GHANA WHOLESALE ELECTRICITY MARKET BULLETIN

MARKET WATCH

Monthly Market Data Analysis

ISSUE NO. 6: 1st June 2016 to 30th June 2016

This Bulletin covers major developments in the Wholesale Electricity Market (WEM) of Ghana from 1st June 2016 to 30th June 2016. It analyses the performance of the key WEM indicators against their benchmarks, and examines the likely implications of any discernable trends for the future of the market. This edition of the monthly WEM Bulletin also discusses the private sector participation in the Electricity Company of Ghana within the context of existing legal framework and the Millennium Challenge Account (MCA) arrangements.

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 June 2016

According to the Electricity Supply Plan (ESP) developed for the year 2016, projected electricity supply for June 2016 was 1,354 GWh but the outturn was 1,023.8 GWh which was 24.4% lower than projected. The total electricity supply of 1,023.8 GWh in June 2016 was made up of 997.2 GWh produced domestically and imports of 26.1 GWh from La Cote D'Ivoire. The imports of electricity in June 2016 was significant because of the difficulties in electricity generation from domestic sources. Table 1 shows a comparison of the projected and actual electricity demand and supply for June 2016.

The peak load of 1,885.5 MW recorded in June 2016 was lower than the projected peak load of 2,200 MW representing a deviation of over 300 MW. It also represented a drop of about 134 MW compared to the peak load of 2,019 MW recorded in May 2016. The drop in peak load was as a result of unavailability of adequate generating resources created by difficulties with fuel supplies and low level of water in the hydro dams which compelled cuts in power generation from the hydro power stations.

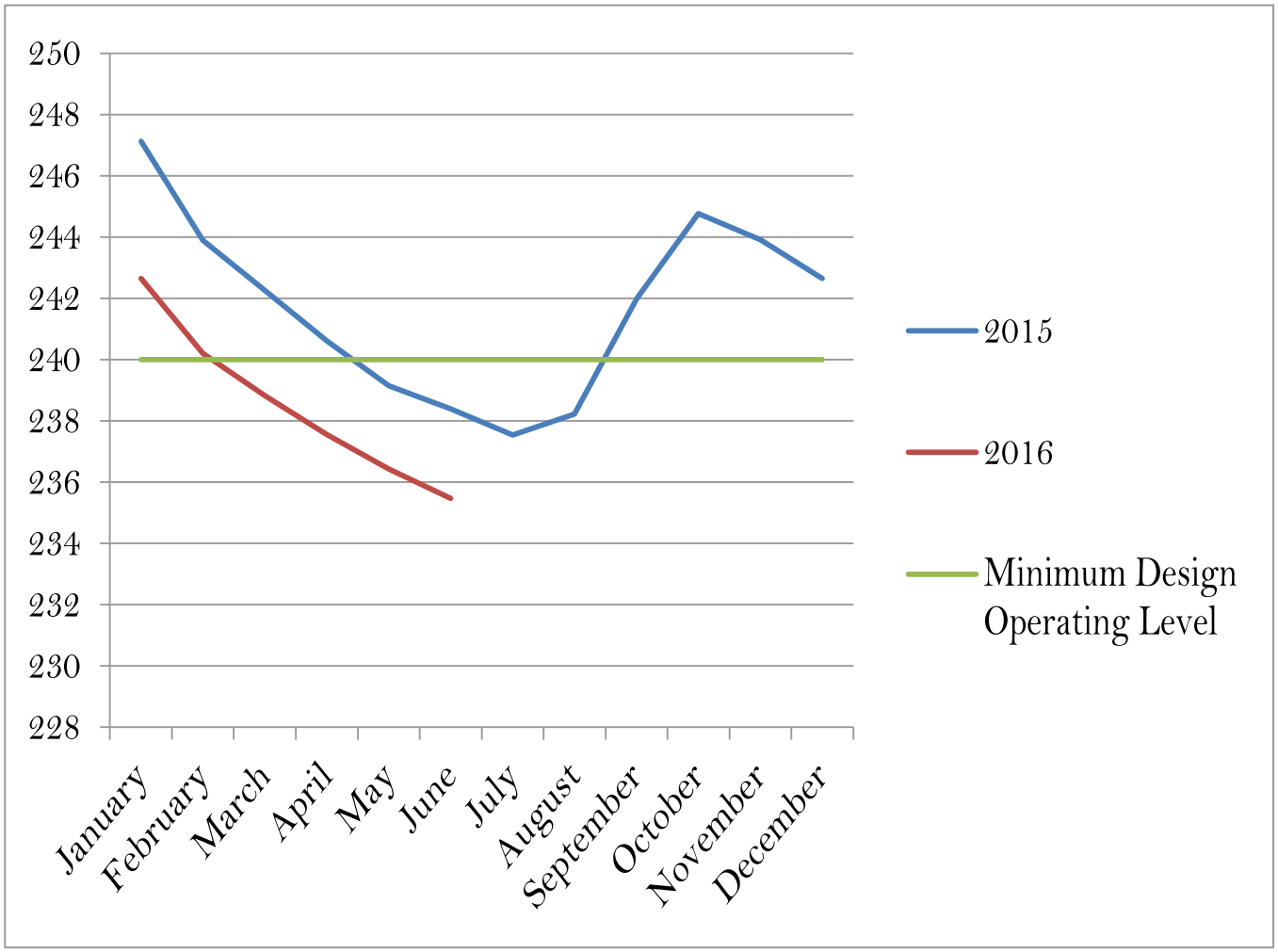
Table 1Projected and Actual Outturn of electricity supply and demand in June 2016

