



GHANA WHOLESALE ELECTRICITY MARKET BULLETIN

MARKET WATCH

Monthly Market Data Analysis

ISSUE NO. 9: 1st September 2016 to 30th September 2016

This Bulletin covers major developments in the Wholesale Electricity Market (WEM) of Ghana from 1st September 2016 to 30th September 2016. 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, but nevertheless, regrets any errors, omissions or inaccuracies therein.

HIGHLIGHTS OF THE MONTH

Electricity supply reduces further in September 2016

Total electricity supplied to meet Ghana's requirement in September 2016 was 1,071.9 GWh compared to 1,058.2 GWh in August 2016. The total supply was made up of 946.7 GWh from domestic generation and 107.3 GWh from imports from La Cote D'Ivoire. The total supply of electricity in September 2016 was lower than the 1,349 GWh projected in the Electricity Supply Plan (ESP) developed for the year 2016 representing 20% deviation between the outturn and projection. Table 1 shows a comparison of the projected and actual electricity demand and supply for September 2016.

The GRIDCo System Coincident Peak Load (Ghana peak generation plus import) recorded in September 2016 was 1,913 MW up from 1,867.9 MW in August 2016. The Ghana coincident peak load (domestic peak load including Valco minus export) was 1,862.4 MW up from 1,843.7 MW in August 2016, an increase of 18.7 MW. Both the GRIDCo System Peak Load and Ghana Peak Loads were lower than the projected peak load of 2,283 MW representing a deviation of over 400 MW. The Ghana Peak Load has increased by about 119 MW between July 2016 and September 2016 and by 18.7 MW between August 2016 and September 2016.

Table 1 Projected and Actual Outturn of electricity supply and demand in September 2016

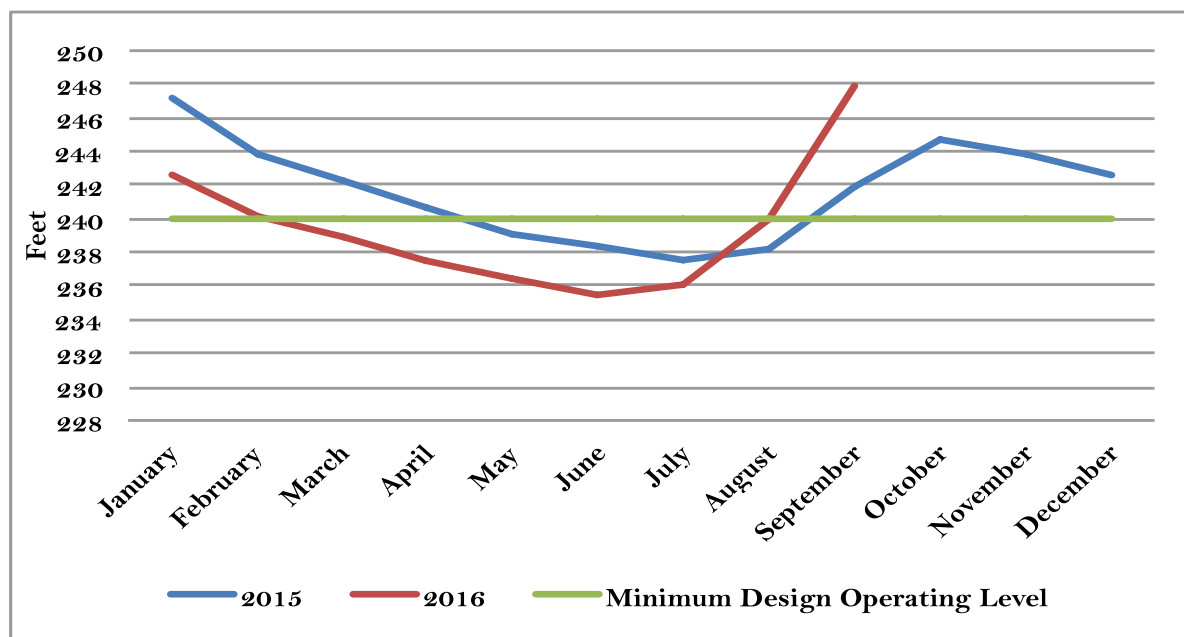
	September 2016	
	Projected	Actual Outturn
Total Demand (GWh)	1,349.0	1,071.9
Supply by Power Plant (GWh)		
Akosombo	269.0	277.2
Kpong	51.0	58.9
Bui	83.0	31.2
TAPCO	189.0	66.1
TICO	196.0	203.3
Sunon Asogli - Phase I	111.0	-
Sunon Asogli - Phase II	110.0	-
CENIT	46.0	15.3
TT1PP	41.0	27.7
TT2PP	-	-
MRP	-	-
KTPP	36.0	13.1
Ameri Energy	149.0	104.6
Karpowership	68.0	156.1
Trojan	-	11.3
Total Generation (GWh)	1,349.0	964.7
Imports (GWh)	-	107.3
Total Supply (GWh)	1,349.0	1,071.9
Deficit (GWh)	-	277.1
Reduction in Consumption		20.5%
Ghana Coincident Peak Load (MW)	2,358.0	1,862.4
System Coincident Peak Load (MW)		1,913.0

