017 with natural gas accounting for the rest. Shares of DFO reduced from 6% of the total fuel mix in May 2017 to 1% in June 2017 while the share of HFO decreased from 36% to 30% in May 2017 and June 2017 respectively. There was however an increase in the shares of LCO from 15% in May 2017 of the total fuel mix to 23% in June 2017 due to the increase LCO usage by TICO and SAPP.

On the individual fuel level, natural gas continued to dominate the fuel supply mix. Natural gas constituted 46% of the total fuel supply mix in June 2017, which was 3% higher than the 43% recorded in May 2017. Natural gas supply from the WAGPCo increased from 9% of the share of the total natural gas supply in May 2017 to 12% in June 2017. Correspondingly, natural gas supply from the AGPP reduced from 35% in May 2017 to 34% in June 2017 of the total natural gas supply.

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

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

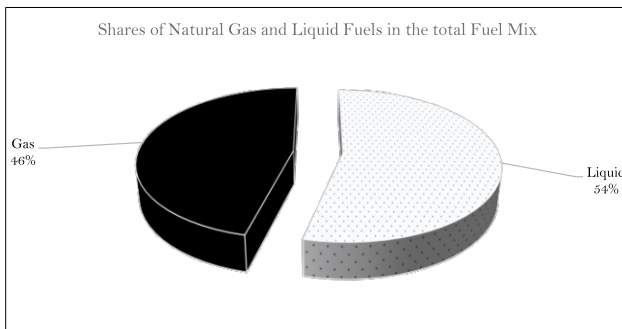
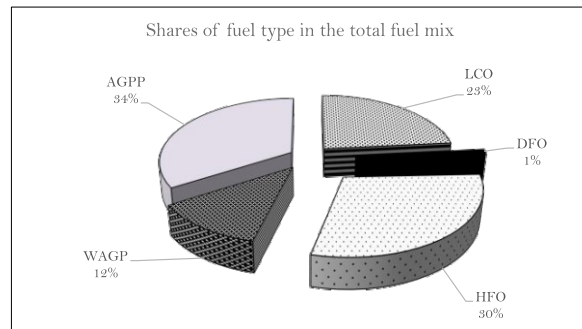


Figure 3b: Shares of fuel type in the generation fuel mix power generation



Natural gas supplies from WAGPCo increased marginally

Natural gas flow rate from Nigeria through the WAGP to Tema and Kpone increased to 24.87 MMSCF per day in June 2017 from the 16.62 MMSCF per day recorded in May 2017. Total supply increased to 752.6 MMSCF (48.7%) in June 2017 from 506.03 MMSCF in May 2017. Natural gas supply from the WAGP accounted for 26% of the total natural gas supplied in June 2017. Despite the increase in supply, there was no continuous supply of natural gas from the WAGP for electricity generation by the Sunon Asogli Power Plant in June 2017.

Natural gas supply from GNCC decreased marginally

Natural gas flow rate from the AGPP to the Aboadze Power Enclave decreased marginally from 68.74 MMSCF per day in May 2017

HIGHLIGHTS OF THE MONTH

to 68.48 MMSCF per day in June 2017. Total gas supply from the Atuabo Gas Processing plant to the Aboadze Power Enclave of 1,885.17 MMSCF in June 2017 was 6.4% lower than the 2,014.74 MMSCF supplied in May 2017. Natural gas supply from the AGPP accounted for 74% of the total natural gas supply in June 2017. Of the total natural gas supplied in June 2017, 55.7% was used by the Ameri Power Plant for electricity generation, 32.1% was used by TICO Power Plant while the remaining 12.2% was used by the TAPCO Power plant.

Figure 4a: Contribution of Gas Supply by sources

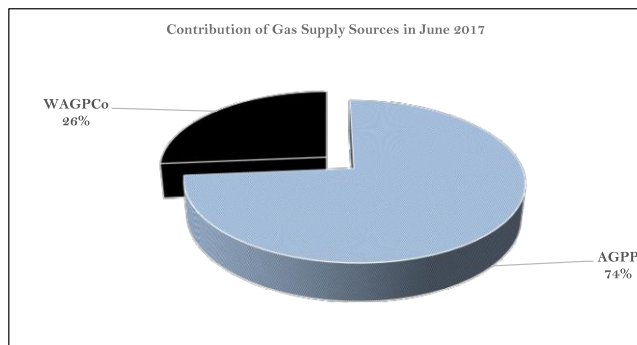
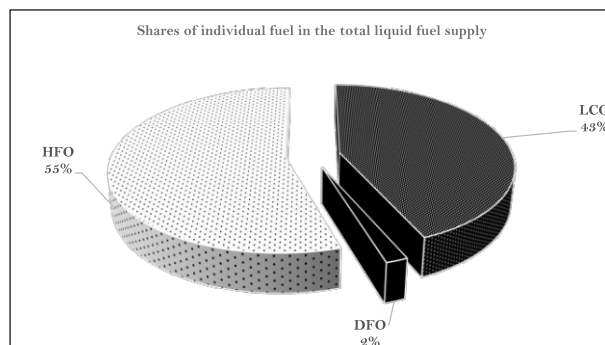


Figure 4b: Contribution of individual fuel in the liquid fuel supply



Liquid Fuel

A total of 610,430 barrels of liquid fuel was used by thermal power plants in June 2017. This total comprised of 43% LCO, 2% DFO and 55% of HFO. LCO continues to lose its dominance in the liquid fuel supply mix despite its share of the total liquid fuel supply increasing to 43% in June 2017 from 25% in May 2017. Share of HFO in the liquid fuel supply mix decreased from 64% in May 2017 to 55% in June 2017. The decrease in HFO usage is attributed to the decreased generation from the AKSA Power Plant due to system demand. The share of DFO in the total liquid fuel supply mix dropped further to 2% in June 2017 from 11% in May 2017.

