GHANA WHOLESALE ELECTRICITY MARKET BULLETIN

MARKET WATCH

Monthly Market Data Analysis

ISSUE NO. 15: 1st March 2017 to 31st March 2017

This Bulletin covers major developments in the Wholesale Electricity Market (WEM) of Ghana from 1st March 2017 to 31th March 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.

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 deeply regretted.

HIGHLIGHTS OF THE MONTH

Overview of the Month

The month of March 2017 witnessed a significant increase in generation by most of the power plants whose low generation output caused some quantum of load to be shed in February 2017. The TICO and Ameri Power Plants which together dropped a combined generation of 140.8 GWh in February 2017 over that of January 2017, recovered in March 2017 to generate additional 172.82 GWh of electricity to the February 2017 generation. The average generation of the TICO Power Plant increased from 2.21 GWh/day in February 2017 to 3.07 GWh/day (37.9% increment) in March 2017 and that of the Ameri Power Plant increased from 2.58 GWh/day to 5.09 GWh/day (97.3% increment) within the same period. The TT1PP whose output in February 2017 decreased by a total of 30 GWh compared to January 2017 due to low levels of treated stocks of LCO, also recovered in March 2017 to generate an additional 33.1 GWh of electricity to what it generated in February 2017. The CENIT Plant which did not generate at all in February 2017 also came back online in March 2017 with a generation of 23.69 GWh of electricity. The Sunon Asogli Plant even though was not a major contributor to the load shed in February 2017, increased its generation significantly from an average of 1.9 GWh/day in February 2017 to 2.6 GWh/day in March 2017. The AKSA Power Plant which started commissioning procedures in March 2017 generated 2.33 GWh of electricity.

The increased generation by the above mentioned power plants was as a result of improved LCO supply (in the case of TT1PP, CENIT and SEAP), completion of mandatory maintenance (in the case of TICO) and successful completion of the tie-in of the gas pipeline of the TEN oil field with the gas export

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

	March 2017		February 2017	
	Projected	Actual Outturn	Projected	Actual Outturn
Total Supply (GWh)	1,301.0	1,295.8	1,291.0	1,244.1
Source by Power Plants (GWh)				
AKOSOMBO	348.0	529.3	362.0	496.9
KPONG	70.0	77.9	72.0	71.5
BUI	71.0	64.7	74.0	115.4
Sunon Asogli	55.0	80.6	62.0	49.8
TAPCO	95.0	-	-	-
TICO	170.0	95.1	94.0	61.9
TT1PP	60.0	64.7	58.0	29.9
CENIT	39.0	23.7	55.0	-
TT2PP	-	-	-	-
MRP	-	-	-	-
Karpowership	147.0	166.7	140.0	150.9
AMERI	144.0	157.7	40.0	18.0
KTPP	-	6.6	62.0	65.4
Trojan Power	7.0	10.2	5.0	13.9
AKSA	-	2.3	-	-
Total Generation (GWh)	1,206.0	1,279.4	1,024.0	1,073.6
Imports (GWh)	95.0	16.5	133.0	52.1
Total Supply (GWh)	1,301.0	1,295.8	1,291.0	1,244.1
Deficit (GWh)	-	(5.2)	-	(46.9)
Reduction in Consumption		0%		4%
Ghana Coincedent Peak Load (MW)	2,018.0	2,105.8	1,973.0	2,049.6
System Coincident Peak Load (MW)	2,151.0	2,152.8	2,106.0	2,099.8

pipeline of the FPSO Kwame Nkrumah (in the case of Ameri Plant) which restored gas supply to the Aboadze Power Enclave increasing from an average of 6.4 MMSCF per day in February 2017 to 64.7 MMSCF per day in March 2017.

Even though the TAPCO Plant which was a contributor to the February 2017 generation deficit remained offline in March 2017 and the average generation from Bui Generation Station reduced by 43.9% with marginal decrease in average generation from the Akosombo (4.1%) and Kpong Generation Stations (1.6%), the recovery by the other thermal plants resulted in an overall increase in total system generation by about 15.1% from 1,125.7 GWh (an average of 40.98 GWh per day) in February 2017 to 1,295.82 GWh (an average of 41.8 GWh per day) in March 2017 and consequently no load was shed in the month.

The overall increase in generation led to the reduction in import from La Cote D'Ivoire by 2.5 folds from an average of 1.86 GWh per day in February 2017 to 0.53 GWh per day in March 2017 with an increase in electricity export to CEB from 27.82 GWh (average of 1.0 GWh per day) in February 2017 to 37.19 GWh (average of 1.2 GWh per day) in March 2017. The increase in generation resulted in a marginal increase in the SMC by 0.5%.

Electricity Demand and Supply in March 2017

Electricity Demand at peak increased

The System Peak Load (Ghana Peak Load plus Import) of 2,152.80 MW recorded in March 2017 was 3.3% higher than the 2,084.3 MW recorded in February 2017. With a decrease in electricity import, the increment in the System Peak Load was largely attributable to increase in the Ghana Peak Load from 2,038.3 MW in February 2017 to 2,105.8 MW in March 2017 which is also as a result of the recovery in demand after the load shedding in February 2017. Both the System Peak Load and Ghana Peak Load for March 2017 were marginally higher than the projected System Peak load of 2,151 MW and Ghana Peak Load of 2,018 MW projected under the 2017 Electricity Supply Plan (ESP).