HIGHLIGHTS OF THE MONTH

Akosombo dam water level continues recovery beyond the minimum design operating level in September 2016

The level of the Akosombo Dam rose steadily to reach 247.8 feet at the end of September 2016. The good news is that, besides rising above the minimum design operating level of 240 feet, the water level at the end of September 2016 was higher than the level at the same time in September 2015 by about 5.8 feet. The continued rise in water level was impacted by adherence to the planned operation of the power station at 3 units coupled with increased water inflows following the rainy season in the catchment area. Indeed, the rise in the level points to significant improvement in the management of the lake for electricity generation. Figure 2 shows comparative trajectory of the Akosombo Dam for the whole of 2015 and January up to September 2016.

Figure 2: Month-End Water Level for Akosombo Dam from January 2015 to September 2016



Generally, Akosombo Power Station continued to be operated with caution, running on 2 turbine units at off-peak periods and 3 turbine units at peak and on few occasions at 4 turbine units at peak periods. The Akosombo Power Station generated 277.2 GWh of electricity in September 2016 which was marginally higher than the 276 GWh projected under the 2016 ESP but significantly higher than 236.8 GWh recorded in August 2016, representing a rise in production of about 17.1% between September 2016 and August 2016. Akosombo generated 25.9% of total electricity supplied in September 2016, up from 22.4% in August 2016. The Akosombo Power Station contributed 585 MW and 560 MW to meet the GRIDCo System Peak demand of 1,913 MW and the Ghana Peak Load of 1,862.4 MW recorded in September 2016 respectively.

Electricity generation from Bui Power Plant increased in September 2016 as water level rises

Electricity production from the Bui Power Plant increased from 24.8 GWh in August 2016 to 31.2 GWh in September 2016 representing an increase of 30.3%, based on the daily average production in the two months. The total electricity generated in September 2016 from the Bui Power Plant was significantly lower than the 83 GWh projected to be generated under the 2016 Electricity Supply Plan (ESP). The water level of the Bui dam continued rising to reach 580.66 feet at the end of September 2016, representing over 29.66 feet above the minimum operating level of 551 feet compared to 12 feet above the minimum operating level in August 2016. The Bui Power Plant generated 2.9% of total electricity supplied in September 2016 up from 2.3% in August 2016.

Sunon Asogli Power Plant did not generate electricity in September 2016

The Sunon Asogli power plant did not produce electricity in September 2016 owing to severe difficulties with natural gas supplies from Nigeria which started in July 2016 through August 2016 and September 2016. The curtailment of power generation from the Sunon Asogli Power Plant (SAPP), whose operation relies primarily on natural gas, denied the country about 360 MW of generation capacity and 221 GWh of electrical energy in September 2016 as the power plant was projected under the 2016 ESP to generate 221 GWh in September 2016. Difficulties with natural gas supply from Nigeria continues to pose a major challenge for electricity generation by power plants in Ghana in general and power plants in Tema and Kpone Power Enclaves, in particular.

Electricity generation from CENIT slumped in the month of September 2016

CENIT Power Plant did not operate consistently in September 2016, generating only 15.3 GWh compared to 42.4 GWh generated in August 2016. This was due to low levels of LCO stocks at the Tema Thermal Power Enclave in the 1st and 2nd weeks of September 2016. Even when LCO supply improved within the month, the CENIT Power Plant did not operate due to excess generation capacity in the national grid.

HIGHLIGHTS OF THE MONTH

Ameri Energy Power Plant generated less electricity in September 2016

The power plant generated a total of 104.6 GWh of electricity in September 2016 compared to 143.9 GWh in August 2016 representing a reduction of about 27.3%. It was also substantially lower than the 149 GWh projected for the month of September 2016 under the 2016 ESP. The lower electricity generation in September 2016 than projected was largely as a result of reduced gas supply from the Atuabo Gas Processing Plant from 70.7 MMSCFD in August 2016 to 64.5 MMSCFD in September 2016 and partly due to technical challenges to one of its unit. The Ameri Energy Power Plant contributed 170 MW and 200 MW to meet GRIDCo System Peak Demand of 1,913 MW and Ghana Peak Load of 1,862.4 MW respectively. The power plant thus contributed 9.4% and 10.6% of GRIDCo System Peak Load and Ghana Peak Load respectively in September 2016.

KTPP generation increased marginally in September 2016

Electricity generated from the Kpone Thermal Power Plant (KTPP) increased marginally from 9.5 GWh in August 2016 to 13.05 GWh in September 2016. It was however significantly lower than the 54.7 GWh it produced in July 2016. Electricity generation in September 2016 was also 63.8% lower than the 36 GWh projected under the 2016 ESP.