A total of 285,099 barrels of LCO was used for electricity generation in June 2017, which was 69.3% higher than the 168,442 barrels used in May 2017. Of this total, 36.2% was used by power plants in the Tema and Kpone while 43.8% was used in the Aboadze Power Enclave.

DFO consumption decreased significantly in June 2017 by 85.2% from 72,557 barrels in May 2017 to 11,130 barrels in June 2017, primarily due to the reduced generation from KTRP and Trojan Power Plant as a result of the availability of cheaper sources of electricity. Of the total of 11,130 barrels of DFO used in June 2017, 99% was used by Trojan Power Plants in Tema and Kumasi.

HFO consumption decreased in June 2017 by 15.1% from 370,279 barrels in May 2017 to 314,201 barrels in June 2017. Of this total, 64.8% was used by the Karpowership power plant and 35.2% was used by the AKSA power plant.

Plant by Plant Highlights

Electricity Generation at the Akosombo Generation Station (GS) dropped significantly in June 2017

The Akosombo GS operated for the entire month of June 2017, generating 284.41 GWh of electricity which was 104.11 GWh lower than it generated in May 2017 of 388.52 GWh. Average generation from the Akosombo GS decreased from 12.53 GWh per day in May 2017 to 9.48 GWh per day in June 2017 due to increased supply of electricity from thermal sources and lower demand. The Akosombo GS share of the total electricity supply continued to decline in June 2017 from 31.7% in May 2017 to 24.7% in June 2017. The low share of Akosombo GS in the total supply mix was well anticipated in the 2017 Electricity Supply Plan (ESP) but the actual percentage outturn differs from the projection. The 2017 ESP projected supply from the Akosombo GS to be 21.1% in May 2017 and 22.1% in June 2017. The Akosombo GS generated 1.9% higher than the 279 GWh projected under the 2017 ESP. The Akosombo GS contributed 569 MW (27.3%) to meet the System Peak Load which is marginally lower than the 822 MW (38.1%) it contributed in May 2017. Similarly, the Akosombo GS contributed 569 MW (27.4%) to the Ghana Peak Load in June 2017, higher than the 822 MW (38.6%) recorded in May 2017.

Electricity supply by Kpong Generation Station (GS) continued to decline

The Kpong GS generated a total of 59.06 GWh in June 2017 which was lower than the 68.16 GWh it generated in May 2017. The Kpong GS generated an average of 1.97 GWh a day in June 2017 which was 10.5% lower than in May 2017. Generation from the Kpong GS accounted for 5.1% of the total electricity supplied in June 2017. The generation from the Kpong GS was 7.4% higher than the 55 GWh projected for June 2017 under the 2017 ESP. The Kpong GS contributed 81 MW (3.9%) to meet System Peak Load in June 2017, lower than the 106 MW (5%) recorded in May 2017. Similarly, the Kpong GS contributed 81 MW (3.9%) to the Ghana Peak Load in June 2017, which was also lower than the 106 MW (3.9%) recorded in May 2017.

Electricity supply by the Bui Generation Station (GS) continued to decline significantly

Electricity production from the Bui Power Plant decreased significantly in June 2017 to 27.99 GWh (0.93 GWh per day) from 50.49 GWh (1.63 GWh per day) in May 2017. This represents a decrease of 42.9% between June 2017 and May 2017, based on the daily average production of the months. The daily average generation suggests that the Bui GS operated largely with two units only at peak in June 2017. The Bui GS supplied 2.4% of the total electricity supplied in June 2017, lower than the 5.6% supplied in May 2017. The total electricity generated in June 2017 from the Bui Power Plant was 59.4% lower than the 69 GWh projected to be generated under the 2017 Electricity Supply Plan (ESP). The Bui power plant contributed 202 MW to meet both the System Peak (2,077.6 MW) and Ghana Peak Loads (2,077.6 MW), which represents 9.7% for each.

HIGHLIGHTS OF THE MONTH

Generation by the Sunon Asogli Power Plant (SAPP) increased significantly in June 2017

The Sunon Asogli Power Plant (SAPP) operated for the whole of June 2017 and generated a total of 171.2 GWh of electricity (5.71 GWh per day), a significant increase from the 73.97 GWh (2.39 GWh per day) generated in May 2017. The increase in generation was due to the significant increase in the supply of fuel, especially LCO, to the Power Plant. The Power Plant contributed 14.9% of the total electricity supplied in June 2017, an increase from the 6% recorded in May 2017 and higher than the 11.3% projected under the 2017 ESP for June 2017. The SAPP contributed 144.7 MW (7%) to meet the System Peak Load and Ghana Peak Load of 2,077.6 MW in June 2017. The SAPP consumed a total of 752.6 MMSCF of natural gas and 103,214 barrels of LCO at an estimated heat rate of 7,761.17 Btu/kWh, an improvement in fuel efficiency as compared 8,327.75 Btu/KWh recorded in May 2017.

CENIT Power Plant did not operate in June 2017

The CENIT Power Plant was offline for the whole month of June 2017 due to low levels of Light Crude Oil (LCO) stocks to power the plant. The Power Plant was also correctly projected to be offline in June 2017 under the 2017 ESP.

Ameri Energy Power Plant generation decline in June 2017

Electricity generation from the Ameri Energy Power Plant declined from 4.68 GWh per day in May 2017 to 4.01 GWh per day in June 2017. The total electricity generation of 120.26 GWh was also lower than the 144.95 GWh supplied in May 2017. The Ameri Power Plant generated 14.1% which was higher than the 140 GWh projected under the 2017 ESP. The total of electricity generated by Ameri Power Plant in June 2017 represented 10.5% of total electricity supplied in the month which was lower than the 11.82% recorded in May 2017. The Ameri Power Plant consumed 1,049.31 MMSCF of natural gas to generate the 120.26 GWh of electricity at an estimated average heat rate of 10,129.61 Btu/kWh a marginal improvement in fuel efficiency from the 10,174.18 Btu/kWh recorded in May 2017. The Ameri Power Plant contributed 213.4 MW (10.3%) to meet both the System Peak Load and Ghana Peak Load in June 2017.