Electricity supply increased in March 2017

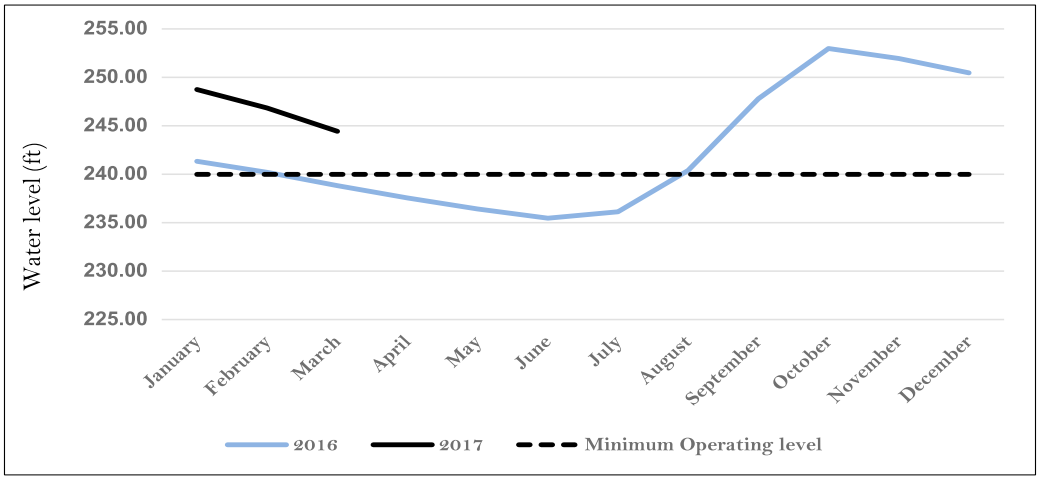
The average daily electricity supplied to meet Ghana's requirement increased marginally in March 2017 to 41.8 GWh per day in March 2017 from 40.98 GWh per day recorded in February 2017. The total electricity supply in March 2017 was 1,295.82 GWh consisting of 1,279.36 GWh from domestic generation and 16.46 GWh from imports from La Cote D'Ivoire. The total supply of electricity in March 2017 was 8.8 GWh lower than the 1,301 GWh projected in the Electricity Supply Plan (ESP) developed for the year 2017 representing a 0.67% deviation between the outturn and projection.

Hydro Dam Levels

Akosombo Dam water level dropped further in March 2017 at an increased rate

Even though the average electricity generation from the Akosombo GS dropped marginally, there was a further drop in the water level of the Akosombo GS by 2.4 feet in March 2017 from the 1.92 feet drop recorded in February 2017. Average daily drop rate in water level increased from 0.069 feet per day in February 2017 to 0.077 feet per day in March 2017 (11.6% increment in drop rate of water level). The water level of the Akosombo GS at the end of March 2017 stood at 244.44 feet, which is 4.44 feet above the minimum operating level of 240 feet. This notwithstanding, the water level at the end of March 2017 was higher than the level at the same time in March 2016 by about 5.62 feet. Figure 1 shows comparative end of month trajectory of the level of water in the Akosombo dam for the January 2016 to March 2017.

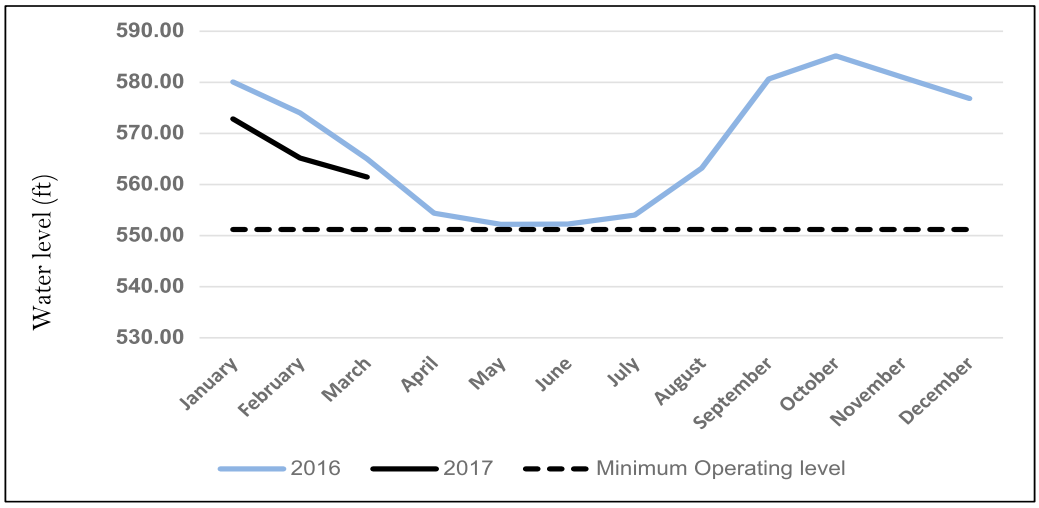
Figure 1: Month-End Water Level for Akosombo Dam from January 2016 to March 2017



Bui Dam water level dropped but at a reduced rate

The Bui dam water level dropped by 3.74 feet in March 2017, which was 50.9% lower than the 7.61 feet drop recorded in February 2017 even though it run for fewer days in February 2017 than in March 2017. The drop rate of 0.12 feet per day recorded in March 2017 was significantly lower than the 0.27 feet per day recorded in February 2017 (55.5% reduction in drop rate of water level). The water level dropped from 565.21 feet level at the beginning of the month to 561.47 feet at the end of the month. Even though the water level is still above the minimum design operating level of 551.04 feet, the water level at the end of March 2017 was lower than the level at the same time in March 2016 by about 3.58. Figure 2 shows comparative end of month trajectory of the level of water in the Bui dam for the January 2016 to March 2017.

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



Fuel Supply for Power Generation

Liquid fuel continued to dominate the fuel supply mix in March 2017 even though its share in the total fuel supply mix reduced from 85% in February 2017 to 55% in March 2017 with Natural Gas accounting for the rest. Shares of LCO in the total fuel supply mix dropped marginally from 29% in February 2017 to 28% in March 2017, shares of HFO dropped from 32% in February 2017 to 23% in March 2017 and DFO shares reduced significantly from 24% in February 2017 to 4% in March 2017.

Natural gas supply in the total fuel supply mix increased from 15% in February 2017 to 45% in March 2017 as a result of increase in natural gas supply from the AGPP from an average 6.4 MMSCF in February 2017 to 64.7 MMSCF in March 2017 due to the completion of work on the tie-in of the TEN oil fields gas pipeline to the gas exports from the FPSO Kwame Nkrumah. Natural gas supply from the AGPP increased from 4.9% of the total fuel supplied in February 2017 to 37.1% in March 2017. Natural gas supply from the WAGPCo, also increased marginally from 7.1% of the total fuel supply in February 2017 to 7.6% in March 2017.