Karpowership generation dipped in September 2016 as HFO price continue to increase

The Karpowership Power Plant generated 156.1 GWh in September 2016 compared to 162.7 GWh generated in August 2016 and 160.3 GWh it generated in July 2016. The electricity generated in September 2016 was however significantly above the projected generation of 65 GWh forecasted under the 2016 ESP. The power plant however contributed 217 MW to meet the GRIDCo System Peak Demand of 1,913 MW and 226 MW to meet the Ghana Peak Load of 1,862.4 MW. Thus the power plant contributed about 12% to both the total GRIDCo System Demand as well as Ghana Peak Load in September 2016. The price of Heavy Fuel Oil (HFO) continue to increase, rising marginally from US\$ 244.13 per metric tonne in July 2016 to US\$245.48 per metric tonne in August 2016 then rose significantly to US\$ 258.30 per metric tonne in September 2016. Correspondingly, average fuel cost of electricity production increased to US cents 4.49/kWh in September 2016 compared to US cents 4.39/kWh in August 2016.

TICO increased electricity generation in September 2016

The TICO Power Plant generated 203.3 GWh of electricity in September 2016 up from 181.7 GWh of electricity generated in August 2016 and 169.7 GWh generated in July 2016. This represented its highest monthly generation in the year. The total generation of 203.3 GWh in September 2016 by TICO was marginally higher than the 202 GWh projected under the 2016 ESP. TICO operated largely in combined cycle mode, generating 312 MW to meet the September 2016 GRIDCo System Peak Load of 1,913 MW representing 16.3% of peak load compared to 15.7% of peak load in August 2016. It contributed 261 MW to meet the Ghana Peak Load of 1,862.4 MW representing 13.8% of peak load in September 2016 compared to 17.9% in August 2016. The TICO Power Plant operated solely on light crude oil (LCO) consuming about 265,485 barrels of the fuel.

TAPCO generation dipped in September 2016

The TAPCO Power Plant generated less electricity in September 2016 than in August 2016. Electricity generation in September 2016 by TAPCO Power Plant was 66.1 GWh compared to 92.1 GWh in August 2016 representing a reduction of 28.2%. Electricity generation in September 2016 by TAPCO Power Plant was significantly lower than the projected amount of 195 GWh under the 2016 ESP. The TAPCO Power Plant generated 6.2% of the total electricity supplied in September 2016 compared to 8.7% of total electricity supplied in August 2016. All of TAPCO's electricity generation in September 2016 was from natural gas and contributed 111 MW to meet the Ghana Peak Load (6% of the Ghana Peak Load) but did not contribute to meeting the GRIDCo System Peak Load.

TT1PP electricity generation dipped in September 2016

Electricity generation from the Tema Thermal 1 Power Plant, (TT1PP) dipped from 59 GWh in August 2016 to 27.7 GWh in September 2016 representing a reduction of about 106% and lower than the projected generation of 40 GWh under the 2016 ESP. The power plant operated solely on LCO consuming about 678,202 barrels of LCO. TT1PP produced 2.9% of the total electricity supplied in September 2016 compared to 5.6% of total electricity supplied in August 2016. It contributed 103 MW to meet GRIDCo System Peak Load but was not scheduled to meet the Ghana Peak Load.

Zero natural gas supplies from WAGPP in September 2016

Just as happened in August 2016, there was no natural gas supplies from the West African Gas Pipeline Project in September 2016. WAGPCo halted natural gas supplies in July 2016 leading to the complete curtailment of power generation from the SAPP which runs solely on natural gas. The other power plants in the Tema Power Enclave were compelled to run on LCO whose supplies also faced challenges of financing owing to the inability of VRA to raise the requisite funds to procure LCO on time.

Natural gas supplies from GNGC to the Aboadze Power Enclave reduced in September 2016

Daily average natural gas supply from the Atuabo Gas Processing Plant to the Aboadze Power Enclave reduced from 70.7 MMSCF per day in August 2016 to 64.5 MMSCF per day in September 2016 as a result of shutdown down of the Atuabo Gas Processing Plant for routine maintenance for a period of one week. Of the total 1,430.1 MMSCF of natural gas consumed in September 2016 at the Aboadze Power Enclave, the Ameri Energy power plant and the TAPCO power plant consumed 36.1% and 63.9% respectively. The TICO power plant continued to be operated only on light crude oil (LCO) in September 2016.

Electricity imports surge to shore up supplies in September 2016

Electricity imports from La Cote D'Ivoire have increased consistently in 2016 even though it was projected, at the beginning of the year, that Ghana would be able to meet all its requirements without resorting to imports during the year. It is important to note that part of the imports are required to be wheeled to CEB of Togo/Benin on behalf of CIE of La Cote D'Ivoire but there have been periods when additional domestic generation have been required to make up for exports.