	June 2016	
	Projected	Actual Outturn
Total Demand (GWh)	1,335.0	1,023.3
Supply by Power Plant (GWh)		
Akosombo	269.0	290.82
Kpong	51.0	57.19
Bui	71.0	19.65
TAPCO	163.0	96.91
TICO	196.0	100.0
Sunon Asogli - Phase I	111.0	8.99
Sunon Asogli - Phase II	110.0	-
CENIT	66.0	56.8
TT1PP	13.0	-
TT2PP	-	-
MRP	-	-
KTPP	36.0	63.24
Ameri Energy	149.0	146.17
Karpowership	119.0	157.39
Trojan	-	-
Total Electricity Generation		997.2
Imports	-	26.1
Total Supply	1,354.0	1,023.3
Deficit/Over supply		(330.68)
% Reduction in Supply		24.4%
Peak Load (MW)	2,200.0	1,885.5

Akosombo dam water level drops further in June 2016

The Akosombo hydro power plant continued to operate below the minimum operating design level of 240 feet reaching 235.47 feet at the end of June 2016. Indeed, the level of Akosombo dam at the end of June 2016 was 2.82 feet lower than the level at the same time last year. Figure 1.0 shows comparative trajectory of the Akosombo dam for 2015 and 2016 (January to June

Figure 1.0 Month End Water Level for Akosombo Dam from 2015 to 2016



The Akosombo power plant generated 290.82 GWh of electricity in June 2016 representing 33.6 % higher than what was projected under the 2016 Electricity Supply Plan (ESP). Electricity generation in June 2016 was however lower than the 368.7 GWh generated in May 2016. On the average, daily electricity production in June 2016 (9.69 GWh) was lower than that of May 2016 (11.89 GWh) representing a reduction of about 18.55%.

Bui Power Plant reduces electricity generations in June 2016 as water level rises

Electricity production from the Bui Power Plant reduced from 42.7 GWh in May 2016 to 19.65 GWh in June 2016 representing a reduction of 52% on the daily average production in the two months. The reduction in electricity generation was as a result of reverting to its design-operating schedule as a peaking plant after continuously generating outside peak periods from January 2016 to May 2016 to fill in the generation gap experienced in the country. Power generation in June 2016 was lower than the 71 GWh projected to be generated in the month under the 2016 Electricity Supply Plan (ESP). The water level of the Bui dam continued rising to reach 552.25 feet at the end of June 2016 after stabilizing at 552.15 feet in the middle of the month. Unlike the Akosombo dam, the Bui dam is out of danger as the rains set in and its operating schedule is maintained at peak periods only.

HIGHLIGHTS OF THE MONTH

Ameri Energy Power Plant operated throughout June 2016

The 250 MW capacity Ameri Energy Power Plant operated throughout the month of June 2016 after it resumed operation on the 5th of May 2016 following its shutdown throughout the month of April 2016 owing to curtailment in natural gas supplies. The power plant generated a total of 146.17 GWh of electricity in June 2016 compared to the projected 149 GWh under the ESP. It was higher than the 92.15 GWh generated in May 2016 when the power plant was not operated fully due to fuel supply difficulties. Even though the power plant was technically available, generation was constrained by low natural gas supplies from the Atuabo Gas Processing Plant.

KTPP in full operation in June 2016

The Volta River Authority (VRA) completed the commissioning of the second unit (110 MW) of the Kpone Thermal Power Plant (KTPP) on 20th June 2016 on Distillate Fuel Oil (DFO). In May 2016, the first unit (110MW) began commercial operation, mainly as a peaking plant, and contributing a total of 36.65 GWh of electricity into the power system. The power plant (Unit 1&2) interchangeably contributed about 100 MW of capacity to meet daily peak load throughout the month of June 2016.