Kpone Thermal Power Plant (KTPP) generation declined significantly

The Kpone Power Plant generated significantly lower volume of electricity in June 2017 than in May 2017. The Power Plant generated 4.66 GWh in June 2017, which was about 3.9 folds lower than the 23.16 GWh generated in May 2017 due to cheaper sources of electricity than the KTPP. The Kpone Thermal Power Plant contributed 0.41% of the total electricity supplied in June 2017 and was projected to be offline under the 2017 ESP. The KTPP did not contribute to either the System Peak Load or the Ghana Peak Load in June 2017. The KTPP consumed a total of 9,323 barrels of DFO at an estimated heat rate of 10,764.69 Btu/kWh, a significant improvement in fuel efficiency as compared to the 11,406.89 Btu/KWh recorded in May 2017.

Karpowership Power Plant generation reduced marginally

The Karpowership Power Plant generated every day in the month of June 2017, generating an average of 5.04 GWh per day which was marginally lower than the average generation of 5.1 GWh per day recorded in May 2017. Total electricity supplied by Karpowership in June 2017 was 151.08 GWh, which was 4.4% lower than the 157.98 GWh supplied in May 2017 and 0.7% higher than the 150 GWh projected under the 2017 ESP. The Power Plant contributed 13.1% of the total electricity supplied in June 2017, which is marginally higher than its contribution of 12.9% in May 2017 and 11.9% projected under the 2017 ESP. The Karpowership also contributed 220.1 MW (10.6%) to meet both the System Peak Load and Ghana Peak Loads June 2017. The Karpowership Power Plant consumed 203,474 barrels of Heavy Fuel oil (HFO) to generate the 151.08 GWh in June 2017 at an average heat rate of 8,143.42 Btu/kWh which is a marginal improvement in fuel efficiency from the 8,164.58 Btu/kWh recorded in May 2017.

AKSA Power Plant generation declined significantly in June 2017

The AKSA Power Plant generated 77.76 GWh in June 2017 significantly lower than the 111.42 GWh generated in May 2017 and the 129 GWh projected under the 2017 ESP. The low generation from AKSA Power Plant in June 2017 was due to System demand. The Power Plant supplied 6.8% of the total electricity supplied in June 2017, which is significantly lower than the 9.1% supplied in May 2017. The Power Plant contributed 143.4 MW (6.9%) to meet both the System Peak Load the Ghana Peak Load in June 2017. A total of 110,727 barrels of HFO was consumed by the AKSA Power Plant at an average heat rate of 8,600.82 Btu/kWh a marginal improvement from the 8,496.08 Btu/kWh recorded in May 2017.

Takoradi International Company (TICO) continued to increase its generation

The TICO Power plant operated throughout the month of June 2017 and generated a total of 177.12 GWh of electricity (average of 5.9 GWh per day) representing 15.4% of total electricity supplied in June 2017. The supply from the TICO Power Plant was 53.9% higher than it supplied in May 2017 and constituted the 9.4% of the total supply in May 2017. The TICO Power Plant had all of its units available in June 2017. The TICO Power Plant in June 2017 contributed 339 MW (16.3%) to meet both the System Peak Load and Ghana Peak Load respectively. The Power Plant operated on both light crude oil (LCO) and natural gas consuming about 135,328 barrels of LCO and 604.92 MMSCF of natural gas to produce the 177.12 GWh of electricity at an estimated average heat rate of 7,850.69 Btu/kWh, an improvement over the 8,049.72 Btu/kWh recorded in May 2017.

Takoradi Power Company (TAPCO) Plant continued to operate with half of its capacity

The TAPCO Power plant operated for 24 days in the month of June 2017 due to technical challenges to the Power Plant and generated a total of 62.64 GWh of electricity (average of 2.61 GWh per day) representing 5.5% of total electricity supplied in June 2017. The Power Plant was offline for 7 days due to technical issues. The supply from the TAPCO Power Plant was 2.8% higher than it supplied in May 2017 and constituted 5.3% of the total supply in May 2017. The TAPCO Power Plant had half of its capacity available in June 2017 due to the shutdown of the Gas turbine (Unit 2) for mandatory maintenance work since January 2017. The TAPCO Power Plant in June 2017 contributed 150 MW (7.2%) to meet both the System Peak Load and Ghana Peak Load respectively. The Power Plant operated on both light crude oil (LCO) and natural gas consuming about 46,557 barrels of LCO and 230.94 MMSCF of natural gas to produce the 62.64 GWh of electricity at an estimated average heat rate of 8,212.44 Btu/kWh, an improvement in the fuel efficiency over the 8,591.96 Btu/kWh recorded in May 2017.

HIGHLIGHTS OF THE MONTH

Tema Thermal 1 Power Plant (TT1PP) was offline in June 2017

The TT1PP was offline for the whole of June 2017 due to low levels of Light Crude Oil (LCO) stocks to power the plant. The Power Plant was also correctly projected to be offline in June 2017 under the 2017 ESP.

Trojan Power Plant generation dropped marginally

The Trojan Power Plant generated a total of 0.63 GWh of electricity in June 2017, which was 11 folds lower than the 8.06 GWh of electricity it generated in May 2017. All the 0.63 GWh was generated at the Kumasi plant site as DFO was unavailable at the Tema Plant site. The DFO available at the Kumasi site of Trojan Power was enough to operate the engines for 8 days. A total of 1,698 barrels of DFO was used by Trojan power plant in Kumasi for electricity generation.

