

VOLTA RIVER AUTHORITY

FIFTY SECOND
ANNUAL REPORT &
ACCOUNTS 2013



**VOLTA
RIVER
AUTHORITY**

PROFILE OF THE VOLTA RIVER AUTHORITY

The Volta River Authority (VRA) was established on April 26, 1961 under the Volta River Development Act, Act 46 of the Republic of Ghana, as a body corporate with the mandate to operate mainly as a power generation, transmission and distribution utility. In 2005, following the promulgation of a major amendment to the VRA Act in the context of the Ghana Government Power Sector Reforms, the VRA's mandate has now been largely restricted to generation of electricity. The amendment has a key function of creating the requisite environment to attract independent power producers (IPPs) onto the Ghana energy market.

The transmission function has been separated into an entity, designated Ghana Grid Company (GRIDCo). The VRA's distribution agency, the Northern Electricity Department (NED), has been transformed into the Northern Electricity Distribution Company (NEDCO), a stand-alone, wholly-owned, subsidiary of VRA.

Power Activities

The Authority operates a total installed electricity generation capacity of 1,970 MW. This is made up of two hydroelectric plants on the Volta River, with installed capacities of 1,020 MW and 160 MW at the Akosombo and Kpong Generating Stations respectively, and complemented by a 330 MW Combined Cycle Thermal Plant at Aboadze, near Takoradi. A further 220 MW Thermal Plant, Takoradi International Company (TICO) is owned as a joint venture with TAQA, from Abu Dhabi in the United Arab Emirates. This is expected to be converted into a 330 MW combined cycle plant and commissioned in 2014. Additional development of 132 MW (T3) Magellan plant at the same site at Aboadze was commissioned in 2012.

The VRA has developed a number of plants in Tema. These include a 110 MW Tema Thermal 1 Power Plant, an 80 MW Mines Reserve Plant, both commissioned in 2008. A 50 MW Tema Thermal 2 Power Plant commissioned in 2010; and additional development of a 200MW Thermal Plant located at Kpone, near Tema, by 2014.

The Authority is also planning additional development of 100-150 MW of wind power, commenced in 2012 at locations in the southern part of the country where conditions are ideal – and up to 12 MW of solar power generation in the next three years in the northern part of the country, where the resource is abundant – beginning with the construction of the first 2 MW solar plant, commissioned in 2012.

The Authority has begun feasibility studies for the development of 140 MW of hydro dams at Pwalugu and Juale in the Northern Region.

The VRA has a strong commitment to renewable energy development to protect the environment and public health and help reduce emissions that cause climate change, while ensuring a system of diversity and security in electricity supply. A renewable energy development programme is one of the most constructive, cost effective ways to address the challenges of high energy prices, energy security, air pollution, and global climate change. As oil and gas are expendable products, renewable resources would play an increasingly vital role in our power generation mix over the next century. Hydroelectric power is currently the largest producer of renewable energy in Ghana. Hydro generation currently accounts for 60 percent of the total system supply.

The VRA, through the Northern Electricity Distribution Company Ltd. (NEDCO), is the sole distributor of electricity in the Brong-Ahafo, Northern, Upper East, Upper West, and parts of Ashanti and Volta Regions of Ghana. Originally, NED was developed as an integral part of the larger Northern Electrification and System Reinforcement Project (NESRP) to extend the national electricity grid to northern Ghana. The new subsidiary company, NEDCO, has a customer population of nearly 400,000 and a load demand of about 130MW.

Customers

The VRA's major bulk customer is the Electricity Company of Ghana (ECG). Power sold to ECG caters mainly for domestic, industrial and commercial concerns. Bulk sales are also made to a number of mining companies, including AngloGold Ashanti, Newmont Ghana Gold Ltd., Goldfields Ghana Ltd., Golden Star Resources Group. Others are Aluworks, Akosombo Textile Ltd., and Diamond Cement Ghana Ltd. International energy sales to neighbouring countries include Togo, Benin and Burkina Faso.