Karpowership starts operation in combined cycle mode in June 2016 as HFO price also increases

The Karpowership power plant started operating its 16 MW steam turbine unit in June 2016. The power plant generated 157.4 GWh of electricity in June 2016 compared to 156.2 GWh in May 2016. The power plant also contributed its full capacity of 220 MW to meet the system peak demand consistently in the month of June 2016. The cost of electricity generated from the power plant however increased as a result of an increase in the cost of Heavy Fuel Oil (HFO) from US$ 174.85 per metric tonne in May 2016 to US$244.87 per metric tonne in June 2016. The increase in the price of HFO resulted in an elevation of the cost of production from US cents 3.37/kWh in May 2016 to US cents 3.87/kWh in June 2016.

TAPCO and TICO continued to operate at half capacity in June 2016

Owing to technical challenges, TAPCO and TICO operated below their rated capacities. TAPCO generated 96.65 GWh as against the projected 163 GWh representing 59% of projected production while TICO generated 100.1 GWh which was lower than the projected amount of 196 GWh. TAPCO and TICO contributed 146 MW and 163 MW respectively to meeting the system peak load of 1,885 MW in June 2016. The damaged unit of TICO, which is under repairs, is expected to be available in the second week of July 2016. This would increase TICO's available generation capacity from 160MW to 320MW.

TT1PP undergoing mandatory maintenance

The Tema Thermal 1 Power Plant, operated by VRA, continues to be off-line owing to maintenance requirements. The operation of the power plant was stopped as a result of VRA not being able to carry out the requisite mandatory maintenance works on the plant. The maintenance work, which was started in May 2016, was completed in the last week of June 2016.

Natural Gas supplies remained low at Aboadze in June 2016

Following the resumption of operation of the Floating Production Storage and Off-Loading (FPSO) facility, natural gas supplies from the Atuabo Gas Processing Plant to the Aboadze Power Enclave resumed on 5th May 2016 with 22 MMscf per day, rising to 57 MMscf per day from 11th May 2016 and continuing at the same rate till the end of the month. In June 2016, an average of 46.07 MMscf per day was supplied to the Aboadze Power Enclave for electricity generation. This represented about 50% of the daily average of about 86 MMscf per day supplied from January 2016 to March 2016 prior to the curtailment of natural gas on the 20th March 2016.

Electricity imports increases in June 2016

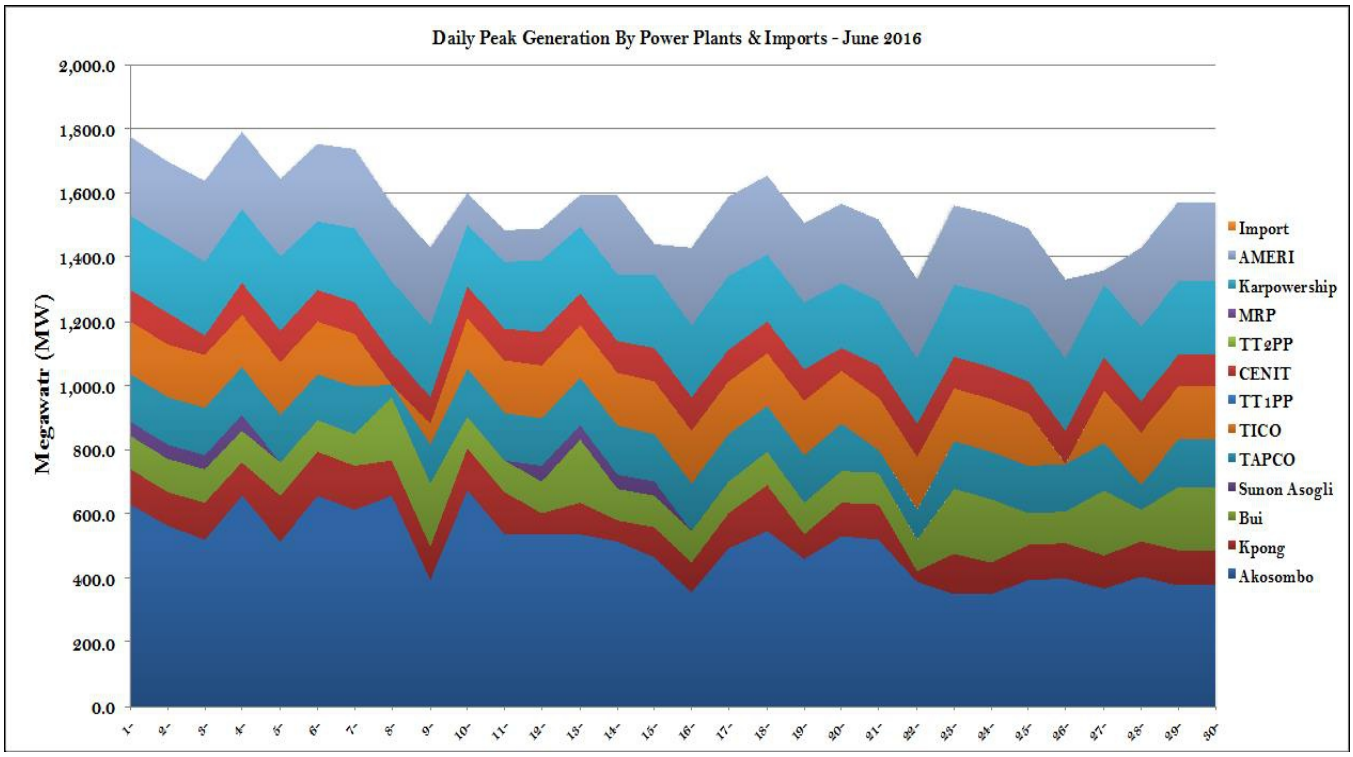
Electricity imports from La Cote D'Ivoire increased from 18.6 GWh in May 2016 to 26.1 GWh in June 2016 representing 2.6% of total electricity supplied in June 2016 compared to 1.7% in May 2016. The importation of electricity was not envisaged for both May 2016 and June 2016 as it was projected at the beginning of the year that Ghana would not import electricity in May and June 2016. The increased importation of electricity in May and June 2016 confirms the difficulties facing the country in the generation of electricity from domestic sources.