Electricity Exchange – Imports and export decreased while Ghana remained a net importer of electricity

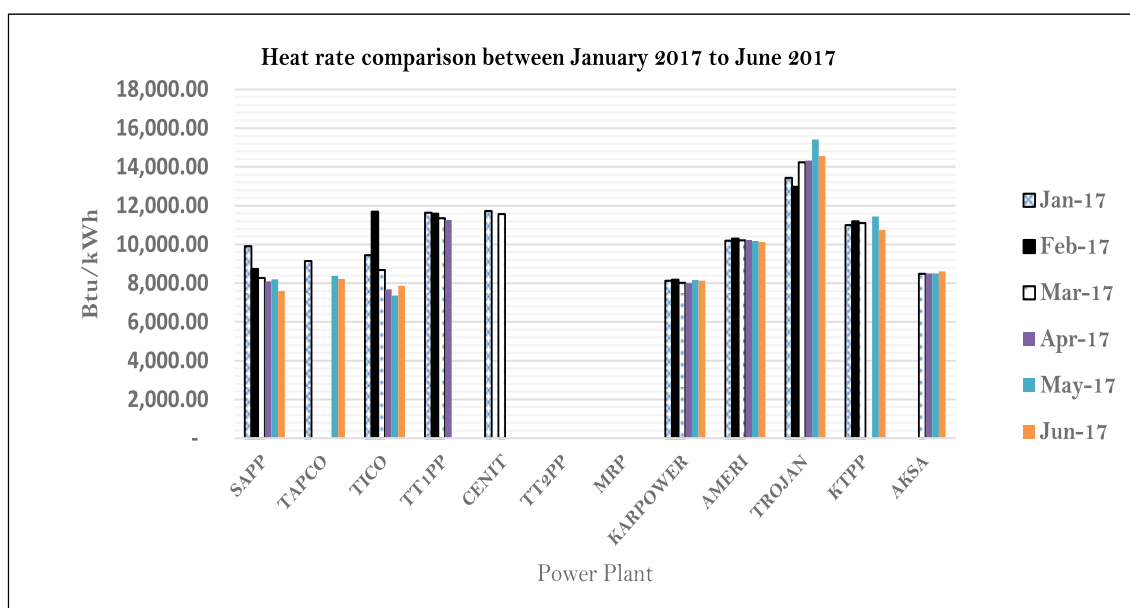
Electricity imports from La Cote D'Ivoire decreased to 13.3 GWh (0.44 GWh per day) in June 2017 from 20 GWh (0.65 GWh per day) in May 2017. Total import in June 2017 was lower than the 20 GWh projected under the 2017 ESP. Electricity import contributed 1.2% of the total electricity supplied in June 2017. Daily peak import in June 2017 reached a maximum of 59 MW and contributed 0.7% of the System Peak Load and Ghana Peak Load June 2017.

Electricity export to CEB decreased significantly from 11.9 GWh (0.38 GWh per day) in May 2017 to 5.76 GWh (0.19 GWh per day) in June 2017 and was significantly lower than the 77 GWh projected under 2017 ESP. Ghana was a net importer of electricity in June 2017 similar to May 2017.

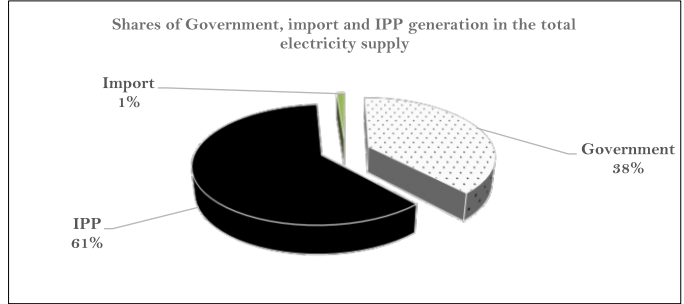
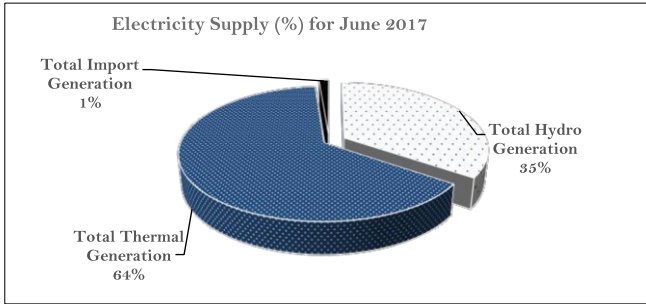
OPERATIONAL FACT SHEET

Peak Electricity Supply - June 2017			
Source of Supply	Generation at System Peak Load of June 2017 (MW)	Generation at Ghana Peak Load of June 2017 (MW)	Electricity Supply (GWh)
AKOSOMBO	569.00	569.00	284.41
KPONG	81.00	81.00	59.06
BUI	202.00	202.00	27.99
SAPP	144.70	144.70	171.20
TAPCO	150.00	150.00	62.64
TICO	339.00	339.00	177.12
TT1PP	-	-	-
CENIT	-	-	-
TT2PP	-	-	-
MRP	-	-	-
KARPOWER	220.10	220.10	151.08
AMERI	213.40	213.40	120.26
KTPP	-	-	4.66
Trojan Power	-	-	0.63
CENPOWER	-	-	-
AKSA	143.40	143.40	77.76
IMPORT	15.00	15.00	13.30
Export	-	-	5.76
System Coincident Peak Load	2,077.60	-	-
Ghana Coincedent Peak Load	-	2,077.60	-
Total Supply	-	-	1,150.09
Total Supply without export	-	-	1,144.34