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

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

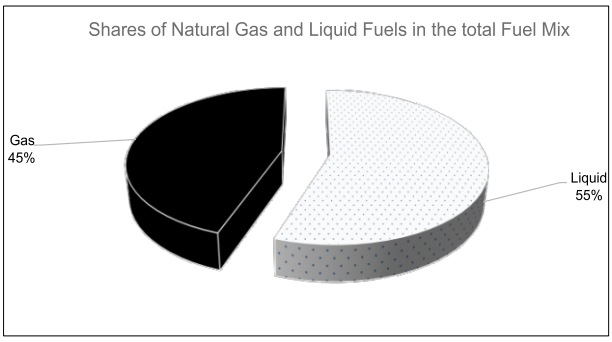
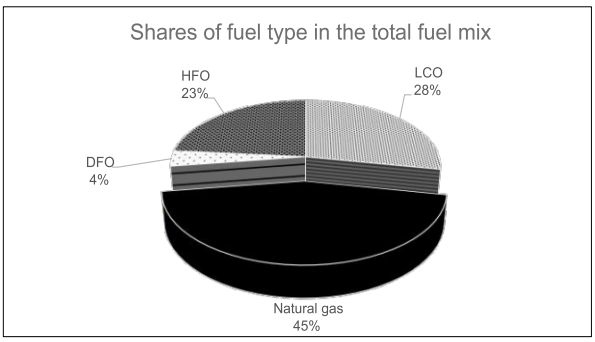


Figure 3b: Shares of fuel type in the generation fuel mix for power generation



Natural gas supplies from WAGPCo continued to decline

Natural gas flow from Nigeria through the West African Gas Pipeline (WAGP) to Tema and Kpone declined marginally from an average of 14.53 MMSCF per day in February 2017 to 13.7 MMSCF per day in March 2017. The shares of natural gas supplied from the WAGPCo in the total natural gas supplied in March 2017 declined to 17% from 68.5% in February 2017. However, there was a steady and continuous flow of natural gas in March 2017 compared to February 2017 which led to the SAPP operating continuously throughout the month of March 2017.

HIGHLIGHTS OF THE MONTH

Natural gas supply from GNCC to the Aboadze Power Enclave increased significantly

Natural gas flow from the AGPP of GNGC to the Aboadze Power Enclave increased from an average of 6.4 MMSCF per day in February 2017 to 64.7 MMSCF per day in March 2017. The shares of natural gas supplied from the AGPP in the total natural gas supplied in March 2017 increased to 83%, from 31.5% in February 2017. Total gas supply also increased to 1,815.6 MMSCF in March 2017 from 160 MMSCF in February 2017. Of the total 1,815.6 MMSCF of natural gas supplied by the AGPP in Mach 2017, 76.4% and 23.6% was consumed by the Ameri and TICO Power Plants respectively. Figure 4a and figure 4b shows the contribution of gas supply by sources and the contribution of individual liquid fuel in the total liquid fuel supply.

Figure 4a: Contribution of Gas Supply by source

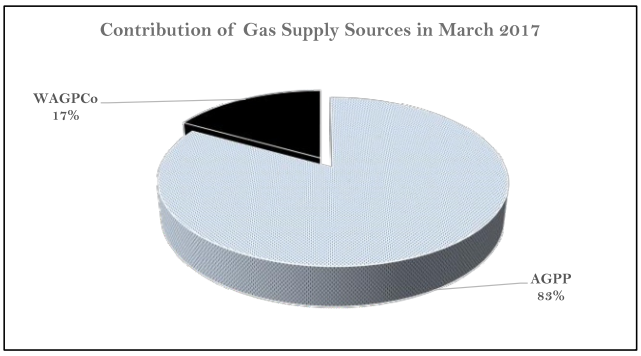
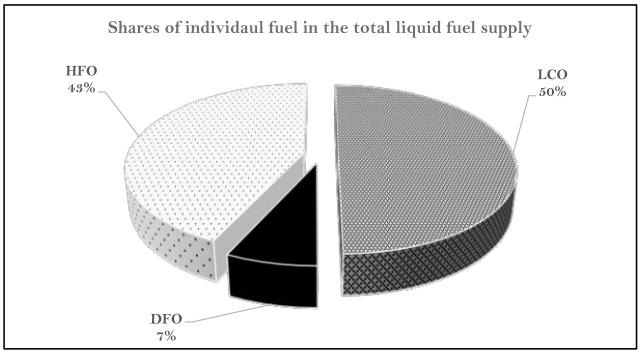


Figure 4b: Contribution of individual fuel in the liquid fuel supply



Liquid Fuel

A total of 562,572 bbls of liquid fuel was used by power plants in March 2017. Of this total, 99.9% was used for electricity generation whiles 0.01% was used for the starting and stopping of the gas turbines in Tema and Aboadze Power Enclaves. LCO was the dominant fuel in the liquid fuel supply increasing its contribution from 34.1% of the total liquid fuel supplied in February 2017 to 49.9% in March 2017. Share of HFO in the liquid fuel supply also increased from 37.6% in February 2017 to 43.1% in March 2017. The shares of DFO however dropped significantly from 28.3% in February 2017 to 7% of the total liquid fuel supplied in March 2017. The significant drop in DFO usage was due to KTPP which uses DFO, not operating for significant periods of March 2017

A total of 296,906 bbls of LCO was used for electricity generation in March 2017. Of this total, 79.2% was used by power plants in the Tema and Kpone Enclaves whiles 20.8% was used in the Aboadze Power Enclave.

DFO consumption dropped from 136,225 bbls in February 2017 to 40,889 bbls in March 2017. Of the total DFO supplied in March 2017, 50% was used in the Tema power enclave, 16.2% was used in Kumasi, 33.4% was used in the Kpone Power Enclave whiles the remaining 0.4% was used in the Takoradi Power Enclave.

A new HFO plant, AKSA Power Plant, was synchronized to the national grid on the 28th March 2017. This power plant consumed 1.5% of the total 224,777 bbls of HFO consumed in March 2017 for electricity generation. The Karpowership consumed the remaining 98.5% of the total HFO supplied in March 2017.

Plant by Plant Highlight

Electricity Generation from the Akosombo GS dropped marginally in March 2017

The Akosombo GS operated for the entire 31 days in March 2017 with a drop in electricity generation from an average of 17.74 GWh per day in February 2017 to 17.07 GWh per day in March 2017. Total generation in March 2017 (529.29 GWh) was however higher than the 496.9 GWh generated in February 2017 due to the more days in March as compared to February. The Akosombo GS generated 40.8% of total electricity supplied in March 2017, down from 46.3% supplied in February 2017. The 529.29 GWh of electricity generated by Akosombo GS in March 2017 was 52% higher than the 348 GWh projected under the 2017 ESP. The power plant contributed 714 MW (33.1%) to meet total System Peak Load of 2,152.80 MW in March 2017 compared to 903 MW (43.3%) in February 2017 to meet System Peak Load of 2,084.30 MW. The Akosombo GS contributed the same amount of 714 MW (33.91%) to meet the Ghana Peak Load of 2,105.80 MW in March 2017.