Trojan Power Plants

Trojan Power Limited has increased the installed capacity of it plants from 22 MW to 88 MW. The power plant now consists of a 50 MW natural gas-fired plant which is yet to be commissioned, 22 MW dual fuel (natural gas and DFO) plants and 16 MW DFO fired plant which is also yet to be commissioned. The 50 MW gas turbines, which are recent additions, have not been commissioned owing to low natural gas supply difficulties from the WAGP. The 16 MW DFO plant has also not been commissioned due to the high cost of DFO. Trojan Power Ltd is seeking waivers of taxes on its DFO purchases in order to deliver reasonably priced electricity. Trojan Power Ltd is also exploring ways of obtaining its own natural gas supplies outside the WAGP supplies.

OPERATIONAL FACT SHEET

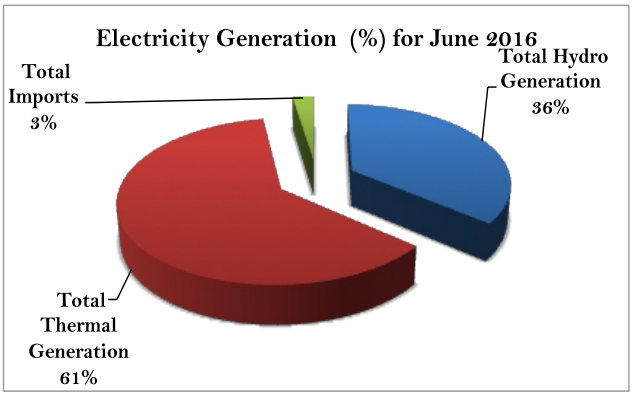
Peak Generation (MW) - June 2016						
Source of Supply	Week 1	Week 2	Week 3	Week 4	Maximum Non-Coincident Peak Generation	Generation at System Coincident Peak
Akosombo	657.0	671.0	549.0	407.0	671.0	657.0
Kpong	144.0	132.0	142.0	128.0	144.0	104.0
Bui	110.0	198.0	103.0	200.0	200.0	100.0
Sunon Asogli	46.3	46.7	47.4	-	47.4	45.2
TAPCO	149.0	151.0	148.0	148.0	151.0	146.0
TICO	163.0	166.0	165.0	166.0	166.0	163.0
TT1PP	-	-	-	-	-	-
CENIT	103.0	104.0	103.0	102.0	104.0	100.0
KTPP	181.0	105.0	207.0	124.0	102.0	100.0
TT2PP	-	-	-	-	-	-
MRP	-	-	-	-	-	-
AMERI Energy	250.1	244.3	250.1	247.4	250.1	241.2
Karpowership	229.6	226.4	227.2	226.8	229.6	229.1
Import	-	-	-	-	-	-
Trojan Power	-	-	-	-	-	-
Total Supply including imports	2,033.0	2,044.4	1,941.7	1,749.2	2,065.1	1,885.5
Total Generation without imports	2,033.0	2,044.4	1,941.7	1,749.2	2,065.1	1,885.5