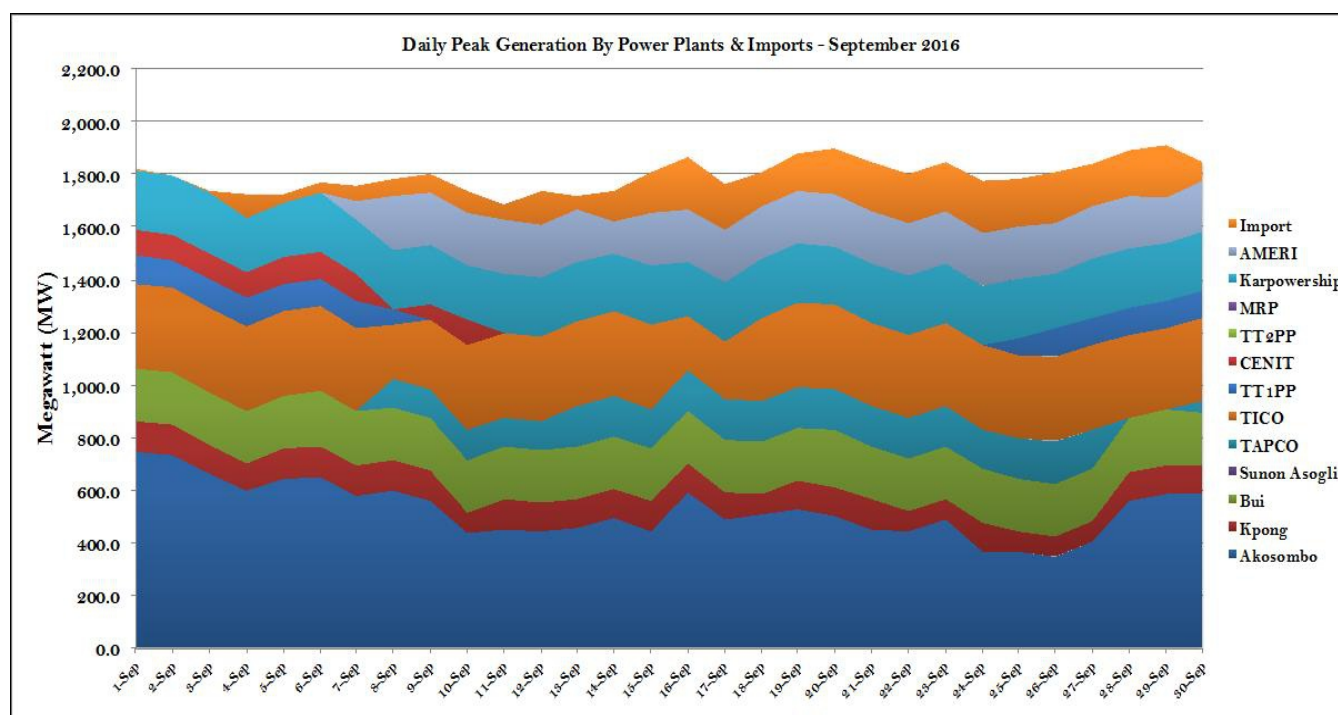
Electricity imports continued to grow reaching 107.3 GWh in September 2016 from 54.9 GWh in August 2016 and 38.2 GWh in July 2016. This represents a substantial increase of about 95.4% between August 2016 and September 2016. Of the total imports of 107.3 GWh, 14.8 GWh, representing 13.8%, was exported to CEB. Electricity imports to meet daily peak demand in September 2016 ranged between 7 MW and 203 MW up from between 17 MW and 120 MW in August 2016. Imports contributed 203 MW to meet the GRIDCo System Peak Load of 1,913 MW that occurred on 29th September 2016 and also contributed 39 MW to meet the Ghana Peak Load of 1,862.4 MW that occurred on 9th September 2016.

OPERATIONAL FACT SHEET

Peak Electricity Supply (MW) - September 2016

Source of Supply	Non-Coincident Peak Generation - Week 1	Non-Coincident Peak Generation - Week 2	Non-Coincident Peak Generation - Week 3	Non-Coincident Peak Generation - Week 4	Generation at System Coincident Peak Load of September	Generation at Ghana Coincident Peak Load of September
Akosombo	750.0	599.0	591.0	519.0	585.0	560.0
Kpong	116.0	116.0	114.0	118.0	112.0	114.0
Bui	212.0	201.0	219.0	202.0	211.0	200.0
Sunon Asogli	-	-	-	-	-	-
TAPCO	-	155.0	154.0	108.0	-	111.0
TICO	323.0	323.0	320.0	332.0	312.0	261.0
TT1PP	107.0	61.0	-	109.0	103.0	-
CENIT	100.0	99.0	-	104.0	-	61.0
KTPP	90.0	90.0	-	90.0	-	90.0
TT2PP	-	-	-	-	-	-
MRP	-	-	-	-	-	-
AMERI Energy	74.6	202.7	200.0	227.6	170.0	200.4
Karpowership	226.3	226.0	226.0	226.3	217.0	226.0
Import	89.0	131.0	199.0	120.0	203.0	39.0
Trojan Power	-	-	-	-	-	-
System Coincident Peak Load	1,845.3	1,891.4	1,899.2	1,914.2	1,913.0	-
Ghana Coincident Peak Load	1,805.3	1,862.4	1,843.2	1,861.2	-	1,862.4