Ghana Electricity Demand		
		Jun-17
Maximum System Peak Load	MW	2,077.6
Minimum System Peak Load	MW	1,735.0
Average Peak Generation	MW	1,932.2
System Base Load	MW	1,155.9
Total Electricity	GWh	1,149.5
Load Factor (LF)	%	74.4



OPERATIONAL FACT SHEET



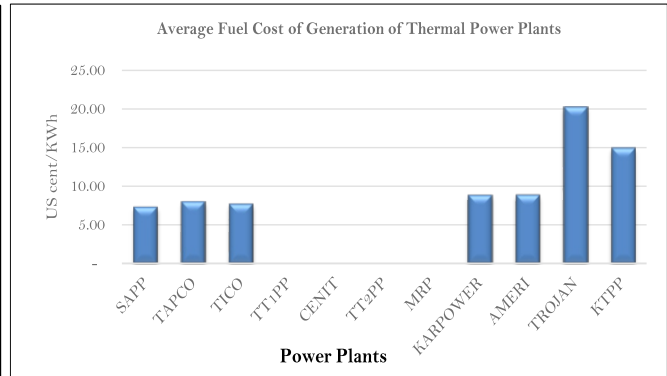
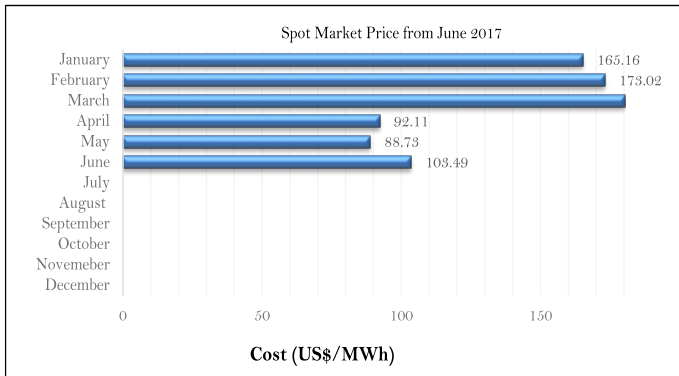
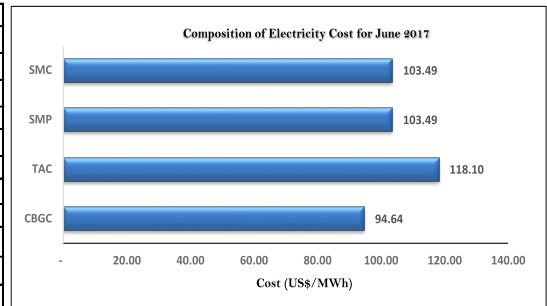
Power Plant Data for June 2017							
	Dependable Capacity (MW)	Plant Utilization (%)	Electricity Generation (GWh)	Gas Consumption (MMBtu)	LCO Consumption (MMBtu)	DFO Consumption (MMBtu)	HFO Consumption (MMBtu)
Akosombo	900.00	43.89	284.41	-	-	-	-
Kpong	140.00	58.59	59.06	-	-	-	-
Bui	340.00	11.43	27.99	-	-	-	-
SEAP	500.00	47.56	171.20	782,707.10	546,002.16	-	-
TAPCO	300.00	29.00	62.64	268,099.92	246,286.38	-	-
TICO	300.00	82.00	177.12	674,343.97	716,008.86	-	-
TT1PP	110.00	-	-	-	-	-	-
CENIT	110.00	-	-	-	-	-	-
TT2PP	45.00	-	-	-	-	-	-
MRP	70.00	-	-	-	-	-	-
KARPOWER	225.00	93.26	151.08	-	-	-	1,228,980.30
AMERI	230.00	72.62	120.26	1,218,176.83	-	-	-
TROJAN	56.00	1.55	0.63	-	-	9,126.00	-
KTPP	200.00	3.24	4.66	-	-	50,174.21	-
AKSA	160.00	67.50	77.76	-	-	-	668,793.05
Total	3,686.00	39.90	1,059.05	2,943,327.82	1,508,297.40		1,228,980.30

Location	Average Gas Flow (MMScfd) - June 2017				
	Week 1	Week 2	Week 3	Week 4	Monthly Average
Etoki	28.51	38.52	39.98	50.53	40.13
Tema	19.25	22.24	29.92	27.34	24.87
Aboadze	87.99	68.47	58.50	61.09	68.48

Hydro Dam	Water Level (ft) - June 2017				Change in water level (feet)
	Week 1	Week 2	Week 3	Week 4	
Akosombo	240.66	240.39	240.15	240.45	-0.21
Bui	556.78	556.81	556.35	556.71	-0.07

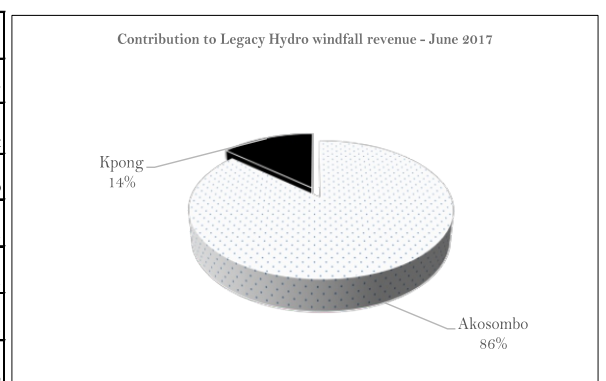
ECONOMIC FACT SHEET

		Jun-17	May-17	Change
Average Market Energy Cost	US\$/MWh	94.56	74.58	19.97
Average Market Capacity Charge (AMCC)	US\$/MWh	23.54	22.01	1.53
Total Average Market Cost (TAC)	US\$/MWh	118.10	96.59	21.51
System Marginal Cost (SMC)	US\$/MWh	103.49	103.49	(0.00)
System Marginal Capacity Charge (SMCC)	US\$/MWh	-	-	-
Spot Market Price (SMP)	US\$/MWh	103.49	103.49	(0.00)
Composite Bulk Generation Charge (CBGC)	US\$/MWh	94.64	94.64	-
Deviation of TAC from CBGC	US\$/MWh	(23.46)	(1.95)	(21.51)
Deviation of SMP from CBGC	US\$/MWh	(8.85)	(8.85)	0.00