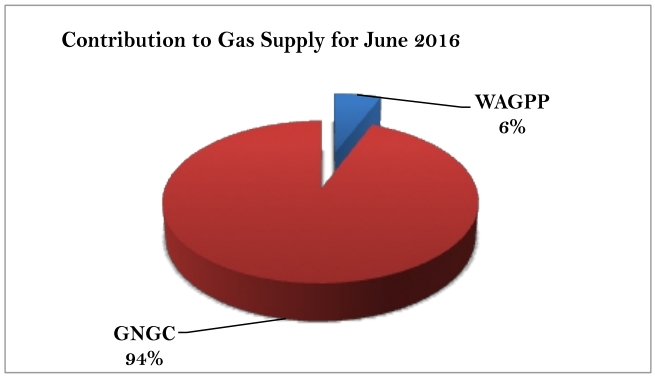


Ghana Electricity Demand for June 2016		
Maximum Peak Generation	MW	1,885.50
Minimum Peak Generation	MW	1,397.20
Average Peak Generation	MW	1,812.51
Total Energy Generated	GWh	997.20
Load Factor (LF)	%	71.1%

OPERATIONAL FACT SHEET

Weekly Generation (GWh) - June 2016					
Power Plant	Week 1	Week 2	Week 3	Week 4	Total
Akosombo	77.28	74.63	60.85	78.06	290.82
Kpong	15.01	14.78	11.89	15.51	57.19
Bui	3.50	5.20	3.40	7.55	19.65
Sunon Asogli	4.41	2.12	2.46	-	8.99
TAPCO	24.24	19.32	23.77	29.58	96.91
TICO	26.01	19.88	26.51	27.64	100.04
TT1PP	-	-	-	-	-
CENIT	13.74	12.75	12.38	17.93	56.80
KTPP	12.59	15.72	20.56	14.37	63.24
TT2PP	-	-	-	-	-
MRP	-	-	-	-	-
AMERI Energy	40.63	17.97	34.77	52.80	146.17
Karpowership	37.82	35.96	36.21	47.40	157.39
Import	4.71	4.53	7.44	9.44	26.12
Trojan Power	-	-	-	-	-
Total Supply including imports	259.94	222.86	240.24	300.28	1,023.32
Total Generation without imports	255.23	218.33	232.80	290.84	997.20





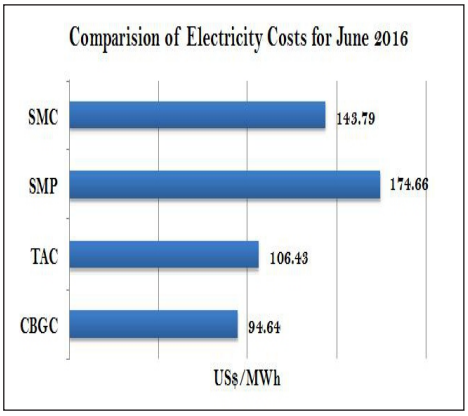
GNGC= Ghana National Gas Company
WAGPP = West African Gas Pipeline Project

Average Gas Flow (mmscfd) -June 2016					
Location	Week 1	Week 2	Week 3	Week 4	Monthly Average
Etoki	5.78	0.38	3.91	-	2.35
Tema	7.13	1.38	4.14	-	2.95
Aboadze	56.81	21.17	46.36	56.86	46.07

Water Level (ft) - June 2016					Change in water level
Hydro Dam	Week 1	Week 2	Week 3	Week 4	(feet)
Akosombo	236.43	236.21	235.99	235.47	(0.96)
Bui	552.22	552.42	552.29	552.25	0.03
Akosombo Minimum Design Operating Level	240.00	240.00	240.00	240.00	
Akosombo Maximum Level	278.00	278.00	278.00	278.00	