Daily Peak Generation By Power Plants & Imports - September 2016

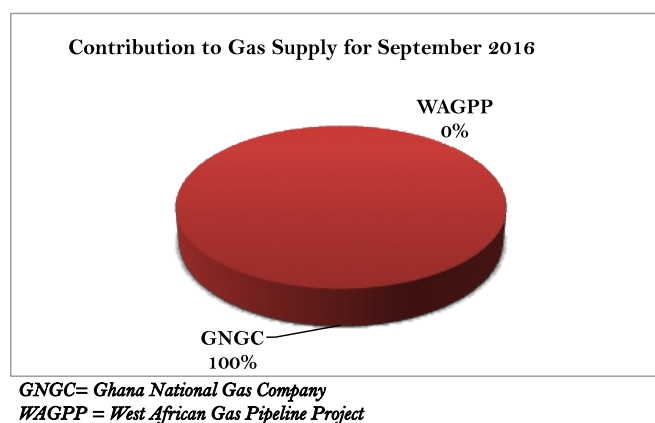
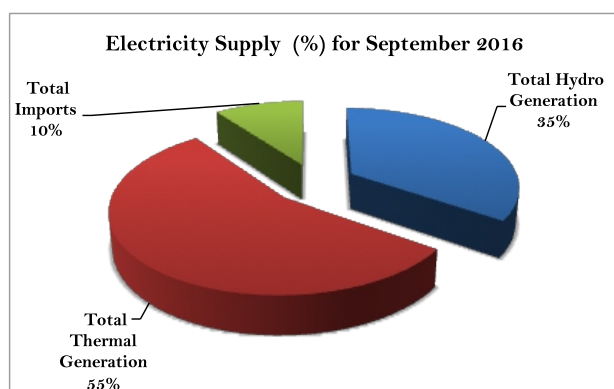


Ghana Electricity Demand for September 2016

Maximum Peak Load	MW	1,862.40
Minimum Peak Load	MW	1,654.40
Average Peak Generation	MW	1,766.63
System Base Load	MW	1,177.15
Total Electricity Consumption	GWh	1,071.29
Total Energy Imported	GWh	107.27
Load Factor (LF)	%	77.3%

OPERATIONAL FACT SHEET

Weekly Electricity Supply (GWh) - September 2016					
Power Plant	Week 1	Week 2	Week 3	Week 4	Total
Akosombo	77.2	62.7	59.7	77.6	277.2
Kpong	16.2	13.7	12.2	16.7	58.9
Bui	9.0	6.6	6.5	9.0	31.2
Sunon Asogli	-	-	-	-	-
TAPCO	0.4	18.2	25.2	22.2	66.1
TICO	52.0	43.8	47.8	59.7	203.3
TT1PP	15.5	1.0	0.0	11.3	27.7
CENIT	13.5	1.2	0.0	0.0	14.7
KTPP	4.3	7.4	0.3	1.1	13.1
TT2PP	-	-	-	-	-
MRP	-	-	-	-	-
AMERI Energy	0.4	29.6	32.6	42.0	104.6
Karpowership	36.2	36.6	36.3	47.0	156.1
Import	19.7	22.8	30.3	34.5	107.3
Trojan Power	-	-	-	11.3	11.3
Total electricity supply including imports	244.4	243.6	250.9	332.4	1,071.3
Total domestic electricity generation	224.7	220.8	220.6	297.9	964.0

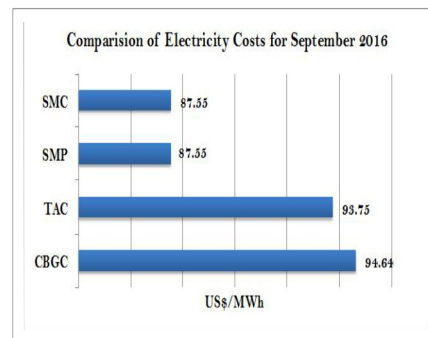


Average Gas Flow (MMSCFD) - September 2016					
Location	Week 1	Week 2	Week 3	Week 4	Monthly Average
Etoki	-	-	-	-	-
Tema	-	-	-	-	-
Aboadze	-	65.0	73.6	64.1	64.5

Water Level (ft) - September 2016					Change in water level
Hydro Dam	Week 1	Week 2	Week 3	Week 4	(feet)
Akosombo	240.38	241.65	243.35	247.80	7.42
Bui	563.21	567.14	571.47	580.66	17.45
Akosombo Minimum Design Operating Level	240.00	240.00	240.00	240.00	
Akosombo Maximum Level	278.00	278.00	278.00	278.00	

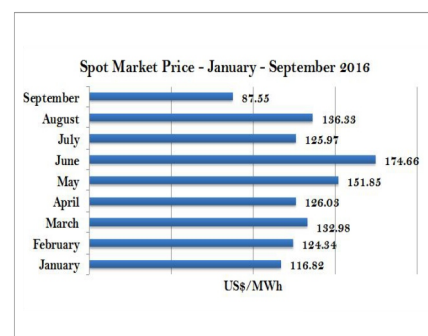
ECONOMIC FACT SHEET

Month at a Glance				
	Units	September 2016	August 2016	Change
Average Market Energy Cost	US\$/MWh	68.60	78.49	(9.89)
Average Market Capacity Charge (AMCC)	US\$/MWh	25.15	25.25	(0.10)
Total Average Market Cost (TAC)	US\$/MWh	93.75	103.75	(10.00)
System Marginal Cost (SMC)	US\$/MWh	87.55	107.69	(20.14)
System Marginal Capacity Charge (SMCC)	US\$/MWh	-	28.64	(28.64)
Spot Market Price (SMP)	US\$/MWh	87.55	136.33	(48.78)
Composite Bulk Generation Charge (CBGC)	US\$/MWh	94.64	94.64	(0.00)
Deviation of TAC from CBGC	US\$/MWh	0.89	(9.11)	10.00
Deviation of SMP from CBGC	US\$/MWh	7.09	(41.69)	48.78