Electricity Generation from Kpong GS decreased marginally in March 2017

The Kpong GS operated for the entire 31 days in March 2017 and generated a total of 77.92 GWh of electricity which was 9% higher than the 71.5 GWh of electricity generated in February 2017 although the average daily generation fell marginally to 2.51 GWh a day in March 2017 from the 2.6 GWh a day in February 2017. The 77.92 GWh of electricity generated by Kpone GS in March 2017 was 11.31% higher than the 70 GWh projected to be generated under the 2017 ESP. The Kpone GS generated 6% of total electricity supplied in March 2017, a marginal fall from 6.3% of total electricity supplied in February 2017. The Kpong GS contributed 105 MW (4.87%) to meet the System Peak Load of 2,015.80 MW in March 2017 and the same amount of 105 MW (4.9%) to meet the Ghana Peak Load of 2,105.80 MW.

Generation at Bui Generation Station (GS) slumped significantly in March 2017

Electricity production from the Bui Power Plant slumped significantly in March 2017 to 64.65 GWh (2.09 GWh per day) from 115.36 GWh (4.12 GWh per day) in February 2017. This represents a fall of 49.3%, based on the daily average production of the two months and contributed 5% of the total electricity supplied in March 2017. This means that Bui GS generated largely as a peaking plant in March 2017 compared to February 2017.The total of 64.65 GWh of electricity generated in March 2017 from the Bui power plant was

also lower than the 71 GWh projected to be generated under the 2017 Electricity Supply Plan (ESP). The Bui power plant contributed301 MW to meet both the System Peak Load (2,152.80 MW) and the Ghana Peak Loads (2,105.80 MW), which represents 13.98% and 14.29% respectively.

Electricity Generation from the Sunon Asogli Power Plant increased significantly in March 2017

The Sunon Asogli Power Plant (SAPP) operated for the entire 31 days in March 2017 and generated 80.57 GWh (at an average of 2.6 GWh per day), which is 61.9% higher than the 49.78 GWh (an average of 1.9 GWh per day) it generated in February 2017.The Sunon Asogli power plant contributed 6.2% of the total electricity supplied in March 2017. The 80.57 GWh generated by SAPP in March 2017 was 31.7% higher than the 55 GWh projected to be generated under the 2017 ESP. The Sunon Asogli Power Plant contributed 211.40 MW to meet both the System Peak Load of 2,152.80 MW and Ghana Peak Load of 2,105.80 MW. This represented 9.8% and 10% of System Peak Load and Ghana Peak Load respectively. The SAPP consumed a total of 405.87 MMSCF of natural gas and about 44,628 bbls of LCO at an estimated heat rate of 8,270.2 Btu/kWh.

CENIT Power Plant resumed operation in March 2017

The CENIT Power Plant which was offline for the entire month of February 2017 due to low levels of treated LCO stocks came back online in March 2017 and operated for 14 days generating 23.69 GWh at an average of 1.69 GWh/day.The plant generated 39.2% less than the 39 GWh projected to be generated under the ESP of 2017 and contributed 1.8% of the total electricity supplied in March 2017. Despite the relatively short period of generation in March 2017, the CENIT Power Plant contributed to meet the System Peak Load and Ghana Peak Load in March 2017. The power plant contributed 95 MW to meet both the System Peak Load of 2,152.80 and Ghana Peak Load of 2,105.80. This represented 4.4% and 4.5% of System and Ghana Peak Loads respectively. The CENIT Power Plant consumed 53,810 bbls of LCO to generate 23.69 GWh of electricity at an estimated average heat rate of 11,569.96 Btu/kWh.

Ameri Energy Power Plant generation increased significantly in March 2017

Electricity generation from the Ameri Energy Power Plant increased significantly in March 2017 due to improvement in natural gas supply from the AGPP. Ameri generated an average of 5.09 GWh of electricity per day in March 2017, an increase of 49.5% over the average generation of 2.57 GWh per day in February 2017. The Ameri Power Plant generated a total of 157.67 GWh of electricity in March 2017 which is 7.7 folds increase over the 18.04 GWh generated in February 2017 and accounted for 12.2% of the total electricity supplied in March 2017. The Power plant operated throughout the month generating 157.67 GWh, which is 8.6% higher than the projected 144 GWh under the 2017 ESP. The Ameri Energy Power Plant contributed 238.40 MW to meet both the System Peak Load of 2,152.80 MW and the Ghana Peak Load of 2,105.80 MW, representing 9.72% and 11.32% respectively. The power plant consumed a total of 1,386.31 MMSCF to generate the 157.67 GWh of electricity at an average heat rate of 10,207.55 Btu/kWh.

Generation from the Kpone Thermal Power Plant (KTPP) dropped significantly

Electricity generated from the Kpone Thermal Power Plant (KTPP) dropped significantly to a total of 6.60 GWh in March 2017 from 65.44 GWh in February 2017. The plant operated for only 3 days in March 2017 due to availability of cheaper sources of electricity generation. The generation by KTPP accounted for only 0.5% of the total electricity supply in March 2017. This was very close to the projection by the 2017 ESP which projected no generation from KTPP in March 2017.The KTPP did not make any contribution to either the System Peak Load or Ghana Peak Loads. The 6.60 GWh of electricity generated in March 2017 was achieved with a consumption of 13,647 barrels of DFO resulting in an average heat rate of 11,121.75 Btu/kWh.

Karpowership Power Plant marginally increased its generation but its share of total generation declined

The Karpowership Power Plant operated every day in the month of March 2017, generating a total of 166.73 GWh (average of 5.39 GWh/day) which is 10.5% higher than the total generation of 150.9 GWh (average of 5.38 GWh/day) in February 2017. Notwithstanding the increment in total generation, the generation by Karpowership accounted for 12.9% to total electricity supplied in March 2017, a marginal drop from the 13.4% contributed in February 2017. Karpowership's generation of 166.73 GWh in March 2017 was 13.42% higher than the 147 GWh projected to be generated under the 2017 ESP. The Karpowership contributed 227 MW to meet both the System Peak Load and Ghana Peak Load, representing 10.54% and 10.78% respectively. The Karpowership plant consumed 221,506 barrels of Heavy Fuel oil (HFO) to generate the 166.73 GWh at an average heat rate of 8,024.16 Btu/kWh.