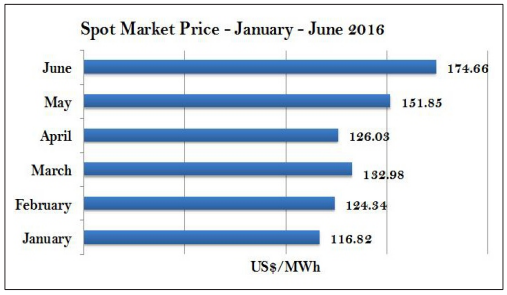
ECONOMIC FACT SHEET

Month at a Glance				
	Units	June 2016	May 2016	Change
Average Market Energy Cost	US$/MWh	84.71	73.12	11.59
Average Market Capacity Charge (AMCC)	US$/MWh	21.72	21.63	0.09
Total Average Market Cost (TAC)	US$/MWh	106.43	94.75	11.68
System Marginal Cost (SMC)	US$/MWh	143.79	121.26	22.53
System Marginal Capacity Charge (SMCC)	US$/MWh	30.87	30.63	0.24
Spot Market Price (SMP)	US$/MWh	174.66	151.89	22.77
Composite Bulk Generation Charge (CBGC)	US$/MWh	94.64	94.64	(0.00)
Deviation of TAC from CBGC	US$/MWh	(11.79)	(0.11)	(11.68)
Deviation of SMP from CBGC	US$/MWh	(80.02)	(57.25)	(22.77)



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	671.00	58.25	290.82	-	-	-
Kpong	144.00	53.38	57.19	-	-	-
Sunon Asogli	47.40	25.49	8.99	95,132.36	-	-
Bui	200.00	13.21	19.65	-	-	-
Trojan Power	-	-	-	-	-	-
TAPCO	151.00	86.26	96.91	-	805,123.43	-
TT1PP	-	-	-	-	-	-
TICO	166.00	81.00	100.04	31,072.25	753,644.51	-
MRP	-	-	-	-	-	-
CENIT	104.00	73.41	56.80	-	658,493.19	-
KTPP	102.00	83.33	63.24	-	-	-
TT2PP	-	-	-	-	-	-
AMERI Energy	250.10	78.55	146.17	1,482,787.95	-	-
Imports	-	-	26.12	-	-	-
Karpowership	229.60	92.00	157.39	-	-	1,274,287.67
Total	2,065.10		1,023.32	1,608,992.56	2,217,261.13	1,274,287.67



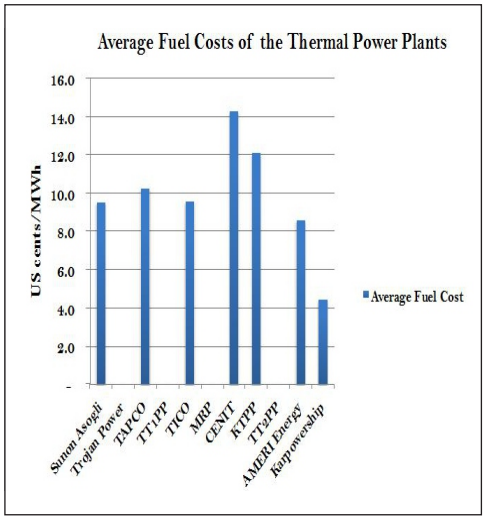
Spot Market Price = SRMC of Energy + SRMC of Capacity

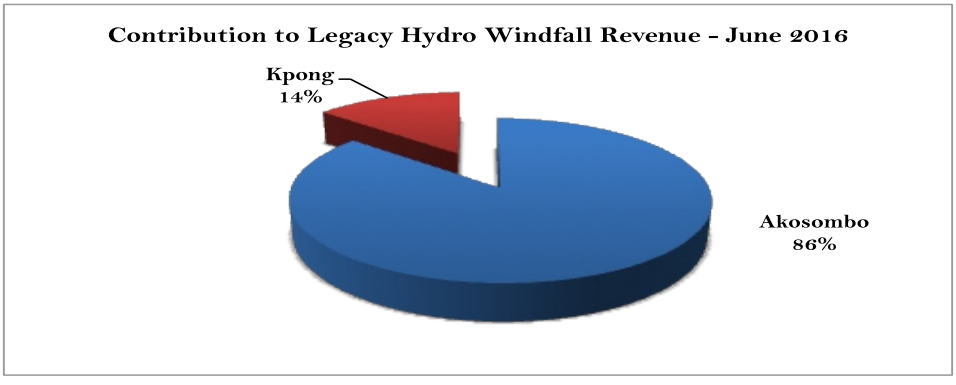
		June 2016	May 2016	Change
Total Thermal Power Plants Fuel Cost	US$	55,537,728.15	44,880,399.77	10,657,328.38
Average Thermal Power Plants Fuel Cost	US$/MWh	84.71	73.12	11.59

Legacy Hydro Windfall Revenue for June 2016				
Power Plant	Average Cost (US$/MWh)	Average SMP (US$/MWh)	Difference (US$/MWh)	Windfall Revenue (US$)
Akosombo	33.10	174.66	141.56	41,167,274.17
Kpong	59.20	174.66	115.46	6,602,920.43
Total				47,770,194.60