CBGC = Composite Bulk Generation Charge; SMC = System Marginal Cost; SMP = Spot Market Price

Power Plant	Maximum Non-Coincident Peak Generation (MW)	Plant Utilisation Factor (%)	Electricity Generation (GWh)	Gas Consumption (MMBTU)	LCO Consumption (MMBTU)	HFO Consumption (MMBTU)
Akosombo	750.00	51.3%	277.17	-	-	-
Kpong	118.00	69.3%	58.87	-	-	-
Sunon Asogli	-	0.0%	-	-	-	-
Bui	219.00	19.8%	31.17	-	-	-
Trojan Power	12.00	130.8%	11.30	-	-	-
TAPCO	155.00	59.2%	66.07	598,902.02	-	-
TT1PP	109.00	35.3%	27.69	-	266,343.08	-
TICO	332.00	85.1%	203.32	-	1,640,566.65	-
MRP	-	0.0%	-	-	-	-
CENIT	104.00	19.6%	14.67	-	183,850.90	-
KTTP	90.00	20.1%	13.05	-	-	-
TT2PP	-	0.0%	-	-	-	-
AMERI Energy	227.60	63.8%	104.58	1,061,321.77	-	-
Imports	199.00	74.9%	107.27	-	-	-
Karpowership	226.30	95.8%	156.13	-	-	1,232,755.64
Total	2,541.90		1,071.29	1,660,223.79	2,090,760.63	1,232,755.64



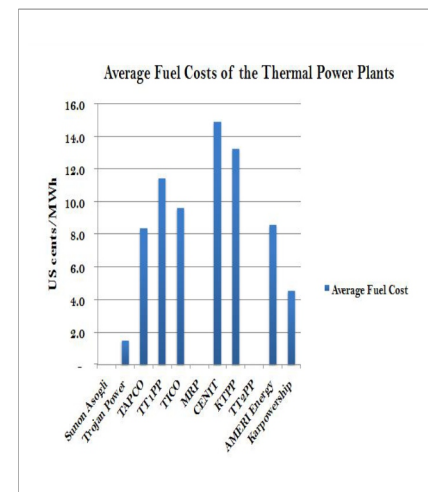
Spot Market Price = SRMC of Energy + SRMC of Capacity

	September 2016	August 2016	Change
Total Thermal Power Plants Fuel Cost	US\$ 48,296,568.06	58,579,440.34	(10,282,872.28)
Average Thermal Power Plants Fuel Cost	US\$/MWh 68.60	78.49	(9.89)

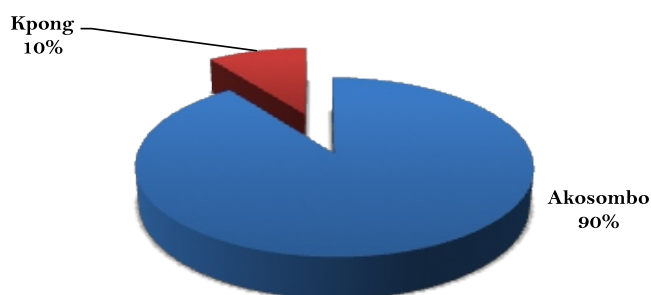
Legacy Hydro Windfall Revenue for September 2016				
Power Plant	Average Cost (US\$/MWh)	Average SMP (US\$/MWh)	Difference (US\$/MWh)	Windfall Revenue (US\$)
Akosombo	33.10	87.55	54.45	15,091,985.49
Kpong	59.20	87.55	28.35	1,668,981.28
Total				16,760,966.76

SMP = Spot Market Price

Average Fuel Prices		
Fuel Type	Unit	Delivered Cost
Natural Gas	US\$/MMBTU	8.73
LCO	US\$/BBL	64.64
HFO	US\$/Tonne	258.30
DFO	US\$/Tonne	408.57