Jun-17				
Power Plant	Average Cost US\$/MWh	Average SMP US\$/MWh	Difference US\$/MWh	Windfall Revenue US\$/MWh
Akosombo	33.10	103.49	70.39	20,018,130.33
Kpong	59.20	103.49	44.29	2,615,398.30
Total	92.30	-	-	22,633,528.63

Average Fuel Prices		
		Jun-17
Fuel Type	Unit	Delivered Cost
Natural Gas	US\$/MMBtu	8.60
LCO	US\$/BBL	57.12
HFO (Karpowership)	US\$/Tonne	417.62
HFO (Tema)	US\$/Tonne	437.62
DFO	US\$/Tonne	553.09



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1. Review of 2017 half year performance of electricity generation and supply

The dependable capacity in the country increased from about 3,200 MW (with Akosombo at 750MW instead of 900MW) to about 3,600 with the completion of commissioning of the SAPP Phase II and the AKSA Power Plant in the first quarter of 2017. Despite the high dependable capacity and the marginal increase in the dependable capacity, there was a significant load shedding in February 2017 due to fuel supply challenges, breakdown of plants and poor health of the hydro dams. System Peak Load has also increase from 2,105.5 MW in 2016 to 2,160.8 MW in the first half of the year but lower than the 2,238 MW projected for the first half of 2017 in the ESP.

There were two partial system collapses in the first half of the year. The first was on the 3rd May 2017 which was due to the sudden tripping of all the units at the Akosombo GS, Kpong GS, Bui, Karpowership, Ameri, AKSA and SAPP but there was supply for CIE. Whiles restoring service, there was a total system collapse which occurred on the 4th May 2017. The second was on the 12th June 2017, which was also due to the tripping of the 330kV Takoradi Thermal-Volta line with a number of transmission lines during nationwide rainfall. In the two occasions, supply was restored within 24 hours of the collapse.

Table 1 shows the actual half year supply of electricity by sources and a comparison with the projections made under the 2017 ESP.

Table 1 Half Year Actual Electricity supply by source vrs ESP Projection - 2017

Source of Supply	Total Supply (GWh)			Deviation (%)	Actual Contribution to total Generation (%)	Projected Contribution to total Generation (%)
	Actual	Projected	Deviation (GWh)			
AKOSOMBO	2,604.32	1,969.00	635.32	32.27	35.86	25.59
KPONG	420.37	387.00	33.37	8.62	5.79	5.03
BUI	373.30	416.00	(42.70)	(10.26)	5.14	5.41
SAPP	505.05	689.00	(183.95)	(26.70)	6.95	8.96
TAPCO	154.07	395.00	(240.93)	(60.99)	2.12	5.13
TICO	669.82	926.00	(256.18)	(27.67)	9.22	12.04
TT1PP	178.83	178.00	0.83	0.47	2.46	2.31
CENIT	58.89	154.00	(95.11)	(61.76)	0.81	2.00
TT2PP	-	-	-	-	-	-
MRP	-	-	-	-	-	-
KARPOWER	952.27	892.00	60.27	6.76	13.11	11.59
AMERI	712.09	758.00	(45.91)	(6.06)	9.80	9.85
KTPP	117.03	62.00	55.03	88.75	1.61	0.81
Trojan Power	51.44	19.00	32.44	170.76	0.71	0.25
CENPOWER	-	-	-	-	-	-
AKSA	284.35	318.00	(33.65)	(10.58)	3.92	4.13
IMPORT	181.30	531.00	(349.70)	(65.86)	2.50	6.90
Export	147.10	466.00	(318.90)	(68.43)	2.03	6.06
Total Supply	7,263.14	7,694.00	(430.86)	(5.60)	100.00	100.00
Total Supply without export	7,116.05	7,228.00	(111.95)	(1.55)		

There was a marginal deviation of 5.6% between the electricity supplied and the projections made in the 2017 ESP for the first half of 2017. There were major negative deviation (generated lower than projected) with TAPCO, CENIT, SAPP, Bui, AKSA and TICO primarily due to fuel inadequacies, technical challenges and grid demands. Power plants such as Akosombo GS, Kpong GS, KTPP, Karpowership and TT1PP recorded positive deviation (generated higher than projected) due to the unavailability of other power plants. About 98% of the total electricity supplied was supplied for domestic consumption.

1.1 Hydro Generation Sources

The hydro power plants contributed 46.8% of the total electricity supplied in the first half of 2017 against a projected 36% under the 2017 ESP. The increase in generation is to make up for the deficit in supply and prevent any load curtailment exercise. All the hydro plants except Bui GS generated above their projected generation levels. The Akosombo GS and Kpong GS generated 32.3% and 8.6% respectively above what they were projected to generate for the first six month under the 2017 ESP. Bui GS on the other hand generated 10.3% lower than projected primarily due to lower than expected water levels.

The elevated generation from the Akosombo GS had negative impact on the Akosombo Dam. From January 2017, the water level of Akosombo Dam dropped steadily from 250.47 feet at the beginning of the year to 240.45 feet by the end of June 2017 at an average drop rate of 0.055 feet per day. The water level of the Dam begun to rise from the 22nd June 2017. From the 22nd June 2017 to 30th June 2017, the water level at the Bui Dam rose by an average of 0.04 feet. The water level at the end of the first half of the year was 0.45 feet above the minimum operating level of 240 feet. The Bui Dam water level on the other hand dropped by an average of 0.136 feet from 576.85 feet at the beginning of the year to 552.22 feet by the end of June 2017. The water level at the end of June was 1.04 feet above the minimum operating level of the dam at 551.18 feet. The Bui Dam water level begun to rise from the 26th June 2017 at an average of 0.07 feet.