SMP=Spot Market Price

Average Fuel Prices		
Fuel Type	Unit	Delivered Cost
Natural Gas	US$/MMBTU	8.49
LCO	US$/BBL	66.97
HFO	US$/Tonne	244.89
DFO	US$/Tonne	440.93





1. Government endorses electricity retail competition under the ECG PSP arrangements

The Government of Ghana (GoG), as part of the policy directives for the implementation of the ECG PSP, has endorsed the implementation of electricity retail competition in Ghana. The endorsement is well aligned with the Power Sector Reform Programme initiated by GoG in 1997 which led to the passage of the PURC Act 538 and the Energy Commission Act 541. The two regulatory institutions, PURC and EC were subsequently established. Indeed, implementation of an electricity retail sales market will be a "game changer" in the Ghana Electricity Industry towards securing improved customer services to end-use customers driven by competition for the over 3 million residential electricity customers and small commercial businesses in Ghana.

Electricity retailing involves the final sale of electricity from an electricity provider to an end-use customer. The competitive aspect of electricity retailing primarily relates to the ability of an end-use customer to make a choice among multiple electricity providers. The end-user customer competition space in electricity retail sale in the Ghana would focus on retail services to small businesses and individual households. This is because the EC has already defined a bulk customer consumption level that covers most large industrial consumers which enables them to procure electricity from generators of their choice. It is believed that end-use customers can obtain monetary and other service benefits through competition among service providers and exploit diverse electric services which can be more enhanced with retail competition. Service providers would compete to provide innovative energy services and products such as solar PV systems and energy efficiency and conservation services and products. Generally, competitive retail suppliers, in order to increase market share, may provide a variety of consumer-friendly service plans that give end-use customers flexibility in their energy purchases. It is also suggested, by some experts, that retailing will lead to better alignment of electricity supply costs as a consequence of better regulation of distribution and transmission charges and the diffusion of retail competition for customers of all status.

Electricity retailing may be implemented in different forms including a situation in which customers may choose between the incumbent utility supplier and an array of competiting retail suppliers as opposed to being a captive customer to a single provider. Alternatively and in order to enhance retail competition with sufficient number of licensed retailers, the incumbent utility supplier may be barred from engaging in direct retailing but granted the status of provider of last resort in the event that a customer is unable to receive retail service from a licensed retailer. In such cases the retail competition system should be designed to minimize financial losses to the incumbent utility supplier as its mandate changes to the provision of only distribution services through its wires.

2. Policy framework for ECG Private Sector Participation

The Energy Commission (EC) has prepared the policy framework to clarify the process of implementing its mandates regarding the licensing of entities to be involved in the ECG Private Sector Participation (PSP) Transaction under the Second Ghana Compact.

The Second Ghana Compact, being implemented under the Millennium Challenge Corporation (MCC) signed between the Government of the United States of America and the Government of Ghana, is intended to provide support for the Power Sector of Ghana under a five-year programme. A major activity under the Second Ghana Compact is private sector participation (PSP) in the management and operation of the Electricity Company of Ghana (ECG), the largest electricity distribution company in Ghana. The Second Ghana Compact is being implemented in conjunction with key Ghanaian stakeholders, and is coordinated by the Millennium Development Authority (MiDA), on behalf of Millennium Challenge Corporation (MCC). The Energy Commission (EC) is one of the key stakeholders in the implementation of the Second Ghana Compact.

The momentum for increased private sector participation in the electricity industry is driven by the consistently dipping performance of ECG and the continued relevance of the Government of Ghana (GoG) Power Sector Reform (PSR) programme approved in 1997 which gave birth to the Energy Commission and the Public Utilities Regulatory Commission. One objectives of the PSR was, among others, to bring competition in the electricity supply value chain except in the wires business (transmission and distribution of electricity). The broad PSR policy recognized that, the wires business is a natural monopoly and therefore the operatorship of the network should be separate from the retail sale of electricity which is amenable to competition.

In furtherance of clarifying its policy directives on the implementation of the ECG PSP, the GoG in 2015, took decisions on some major issues raised by MiDA on the ECG PSP programme. The key Cabinet decisions relevant to emerging issues relating to distribution and sale of electricity were as follows:

i. the existing PPAs of ECG prior to the commencement of the PSP, should remain with ECG. ECG may in turn sign an agreement with the Concessionaire for the bulk sale and purchase of electricity for distribution by the new operator of the distribution system (NEWCo) on its behalf if it so wish; and

ii. while full retail competition would not be introduced earlier than 5 years from the commencement of the ECG PSP concession arrangements, Consumer Cooperatives and Indigenous Companies may be licensed to operate retail sale concessions in collaboration with ECG within the 5 year period to serve ECG's existing customers.