Takoradi International Company (TICO) increases generation in March 2017

The TICO Power plant operated throughout the month of March 2017, largely in a combined cycle mode as the steam turbine was restored and generated a total of 95.10 GWh of electricity averaging 3.07 GWh/day. This represented a 39.5% increase in average generation compared over the average generation of 2.2 GWh/day in February 2017. The total generation by the TICO Plant in March 2017 which accounted for 7.1% of total electricity supply in the month, was 44% lower than the 170 GWh projected to be generated under the 2017 ESP. The TICO Plant contributed 158 MW to meet both the System Peak Load and Ghana Peak Loads, representing 7.34% and 7.5% respectively. It operated on both light crude oil (LCO) and natural gas consuming about 59,197.44 bbls of LCO and 429.28 MMSCF of natural gas at an average heat rate of 8,677.6 Btu/kWh.

Takoradi Power Company (TAPCO) continued to be offline in March 2017

The TAPCO Power Plant remained offline in the month of March 2017 and generated no electricity. The power plant has been offline since 10th January 2017 because of works on Gas Turbine 1 (rotor ground fault) and major inspection on Gas Turbine 2.

Tema Thermal 1 Power Plant (TT1PP) increased generation for March 2017

The Tema Thermal 1 Power Plant, (TT1PP) increased its generation from 29.88 GWh (an average of 2.13 GWh per day) in February 2017 to 64.65 GWh (an average of 2.23 GWh per day) in March 2017. Consequently, the March 2017 generation of 64.65 GWh by the TT1PP was 7.75% higher than the 60 GWh projected for the month of March 2017 under the 2017 ESP. The TT1PP contributed 5% of the total electricity supplied in March 2017.The TT1PP contributed 98 MW to meet both the System Peak Load and Ghana Peak Loads, representing 4.55% and 4.65% respectively. The power plant operated solely on LCO consuming about 138,689 bbls to generate the 64.65 GWh of electricity at an average heat rate of 11,350.17 Btu/kWh.

Trojan Power Plant's generation reduced marginally in March 2017

Electricity generated from the Trojan Power plant reduced marginally from 13.93 GWh (an average of 0.5 GWh per day) in February

2017 to 10.15 GWh (an average of 0.33 GWh per day) in March 2017. This represented a 51.5% decrease in average generation. The Trojan Power Plant contributed 0.8% of the total electricity supply in March 2017. The Trojan Power Plant however generated 45% lower than the 7 GWh projected in the 2017 ESP. Of the total of 10.15 GWh generated by the Trojan Plants, the Kumasi plant accounted for 27% whiles the Tema plant accounted for 73%. A total of 26,890 bbls of DFO was used by Trojan power plant for electricity generation in March 2017. Of this, 20,285 bbls was used in the Tema power enclave at an average heat rate of 14,717.86 Btu/kWh and 6,605 bbls was used at Kumasi at an average heat rate of 12,913.45 Btu/kWh.

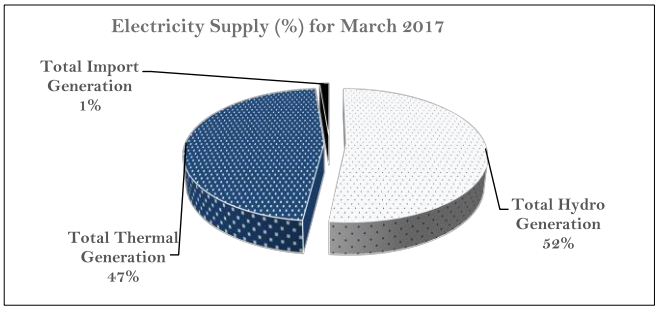
AKSA Generators Limited started commissioning of a 250MW Power Plant in March 2017

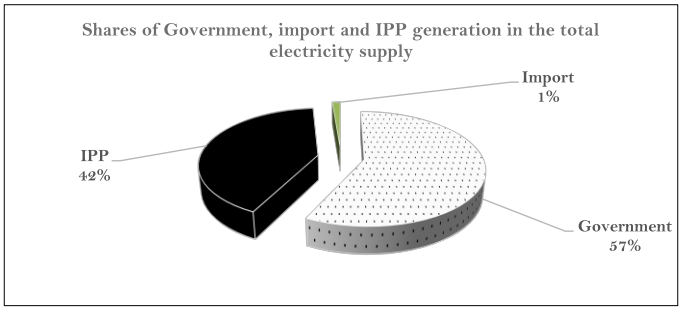
The AKSA Power Plant which was contracted as part of the emergency power solution to the power crisis started commissioning procedures for an HFO fired power plant with an installed capacity of 250 MW. The power plant begun to feed into the grid on the 28th of March 2017, generating a total of 2.33 GWh which was 0.18% of the total electricity supplied in March 2017. The AKSA Power Plant did not contribute to either System Peak Load or Ghana Peak Loads .The AKSA Power Plant consumed 3,270.59 bbls of HFO to generate 2.33 GWh of electricity at an average heat rate (fuel efficiency) of 8,481.92 Btu/kWh.

Electricity Exchange – Ghana was a net exporter of electricity in March 2017

There was a significant reduction in electricity import from La Cote D'Ivoire in March 2017 owing to the commencement of the operation of power plants that were offline in February 2017, improved gas supply to the Aboadze Power Enclave and increased stock of LCO at the Tema Power Enclave. Electricity import reduced from 52.08 GWh in February 2017 to 16.46 GWh in March 2017. Total import into the country constituted 1.3% of the total electricity supplied in March 2017 compared to 4% in February 2017. Imports were also significantly lower than the projected 95 GWh under the 2017 supply plan. Daily peak import in March 2017 ranged between 5 MW and 100 MW and contributed 0.23% and 0.24% to meet the System Peak Load and Ghana Peak Load respectively. Electricity export, however, increased to 37.19 GWh (at an average of 1.2 GWh per day) in March 2017 from 27.82 GWh (an average of 1.0 GWh per day) in February 2017 but was lower than the 80 GWh projected under the 2017 ESP. Ghana was a net exporter of Electricity in March 2017, exporting 9.37 GWh of electricity more than was imported.