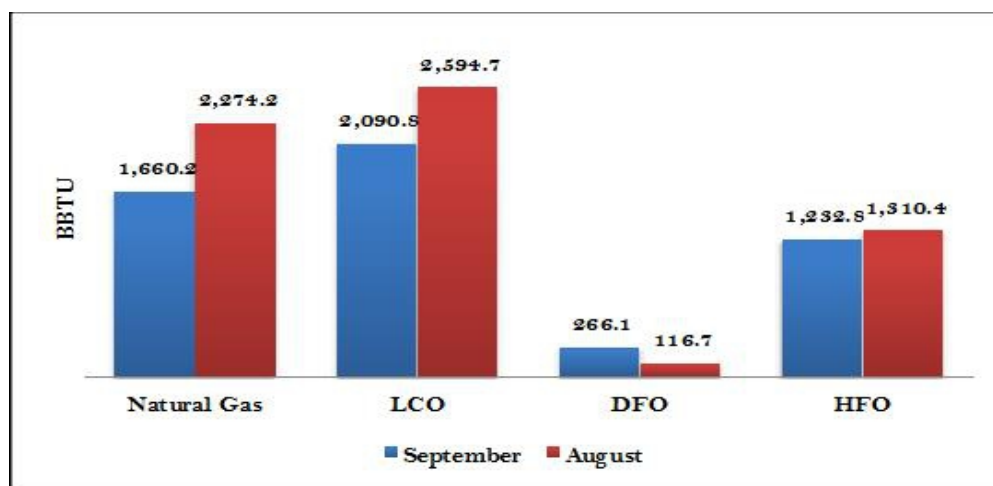
Contribution to Legacy Hydro Windfall Revenue - September 2016



1. LCO dominates fuel-supply mix for electricity generation in September 2016

Light crude oil (LCO) contributed 39.8% of fuel used in power generation by the thermal power plants in September 2016 down from 41.6% in August 2016. Natural gas contributed 31.6% down from 35.5%, HFO about 23.5% up from 21% and then DFO 5.15 up from 1.9% in August 2016. About 54% of total LCO supplied in August 2016 was consumed within the Aboadze Power Enclave by TICO power plant and the rest (44%) was consumed in the Tema Power Enclave by TT1PP and CENIT power plants. Figure 1.1 shows fuel consumption for electricity generation by the thermal power plants in August 2016 and September 2016.

Figure 1.1 Comparative fuel consumption mix for electricity generation in September and August 2016.



Natural gas supply from the West African Gas Pipeline Project (WAGPP) continued to be curtailed completely in September 2016 hence there was no natural gas for the operations of the power plants in the Tema Enclave. Natural gas supply from GNGC was continuous throughout the month of September 2016 but just enough to operate the TAPCO and AMERI power plants only. Average gas supply from GNGC to the Aboadze Power Enclave for September 2016 was 64.5 MMSCf per day just marginally lower than 70.7 MMSCf per day in August 2016. Out of the total gas supply of 1,430.2 MMSCF (1,660.3 Billion BTU) in September 2016 to the Aboadze Power Enclave, about 63.9% was consumed by the Ameri Energy power plant and the rest (36.1%) was consumed by TAPCO power plant. In September 2016 TAPCO power plant operated solely on natural gas. Owing to the diminished supply of natural gas to the Aboadze Power Enclave, the TICO power plant was run solely on LCO.

Owing to the complete shutdown of the gas supplies from the WAGPP, the CENIT and TT1PP power plants in the Tema Enclave were operated on LCO. The TICO power plant in the Aboadze Power Enclave also operated fully on LCO for the month of September 2016.

All the Heavy Fuel Oil (HFO) consumed in September 2016 for electricity generation was used by the Karpowership power plant that is located in the Tema Port. .

In September 2016 the consumption of Distillate Fuel Oil (DFO) saw a huge increase over consumption in August 2016 primarily because of the of increased electricity generation by the Trojan Power plant at Tema. Of the total amount of 266 billion BTU (BBTU) of DFO consumed for electricity generation, 58.1% was consumed by KTPP and 41.3% by Trojan Power plant as the main fuel for power generation while the rest (less than 1%) was used as start-up fuel by TICO, TT1PP and CENIT who used LCO as the main fuel for power generation.

2. Ghana assured of reliable electricity supply for the rest of 2016

The year 2016 opened with significant improvement in electricity supply following from a sordid past 2015. The mid-year report of the power supply situation revealed considerable improvement in electricity supply. The month of September saw a high level of reliability in electricity supply but with increased imports reaching 10% of total electricity supply from 5.2% in August 2016. The increased imports are attributed to the lower prices of importation. The month of September also saw a considerable increase in hydro-electricity supply, with hydro-electricity recording 34.3% of total electricity supply compared to 29.5% in August 2016. With the improved hydrological condition of the Akosombo and Bui hydro power stations, indications are that the ability of the two power plants to support electricity supply for the rest of the year, 2016 will be enhanced significantly.

3. Ghana can achieve security of electricity supply in the medium term - The Case of Renewable Energy-based Mini-grid Systems

Achieving national socio-economic growth and the welfare and prosperity of the citizenry is a paramount goal of the government of Ghana. Secured and reliable electricity supplies are key policy goals of energy policies of every country as well as Ghana. This goal cannot be achieved without secured and reliable supplies of energy in general and electricity in particular.