1.2 Thermal Generation Sources

Thermal generation sources contributed 53.2% of the total electricity supplied in the first half of the year against a projected 64% under the 2017 ESP. Fuel supply inadequacy and frequent plant breakdown were the major contributors to the lower than the projected contribution of Thermal Power Plants to the total electricity supply. TAPCO and TICO generated 60.99% and 27.67% below their projected generation for the first half of the year due to mandatory maintenance work and technical challenges to some units and financial constraints in the case of TAPCO. Unit 1 (Gas turbine 1) of TAPCO has been offline since the last week of March 2016 due to rotor ground fault and was only brought back online in May 2017. The delay in bringing the unit back online was due to the inability of VRA to procure the needed part early as a result of poor financial health of the Company. The Unit 2 (Gas turbine 2) of TAPCO was shut down for mandatory maintenance on the 9th January 2017 and not expected to be back online for the rest of 2017. TICO Power Plant on the other hand had one of its gas turbine and all of its steam turbine shut down for mandatory maintenance with all the units restored by April 2017. CENIT Power Plant, which operated on LCO, generated 61.76% below its projected generation for the first half of the year due to inadequate LCO availability. Likewise, SAPP and AMERI generated 10.26% and 6.06% below their projected generation due to gas supply inadequacy from WAGP and AGPP respectively. The AKSA, with guaranteed fuel, Power Plant generated 10.58% below its projected generated due to low system demands.

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Karpowership, with a guaranteed fuel supply, generated (6.76%) above what was projected for the first half of the year under the 2017 ESP. Likewise, KTPP, TT1PP and Trojan Power Plants generated 88.75%, 0.47% and 170.76% above their projected generation for the first half of the year due to the need to fill in the void created by the inadequate supply from the thermal power plants that were projected to be online. The three Power Plants and CENIT Power Plant were projected to be largely offline for most of the period in the first half of the year. TT1PP, KTPP and Trojan Power Plants have all exceeded their projected yearly generation under the 2017 ESP while CENIT Power Plant generated 38.2% of its total yearly generation.

1.3 Fuel Supply Outturn for first half of 2017

Table 1.3 Fuel Supply to Power Plants for first half of 2017

Power Plant	GAS (MMSCF)	LCO (BBL)	DFO (BBL)	HFO (BBL)
TAPCO	625.35	118,090.59	72.38	-
TICO	2,064.01	660,863.72	896.06	-
AMERI	6,440.20	-	-	-
SAPP	3,014.40	193,830.73	-	-
TT1PP	-	387,785.22	503.91	-
CENIT	-	129,752.37	38.38	-
TT2PP	-	-	-	-
MRP	-	-	-	-
KARPOWERSHIP	-	-	-	1,270,638.95
TROJAN	-	-	134,889.05	-
KTPP	-	-	243,649.83	-
AKSA	-	-	-	401,332.50
TOTAL	12,143.95	1,490,322.64	380,049.62	1,671,971.45

By converting all fuels into a common unit, British Thermal Unit (Btu), it is observed that, total fuel supply reached 33.05 Trillion Btu in the first half of 2017. The total supply of 33.05 Trillion Btu, 39.4% of the total fuel supply was natural gas, 23.8% was LCO, 6.2% DFO and 30.6% was HFO. This translate into 12,143 MMSCF of natural gas, 1.5 million barrels of LCO, 0.38 million barrels of DFO and 1.7 million barrels of HFO. The Ameri Power Plant and the Karpowership utilized about 21% and 23% respectively of the total fuel supplied in the first half of the year whiles TICO Power Plant utilized about 17%. Apart from SAPP which utilized about 13% of the total fuel supplied, the remaining power plant, TT1PP, TAPCO, Trojan, KTPP, CENIT and AKSA, used below 8% each of the total fuel supplied.

About 75.2% of the total natural gas supplied was used in the Aboadze Power Enclave and 24.8% was used by SAPP. Similarly, 52.3% of LCO supplied was used in the Aboadze Power Enclave, 34.7% was used in the Tema Power Enclave and 13% was used by SAPP. DFO was predominately used by the KTPP and Trojan Power Plant for electricity generation. 64.1% of the total DFO supply was used by KTPP and 35.5% was used by the Trojan Power Plant. Only two power plants, Karpowership and ASKA Power Plants operates on HFO in Ghana. Karpowership used 76% of the total 1.7 million barrels of HFO supplied and AKSA used 24% of the total HFO supplied.

There has generally been a relatively steady supply of natural gas to SAPP in the first half of 2017 compared to 2016 which has led to the increase supply of electricity from SAPP in the first half of 2017 (505 GWh) compared to its total supply in 2016 (373 Gwh). Likewise, the stable supply of DFO to the Trojan Power Plant led to the power plant generating 51 GWh in the first half of 2017 which is higher than the total generation of 38.9 GWh for the entire year in 2016.

2.0 Performance Indicators of Power Plants

2.1 Capacity Utilization Factor (CUF)

The hydro power plants generally had a significant reduction in their CUF due to the increased supply of electricity from the thermal sources such as SAPP, TICO and Ameri Power Plants in June 2017. The CUF of Akosombo Hydro Plant reduced from 60% in May 2017 to 43.9% in June 2017. The CUF of Bui GS reduced from 20.6% in May 2017 to 11.4% in June 2017 which is lower than it designed CUF of 25%. Likewise, Kpong GS CUF reduced from 67.6% in May 2017 to 58.6% in June 2017 due to reduced generation from the Akosombo GS.