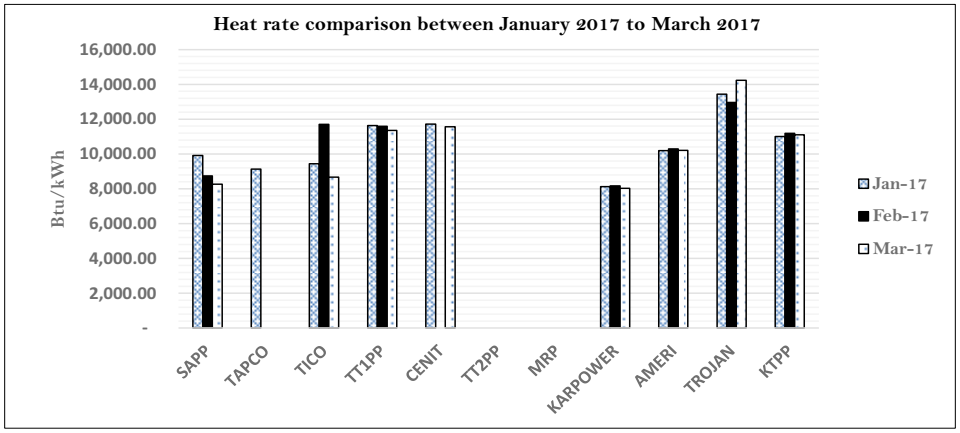
OPERATIONAL FACT SHEET





Peak Electricity Supply - March 2017			
Source of Supply	Generation at System Peak Load of March 2017 (MW)	Generation at Ghana Peak Load of March 2017 (MW)	Eleectricity Supply (GWh)
AKOSOMBO	714.00	714.00	529.29
KPONG	105.00	105.00	77.92
BUI	301.00	301.00	64.65
SAPP	211.40	211.40	80.57
TAPCO	-	-	-
TICO	158.00	158.00	95.10
TT1PP	98.00	98.00	64.65
CENIT	95.00	95.00	23.69
TT2PP	-	-	-
MRP	-	-	-
KARPOWER	227.00	227.00	166.73
AMERI	238.40	238.40	157.67
KTPP	-	-	6.60
Trojan Power	-	-	10.15
AKSA	-	-	2.33
IMPORT	5.00	5.00	16.46
Export		47.00	27.82
System Coincident Peak Load	2,152.80	-	-
Ghana Coincedent Peak Load	-	2,105.80	-
Total Supply	-	-	1,295.82
Total Supply without export	-	-	1,268.00

Ghana Electricity Demand		
		Mar-17
Maximum System Peak Load	MW	2,152.8
Minimum System Peak Load	MW	1,873.1
Average Peak Generation	MW	1,956.1
System Base Load	MW	1,346.4
Total Electricity	GWh	1,295.8
Load Factor (LF)	%	80.9



OPERATIONAL FACT SHEET

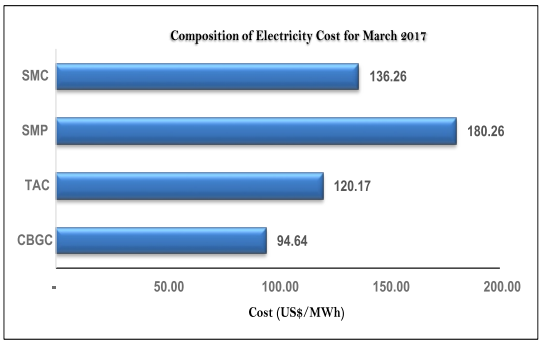
Power Plant Data for March 2017							
	Dependable Capacity (MW)	Plant Utilization (%)	Electricity Generation (GWh)	Gas Consumption (MMBtu)	LCO Consumption (MMBtu)	DFO Consumption (MMBtu)	HFO Consumption (MMBtu)
Akosombo	900.00	79.05	529.29	-	-	-	-
Kpong	140.00	74.81	77.92	-	-	-	-
Bui	340.00	25.56	64.65	-	-	-	-
SEAP	500.00	21.66	80.57	430,222.69	236,124.93	-	-
TAPCO	300.00	-	-	-	-	-	-
TICO	300.00	42.61	95.10	541,705.52	326,867.17	-	-
TT1PP	110.00	79.00	64.65	-	733,793.72	-	-
CENIT	110.00	28.95	23.69	-	274,124.36	-	-
TT2PP	45.00	-	-	-	-	-	-
MRP	70.00	-	-	-	-	-	-
KARPOWER	225.00	99.60	166.73	-	-	-	1,337,841.40
AMERI	230.00	92.14	157.67	1,609,414.52	-	-	-
TROJAN	56.00	24.37	10.15	-	-	144,495.00	-
KTPP	200.00	4.44	6.60	-	-	73,333.49	-
AKSA	160.00	1.96	2.33	-	-	-	19,753.66
Total	**3,686.00**	46.57	**1,277.03**	**2,581,342.74**	**1,570,910.18**		**1,337,841.40**

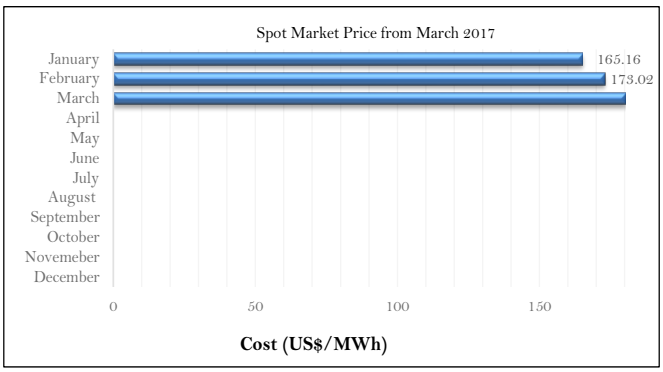
	Average Gas Flow (MMScfd) - March 2017				
Location	Week 1	Week 2	Week 3	Week 4	Monthly Average
Etoki	22.84	16.24	20.47	13.44	**17.78**
Tema	13.34	12.94	13.26	14.80	**13.70**
Aboadze	46.22	49.34	69.20	85.25	**64.70**

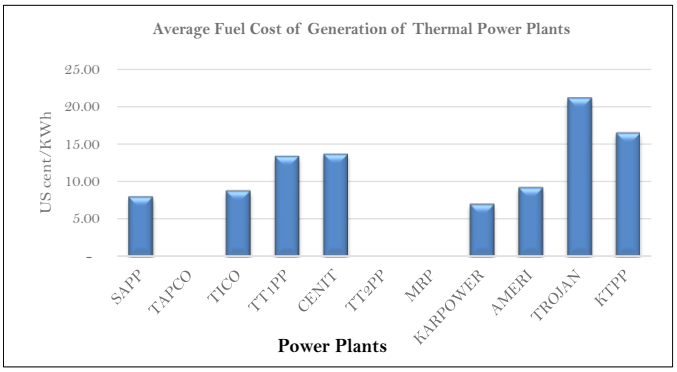
	Water Level (ft) - March 2017				Change in water level
Hydro Dam	Week 1	Week 2	Week 3	Week 4	(feet)
Akosombo	246.84	246.30	245.75	244.44	-2.40
Bui	565.21	564.26	563.44	561.47	-3.74