Links to Customers and Neighbouring Countries

The VRA reaches its customers in Ghana and neighbouring countries through GRIDCo. GRIDCo's transmission system covers the entire country, and is also connected with the national electricity grids of Cote d'Ivoire, Compagnie Ivoirienne d'Electricité (CIE), Togo, Communauté Electrique du Benin (CEB), and Burkina Faso (SONABEL). These interconnections now serve as part of the arrangement under the West Africa Power Pool (WAPP).

Regional Cooperation

The VRA is participating in the development of a power pooling mechanism to provide the West Africa sub-region increased accessibility, availability and affordability to electricity under the auspices of the Economic Community of West African States (ECOWAS). In this context, GRIDCo is building the Ghana component of a new 330kV transmission line, which starts from Aboadze to Tema, and then to Momehagou (Togo) under the West Africa Power Pool Project. The line is expected to be completed and commissioned in 2014. However, the Aboadze to Tema transmission line has been commissioned.

The VRA is the major foundation customer of the West African Gas Pipeline Project (WAGP), which involves the construction of a 20 - inch 600km long natural gas transmission pipeline from Nigeria to Ghana and associated facilities to support the energy requirements of the West Africa sub-region. The objective of the VRA's participation in the WAGP is to obtain natural gas from Nigeria to operate its thermal facilities, and thereby reduce significantly the cost of thermal generation, while increasing electricity availability, accessibility and affordability and protecting the environment. The project has been completed and gas is now being supplied to the VRA thermal facilities. Occasionally, accidental damage to the pipeline disrupts gas supply to thermal facilities and exposes the plants to power generation and financial risks.

Recognizing the VRA's distinctive competencies in power system operations, the United Nations Development Programme (UNDP), appointed the VRA as the principal consulting agency for the implementation of an Emergency Power Programme (EPP) in Liberia after years of conflict. Consequently, the VRA embarked on a power construction scheme to restore power to Monrovia and other critical institutions.

The VRA is a founding member of the Association of Power Utilities of Africa (APUA). APUA aims to promote the integration and development of the African power sector through active cooperation among its members and also between its members on one hand and all international power sector organizations and donors on the other hand. APUA is a permanent member of the Executive Council of the African Energy Commission and a preferred partner of the New Partnership for Africa's Development (NEPAD).

Commercialization Initiatives

The Authority has also embarked on a programme to turn its portfolio of non-power operations into progressively self-financing subsidiaries. The aim is to inject greater efficiency into the

operations of these important but non-core activities of the VRA while the Authority focuses more effectively on power generation, and thereby enhance its competitive advantage in the West African sub-region.

These operating subsidiaries are the Akosombo Hotels Limited, and the Volta Lake Transport Company. Business plans have also been developed for all the other areas: Kpong Farms Limited; the Schools; the Health Services; and the Real Estate department.

The VRA continues to demonstrate its social responsiveness through various programmes designed to enhance the socio-economic and physical environment of the lakeside and downstream communities.

This social investment includes annual commitment of the cedi equivalent of US\$500,000.00 to a Resettlement Trust Fund to support development initiatives in 52 resettlement towns. The fund has been used to support projects for environmental improvement, social welfare, public health, education, electricity, potable water supply and sanitation. In addition, VRA has introduced a new Community Development Programme (CDP). The CDP sets out a framework for guiding the process of support for the development of all communities impacted by the operations of the Authority. The CDP also seeks to improve the previous Community Development Initiative (CDI) Framework Document. It aims at promoting the empowerment of the Communities to take action for development.

The VRA runs hospitals in Accra, Akosombo and Aboadze, equipped with excellent facilities. The VRA also provides free specialist and general medical care to communities along the Volta Lake accessible only by boat, through its medical boat christened *MV ONIPA NUA*.

Malaria has become endemic with economic consequences. To make a total effort to increase the effectiveness of malaria control and prevention, the VRA has enlisted the support of other institutions. As an alternative to the VRA medical boat services, the Authority has in a joint effort signed a Memorandum of Understanding with the Asuogyaman District Health Management Team (DHMT) to provide services to communities along the Volta Lake to fight malaria, Bilharzia and other water-borne diseases. The VRA with the assistance of The Johns Hopkins University Center for Communication Programs Voices for a Malaria-free Future Project has developed a Strategy Document for malaria control. This document sets out the framework for action by the VRA in creating a Malaria-free environment for its workforce, workers' families and their surrounding communities.