By these decisions of the GoG neither the Concessionaire nor the NEWCo is expected to get involved in retail sale of electricity procured under the existing Power Purchase Agreements (PPAs) of ECG. NEWCo may however get involved with bulk sale of electricity on ECG's behalf. The GoG decisions on the ECG PSP are consistent and well aligned with the tenets of the PSR programme of 1997 which were embodied in the Energy Commission Act 541.

Owing to the exigencies of the situation at the time of rolling out the directives embodied in the Energy Commission Act 541, ECG was granted a single license that enables it to distribute as well as sell electricity in its areas of jurisdiction. This was at variance with the "spirit" of the Energy Commission Act 541 which sort for the grant of separate licenses for the distribution and the sale of electricity. The ECG PSP Transaction therefore provides the opportunity for the full implementation of the provisions of the Energy Commission Act 541 in respect of the grant of separate licences for the distribution and for the retail sale of electricity.
On the basis of the above policy decisions, the following actions will guide the licensing of entities that intend to distribute and those wishing sell electricity under the ECG PSP arrangements:

1. ECG, the holder of all existing PPAs, may on its own establish a subsidiary or a joint venture (JV) company with NEWCo that will undertake electricity retail sale in competition with other entities that will be licensed by EC to procure and sell electricity to customers.

2. Within the 5-year period prior to full retail competition, existing ECG customers will remain captive customers of ECG or any other entities that will be licensed to operate retail sale concessions in collaboration with ECG.

3. NEWCo is to be created as a Special Purpose Vehicle (SPV) to operate the distribution network as a subsidiary of the Concessionaire. In view of that, the Concessionaire may, in the event of power inadequacy, sign new agreements to procure power in bulk but with the consent and approval of ECG who is the custodian of all the existing PPAs.

4. The current ECG licence which allows them undertake both electricity distribution and sale will be revoked and Distribution Licence re-issued to NEWCo to enable it to operate ECG's distribution network. The distribution services under the new Distribution Licence would end at the customer's meter. Installation of meters for customers should be agreed between the distribution utility and the Retail Sale Licensee. The EC is preparing an Electricity Metering Code (EMC) to define guidelines for technical specifications, procurement and installation of electricity meters. The Metering Code would allow for the deployment of meters of different makes but which are able to be monitored and managed on a common platform that shall be managed by the distribution utility and shared with the licensed retail entities.

5. ECG will be issued with a separate Electricity Retail Sale Licence with which its new subsidiary will operate in line with guidelines and conditions prepared by EC for electricity retail sales.

6. Electricity Retail Sale Licensees will, among other responsibilities, receive and process applications for connections from customers. Electricity Retail Sale Licensees will be responsible for installation of meters in the presence of a representative of the distribution utility.

7. Only customers who are on pre-payment metering or Automatic Meter Recording (AMR) systems shall qualify to be served by Electricity Retail Sale Licensees. Electricity Retail Sale Licensees should ensure that all their customers are on prepayment metering or an AMR system.

8. In the case of new areas or zones which are outside the jurisdiction ECG and NEWCo, the new customers may opt to be served or serviced by a different distribution and/or retail sale entities licensed by the EC to operate in the new area or zones.

Acronyms

AMR = Automatic Meter Reading system
DFO – Distillate Fuel Oil
ECG= Electricity Company of Ghana
HFO = Heavy Fuel Oil
GHp = Ghana Pesewa
IPP – Independent Power Producer
kWh = Kilo-watt hours
LI = Legislative Instrument
MCC = Millennium Challenge Corporation
MoP = Ministry of Power
MWh = Mega-watt hours
NRSP – National Rooftop Solar Project
PSR = Power Sector Reforms
PURC = Public Utilities Regulatory Commission
SPV = Special Purpose Vehicle
WAGP – West African Gas Pipeline
CBGC = Composite Bulk Generation Charge (gazetted by the PURC)
EC = Energy Commission
ESP – Electricity Supply Plan
GoG = Government of Ghana
GWh = Giga-watt Hours
KTPP = Kpone Thermal Power Plant
LCO = Light Crude Oil
MCA = Millennium Challenge Account
MiDA = Millennium Development Authority
MW – Megawatt
NITS = National Interconnected Transmission System
PPA = Power Purchase Agreement
PSP = Private Sector Participation
PV = Photovoltaic
VRA – Volta River Authority
WEM = Wholesale Electricity Market

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