ECONOMIC FACT SHEET

		Mar-17	Feb-17	Change
Average Market Energy Cost	US$/MWh	97.26	91.94	5.32
Average Market Capacity Charge (AMCC)	US$/MWh	22.91	28.48	(5.57)
Total Average Market Cost (TAC)	US$/MWh	120.17	120.42	(0.25)
System Marginal Cost (SMC)	US$/MWh	136.26	135.52	0.74
System Marginal Capacity Charge (SMCC)	US$/MWh	44.00	37.50	6.50
Spot Market Price (SMP)	US$/MWh	180.26	173.02	7.24
Composite Bulk Generation Charge (CBGC)	US$/MWh	94.64	94.64	-
Deviation of TAC from CBGC	US$/MWh	(25.53)	(25.78)	0.25
Deviation of SMP from CBGC	US$/MWh	(85.62)	(78.38)	(7.24)

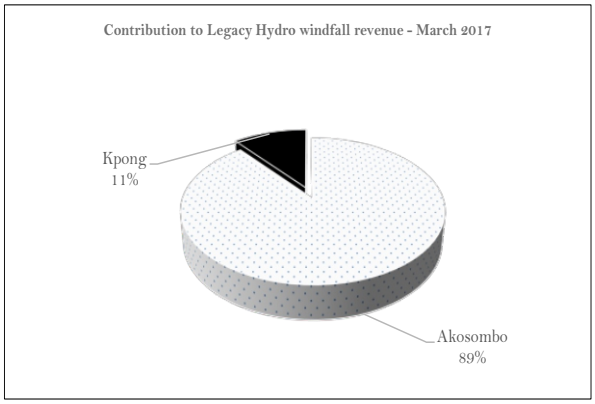






Mar-17				
	Average Cost	Average SMP	Difference	Windfall Revenue
Power Plant	US$/MWh	US$/MWh	US$/MWh	US$/MWh
Akosombo	33.10	180.26	147.16	77,889,070.37
Kpong	59.20	180.26	121.06	9,432,426.93
Total	92.30	-	-	87,321,497.29

Average Fuel Prices		
		Mar-17
Fuel Type	Unit	Delivered Cost
Natural Gas	US$/MMBtu	8.73
LCO	US$/BBL	62.31
HFO (Karpowership)	US$/Tonne	336.34
HFO (AKSA)	US$/Tonne	356.34
DFO	US$/Tonne	593.43



1.0 AKSA Commences Commissioning Procedures for a 250 MW Plant in Tema

AKSA Energy Company Ghana Limited, started Commissioning procedures for its 250 MW installed capacity, Wartsilla Engine HFO fired thermal power plant in Tema in March 2017. Installation of the power plant commenced in June 2016 and was completed in January 2017 pending the tie-in arrangements with the National Interconnected Transmission System (NITS). Six out of the total sixteen Units of the plant for the initial phase of the project with a total capacity of about 100 MW became available for synchronization onto the NITS on March 28, 2017, however, only 4 Units with a total capacity of about 68 MW were actually synchronized based on dispatch instructions from System Control Centre.

The AKSA plant which was part of the emergency power solutions during the power crisis is expected to add a total of 250 MW installed capacity on Commercial Operation Date (COD) and subsequently increase to 370 MW with the inclusion of 7 additional Units to the 16 existing units. A COD is expected by August 2017.

2.0 Performance Indicators of Power Plants

This section presents the two key power plants performance indicators which influence the variable cost of the power plant.

2.1 Capacity Utilization Factor (CUF)

The Karpowership remained the plant with the highest Capacity Utilization Factor (CUF) in March 2017, increasing its CUF from 90.14% recorded in February 2017 to 99.6% in March 2017. The Karpowership continues to dominate even the hydro plants in terms of CUF. The CUF of the Bui GS dropped significantly from 45.6% in February 2017 to 25.6% in March 2017 which is about the design capacity utilization factor of the peaking plant it is designed for. Akosombo GS and Kpong GS had a marginal appreciation in their CUF by 6.5% and 8.9% respectively in March 2017 compared to February 2017.

The CUF of all the thermal plants which recovered from their slump in generation in February 2017 increased. The TT1PP, Ameri and Sunon Asogli Power Plants had a significant increase in their CUF in March 2017 due to availability of fuel. The CUF of TT1PP increased from 36.51% in February 2017 to 79% in March 2017 due to the availability of fuel (LCO) at the Tema Power Enclave in March 2017. The CENIT Power Plant which was offline in February 2017 due to low level of LCO stocks came online in March 2017 when enough stocks of LCO was received and operated for 14 days and recorded a capacity utilization of 29% in March 2017. The CUF of Ameri Power Plant increased from 10.4% in February 2017 to 92.1% in March 2017 due to the increase in flow of natural gas from the AGPP. The CUF of Asogli Plant increased from 13.4% in February 2017 to 21.7% in March 2017 primarily due to increase in availability of LCO to power the dual fuel Sunon Asogli Phase II.

The Trojan power Plant and KTPP recorded a reduction in their CUF in March 2017 for varied reasons. Trojan Power Plant had challenges with some of its Units thereby reducing its CUF from 33.4% in February 2017 to 24.4% in March 2017. CUF for the KTPP reduced significantly from 44% in February 2017 to 4.4% in March 2017 primarily due to the availability of cheaper sources of power and limited fuel stocks at the Kpone Power Enclave (especially in the first two weeks of March 2017).