It is therefore natural that the government has set itself the goal of achieving universal access to electricity for all the people living in Ghana by 2020. Following the declaration of the National Electrification Scheme (NES) in 1989, substantial efforts have been made to achieve universal access to electricity that have raised the electricity access rate from 25% in 1989 to 83% currently with the high voltage national interconnected transmission grid system having reached almost all parts of the country. As the NITS and the medium and low voltage systems are being extended to reach universal access, the challenge is how to reach very remote communities where it is

technically and financially daunting. These remote areas include over 2,000 communities located in over 200 Island located on the Volta River which spans the whole length of the geographical area of Ghana as well as some fishing communities that at the edges of the river.

The mini-grid architecture can be built into urban electricity supply systems where various neighborhoods can receive electricity supply from, not only the national electricity grid, but also from local supply sources including solar PV, wind and battery storage systems.

4. Energy Commission completes Electricity Demand Projections for Ghana for 2016 – 2035 under the SNEP II

The Energy Commission has completed electricity demand projections for the period 2016 to 2035 as part of the Strategic National Energy Plan (SNEP II).

One of the key mandates of the Energy Commission, under the Energy Commission Act (Act 541, 1997) is to prepare, review and update periodically indicative national plans to ensure that all reasonable demands for energy are met in a sustainable manner. Indicative in the sense that the level of potential energy demand is estimated assuming there are no constraints to supply. The Commission then makes the necessary policy recommendations for the removal of any existing and foreseeable constraints to the energy supply in order to meet estimated demand and facilitate rapid and sustainable growth of the economy.

In conformity with this mandate, the Commission in 2000 commenced the country's first integrated long term indicative sustainable energy plan called the Strategic National Energy Plan (SNEP) with 2000 and 2020 as the base and end year respectively.

SNEP is also a comprehensive way of looking at the available energy sources and resources of the country and how to tap them economically and timely to ensure a secured and adequate energy supply for sustainable economic growth now and into the future.

The first SNEP (SNEP I) was completed and published in 2006. However, in that very year, Ghana rebased its economy (national account) from 1993 to 2006. Further in 2007, the country discovered commercial oil field, the Jubilee field and started production in 2010. These affected the supply projections and therefore necessitated the need to update the SNEP I (2006-2020) and consequently shifting the reference (reporting) and end years from 2006 and 2020 to 2016 and 2035 respectively. SNEP is long term since most capital investments in the energy sector are relatively high with lifetime of 20 years or more on the average. SNEP II (2016-2035) is thus the second SNEP produced by the Energy Commission in accordance with its mandate.

The goal of SNEP II (2016-2035) is to contribute to the development of a sound energy market/industry that would provide sufficient, viable and efficient energy services for Ghana's socio-economic development. It places emphasis on policy, economic trends and drivers which underpin the long-term vision for the energy sector. Energy efficiency measures have also been emphasized in the SNEP II and major sectors for energy conservation have been examined in this respect.

The SNEP II analysis had been carried out using the LEAP (Long-range Energy Alternative Planning) computer-based model. LEAP was adopted for its comparatively user friendliness in addition to having sub-programmes to handle both supply-driven and demand-driven projections at the same time and for ease of comparison. The principal result of the demand analysis with LEAP was the net final energy demand projections, that is after bulk transportation or transmission and distribution (retailing) losses have been deducted from the gross energy production.

Time series analysis was applied for sectors with known planned future production outputs and committed power plants to be commissioned or retired in the future. Regression analysis was used for projecting sectors with limited data.

The choice of 2010 as the base year was influenced by the fact that in 2010, a national Population and Housing Census was undertaken and that provided a wealth of reliable data on the country's demographics which were very essential inputs for the modeling. Whilst 2016 was chosen as the reporting or reference year, being the year of released or publication.

In developing and elaborating the SNEP II (2016-2035), the Energy Commission since 2010 had conducted empirical studies, workshops and series of stakeholders' consultative meetings with major institutions representing the various sectors of the economy.

It is hoped that the diverse stakeholders and users of this document find it informative and useful. Feedback on how the Commission could improve the SNEP II, making it more living and relevant at any point in time to the various stakeholders is most welcome.

Acronyms

<i>Btu = British Thermal Units</i>	<i>CBGC = Composite Bulk Generation Charge (gazetted by the PURC)</i>
<i>DFO = Distillate Fuel Oil</i>	<i>EC = Energy Commission</i>
<i>ESP = Electricity Supply Plan</i>	<i>HFO = Heavy Fuel Oil</i>
<i>GHP = Ghana Pesewa</i>	<i>GWh = Giga-watt Hours</i>
<i>KTPP = Kpone Thermal Power Plant</i>	<i>kWh = Kilo-watt hours</i>
<i>LEAP = Long-range Energy Alternative Planning</i>	<i>LCO = Light Crude Oil</i>
<i>LI = Legislative Instrument</i>	<i>MW = Megawatt</i>
<i>MMscf = Million Standard Cubic Feet</i>	<i>MWh = Mega-watt hours</i>
<i>NES = National Electrification Scheme</i>	<i>NITS = National Interconnected Transmission System</i>
<i>PV = Photovoltaic</i>	<i>SAPP = Sunon Asogli Power Plant</i>
<i>SNEP = Strategic National Energy Plan</i>	<i>VRA = Volta River Authority</i>
<i>WAGPP = West African Gas Pipeline Project</i>	

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