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

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

Power Plant	Capacity Utiliation (%)	Average Heatrate (Btu/KWh)	Average Fuel Cost of Generation (US\$/MWh)
Akosombo	43.89	-	-
Kpong	58.59	-	-
Bui	11.43	-	-
SAPP	47.56	7,761.17	73.06
TAPCO	29.00	8,212.44	79.86
TICO	82.00	7,849.86	76.91
TT1PP	-	-	-
CENIT	-	-	-
TT2PP	-	-	-
MRP	-	-	-
KARPOWER	93.26	8,134.42	88.12
AMERI	72.62	10,129.61	88.53
TROJAN	1.55	14,578.27	201.58
KTPP	3.24	10,764.69	148.85
AKSA	67.50	8,600.82	97.63

TICO Power plant recorded a significant increase in its CUF from 53.3% in May 2017 to 82% in June 2017. Likewise, the SAPP recorded an increase in its CUF from 20.6% in May 2017 to 47.6% in June 2017 which is the highest CUF recorded for the power plant in 2017. The Karpowership Power Plant maintained a high CUF of 93.26% in June 2017 but was lower than the 97.5% recorded in May 2017. This was due to the fact that some of the units were taken out of service for routine maintenance work. Other power plants such as Ameri, KTPP, Trojan and TAPCO had a reduced CUF due to low system demand.

The System Load Factor (LF) increased from 74.4% in May 2017 to 76.4% in June 2017.

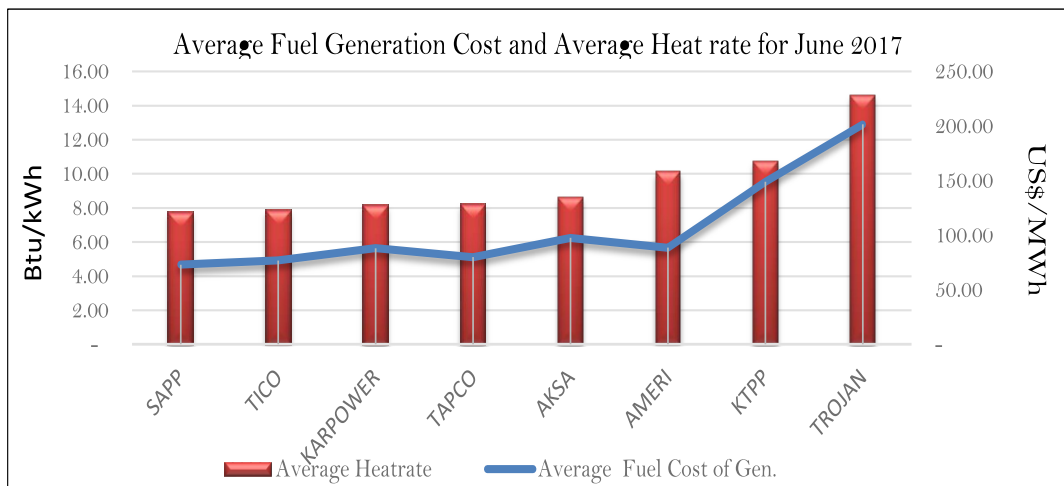
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2.2 Heat Rate (Fuel Efficiency)

There was improvement in the heat rate of most of the thermal power plants in June 2017. The SAPP became the most efficient power plant in June 2017. The Power Plant had an improvement in its heat rate in June 2017 from 8,460.79 Btu/kWh in May 2017 to 7,761.17 Btu/kWh in June 2017. The TICO Power Plant had an average heat rate of 7,849.86 Btu/kWh in June 2017 a significant improvement over the 8,049.72 Btu/kWh in May 2017 as it generated predominantly on combined cycle mode but was not enough to overtake SAPP to be the most efficient Plant in June 2017. Karpowership also had a marginal improvement in its heat rate from 8,164.4 Btu/kWh in May to 8,134.42 Btu/kWh in June 2017. Also, the TAPCO Power Plant had a marginal improvement in its heat rate from 8,591.96 Btu/kWh in May 2017 to 8,212.44 Btu/kWh in June 2017. AKSA on the other hand had a reduced heat rate from 8,495.57 Btu/kWh in May 2017 to 8,600.82 Btu/kWh in June 2017.

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

Figure 2.1.1: Fuel efficiency ranking of thermal power plants with their respective fuel cost of generation.



2.3 Average Fuel Cost of Electricity Generation

The SAPP had the lowest average fuel cost of generation of US\$73.06/MWh in June 2017. This is a marginal improvement over the US\$73.29/MWh recorded in May 2017 due to the reduced average cost of LCO from US\$11.39/MMBtu in May 2017 to US\$10.8/MMBtu in June 2017 and improved heat rate. The TAPCO Power Plant also had a marginal improvement in its fuel cost of generation from US\$88.73/MWh in May 2017 to US\$79.86/MWh in June 2017 due to reduced cost of LCO. The Karpowership and AKSA Power Plants witnessed a significant increase in their average cost of generation from US\$72/MWh and US\$80.04/MWh in May 2017 respectively to US\$88.12/MWh and US\$97.63/MWh in June respectively. This was primarily due to the increase in the cost of HFO from US\$8.9/MMBtu in May 2017 to US\$10.83/MMBtu in June 2017 for Karpowership and US\$9.42/MMBtu in May 2017 to US\$11.35/MMBtu in June 2017 to AKSA Power Plant.

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
 KTRPP = 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
 TT1PP = 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
 NGGC = 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 = Twenebo, Enyenra, Ntomme
 TT2PP = Tema Thermal 2 Power Plant
 WAGPCo = West African Gas Pipeline Company
 WEM = Wholesale Electricity Market

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