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

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

Power Plant	Capacity Utiliation (%)	Average Heatrate (Btu/KWh)	Average Fuel Cost of Generation (US$/MWh)
Akosombo	79.05	-	-
Kpong	74.81	-	-
Bui	25.56	-	-
SEAP	21.66	8,270.72	79.64
TAPCO	-	-	-
TICO	42.61	8,677.63	87.64
TT1PP	79.00	11,350.25	133.67
CENIT	28.95	11,570.04	136.26
TT2PP	-	-	-
MRP	-	-	-
KARPOWER	99.60	8,023.82	70.00
AMERI	92.14	10,207.55	91.87
TROJAN	24.37	14,229.50	211.11
KTPP	4.44	11,104.41	164.74
AKSA	1.96	8,481.61	78.39

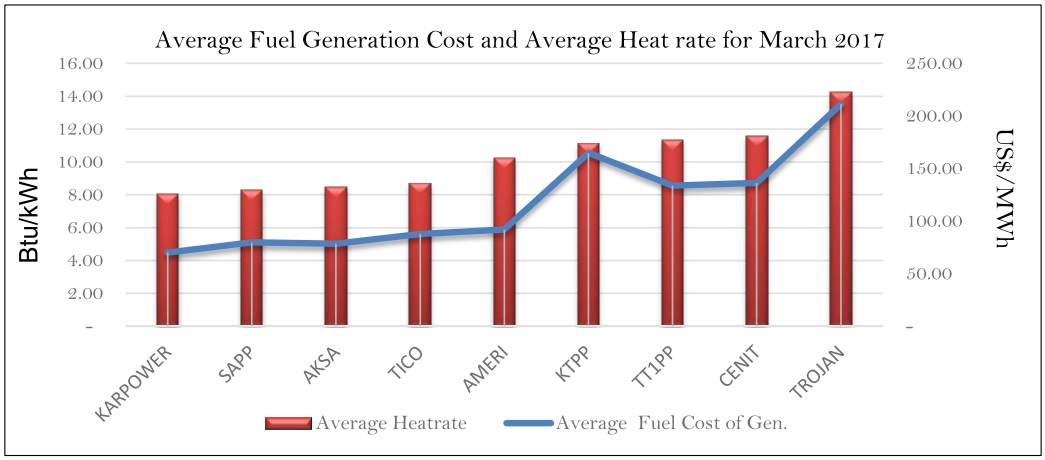
2.2 Heat Rate (Fuel Efficiency)

All the thermal plants recorded decrease in average heat rates (improved fuel efficiency) in March 2017 compared to February 2017. The Karpowership continues to be the most fuel efficient thermal power plant a heat rate of 8,023.82 Btu/kWh (meaning it uses only 8,023.82 Btu of fuel to generate 1 kWh of electricity) with Asogli, AKSA and TICO, following closely with with 8,270.72 Btu/kWh, 8,481.61 Btu/kWh and 8,677.63 Btu/kWh respectively. The heat rate of SAPP decreased from 8,769 Btu/kWh in February 2017 to 8,270.72 Btu kWh in March 2017. The improvement in fuel efficiency of the Sunon Asogli Plant can be attributed to the increased supply of electricity from the Sunon Asogli Phase II Plant which is much more efficient than the Sunon Asogli Phase I Plant.

The heat rate of TICO Power Plant also decreased from 11,697.7 Btu/kWh in February 2017 to 8,270.7 Btu/kWh March 2017 primarily due to operating largely in a combined cycle mode in March 2017. The Karpowership continued to be the most efficient plant with a heat rate of 8,023.82 Btu/kWh, lower than the 8,172.41 Btu/kWh recorded in February 2017. CENIT and Trojan Power Plants were the least efficient power plants in March 2017.

Figure 2.1 shows the ranking of the thermal power plants based on their fuel 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: Fuel efficiency ranking of thermal power plants with their respective fuel cost of generation.



2.3 Average Fuel Cost of Electricity Generation

Based on the estimated heat rates of the plants, the fuel cost of electricity generation by the power plants were estimated. It turned out that the HFO powered plants, Karpowership Power Plant and AKSA had the lowest fuel cost of electricity generation in March 2017. Their fuel cost of electricity generation for Karpowership and AKSA were respectively US$70/MMBtu and US$78.39/MMBtu. Their lower cost of electricity is due to their lower heat rate and relatively lower average cost of HFO for Karpowership (US$8.72/MMBtu) and AKSA (9.24 US$/MMBtu) than natural gas (US$8.73/MMBtu), LCO (US$11.78/MMBtu) and DFO (US$14.84/MMBtu). On the other hand, the Trojan Power Plant which was the least efficient power plant and used DFO in March 2017 had the highest average fuel cost of electricity generation. Even though KTPP was more efficient (Lower Heat Rate) than TT1PP and CENIT, it had a higher average fuel cost of generation US$164.74/MWh than TT1PP (US$133.67/MWh) and CENIT (US$136.26/MWh) due to relatively higher cost of DFO (US$79.72/bbl) than LCO (US$62.31/bbl) in the month of March 2017.

3.0 Energy Commission to Organize the 3rd Ghana Renewable Energy Fair

Renewable energy technologies are clean sources of energy that have a much lower negative environmental impact than conventional energy technologies. By developing these energy sources, Ghana can diversify its energy source and reduce its dependence on oil and gas, there by creating energy portfolios that are less vulnerable to price rises and thus increasing the country's energy security. Renewable energy can also be used to provide affordable electricity to communities without access to grid electricity for lighting and productive uses.

The Energy Commission initiated the annual Ghana Renewable Energy Fair (Conference and Exhibition) in 2015 and has successfully organised two events to date. The Ghana Renewable Energy Fair is an annual Fair which aims at creating a platform for stakeholders in the renewable energy industry for the promotion of renewable energy technologies and innovation.

The 1st Ghana Renewable Energy Fair was organised in November 2015 in collaboration with the Delegation of German Industry and Commerce's (AHK's), West African Clean Energy and Environment (WACEE) at the International Conference Center in Accra. This attracted over 1,900 participants which showcase wares from 33 exhibitors.

The 2nd Ghana Renewable Energy Fair was held in August 2016. The fair attracted over 2,000 participants with 58 companies exhibiting renewable energy and energy efficiency products such as solar PV systems, improved cookstoves, clean cooking fuels, solar water heaters, LED products, etc.

The 3rd edition of the Ghana Renewable Energy Fair, which is to take place from 10th October 2017 to 12th October, 2017, seeks to build on the successes of the first two Fairs and continue to increase awareness on the benefits of renewable energy and energy efficiency technologies and its potential to contribute to social and economic development.

Gaining more popularity with each event, the Ghana Renewable Energy Fair provides better opportunity for businesses in the renewable energy industry to exhibit their products and services, network and exchange contacts for follow-up business transactions. It also provides a far-reaching platform for companies to showcase their capabilities, products and services to potential partners, project financiers, investors and the general public. The potential business opportunities that the Ghana RE Fair offers are unparalleled, and these are being made accessible to local businesses under the Fair.

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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
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
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

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