The Authority maintains a dredging programme at the estuary of the Volta River at Ada to reduce the incidence of Bilharzia, and to restore the ecosystem in the area. VRA also runs afforestation programmes aimed at reducing siltation of the Volta Lake through the restoration of permanent vegetative cover on the slopes bordering the Lake.

The VRA runs first and second cycle schools for children of staff and others living in Akosombo, Akuse and Aboadze. It also administers Local Authority functions in the Akosombo Township.

Relations with statutory regulatory bodies

The relevant regulatory environment of the energy sub sector consists of the Ministry of Energy, Energy Commission, and the Public Utilities and Regulatory Commission (PURC).

- Ministry of Energy – Supervisory Ministry responsible for formulating, monitoring, and evaluating policies, programmes and projects for the energy sector.
- Public Utilities Regulatory Commission (PURC) – An independent regulatory commission with oversight responsibility for tariff and rate setting, and provision of the highest quality of electricity to consumers.
- Energy Commission - Provides advice to the Government of Ghana on energy planning and policy, conducts indicative planning/least cost expansion planning of wholesale supply of electricity, regulates licenses, establishes and monitors standards of performance as well as industry rules of practice for electric utilities.

SUBSIDIARY COMPANIES

In fulfillment of its responsibility to provide facilities and assistance for the socio-economic development of the Volta Basin, the Authority currently operates two subsidiary companies: **Akosombo Hotels Limited** and the **Volta Lake Transport Company Limited**.

Akosombo Hotels Ltd

The Akosombo Hotels Limited, incorporated in 1970, runs a three-star hotel, restaurant, modern conference/seminar facilities, pleasure activities, including cruising on the Lake by *MV Dodi Princess*, and promotes tourism. *MV Dodi Princess* which was gutted by fire is being reconstructed to resume operations in 2014.

Volta Lake Transport Company

The Volta Lake Transport Company, incorporated in 1970, operates river transportation for passengers, bulk haulage of petroleum products and significant quantity of cement, and cross-lake ferry services along the Volta Lake.

Kpong Farms

Kpong Farms Ltd, originally set up in 1982 as a resource centre of excellence for research into modern agricultural practices, played a significant role in the overall agricultural development of Ghana through activities in livestock, rice production, meat processing, and the cultivation of pawpaw for export as a foreign exchange earner. Local interns and expatriates from Egypt, Pakistan and the United States of America have also received training at the Farms.

The VRA has recapitalized the operations of Kpong Farms Ltd., and is seeking strategic investors in a joint venture partnership to transform the Farms into a profitable agribusiness.

THE VOLTA RIVER AUTHORITY BOARD

The Members of the Board of the Volta River Authority as at 31st December 2013:

Chairman	Prof. Akilagpa Sawyerr <i>Professor/Lawyer</i>
Member	Kweku Andoh Awotwi <i>Chief Executive, Volta River Authority</i>
Member	Mr. Johnny Elvis Essilfi Turkson <i>Lawyer</i>
Member	Togbi Gbordzor III <i>Traditional Ruler/Civil Engineer</i>
Member	Alhaji Attah Nantogmah Mahamadu <i>Lawyer</i>
Member	Mrs. Marietta Brew Appiah-Opong <i>Lawyer</i>
Member	Hon. Rev. Dr. Joses Asare-Akoto <i>MP, Asuogyaman</i>
Member	Mr. Ahmed Yakubu Salifu <i>Freight Forwarder, Banker/Accountant</i>
Member	Mr. Danny Anang <i>Managing Director, Daben Cleansing Services</i>
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Secretary	Raymond John Lartey Volta River Authority

Principal Officers (VRA Management) as at 31st December, 2013:

Office of the Chief Executive

Chief Executive	-	Kweku Andoh Awotwi
Director, Audit	-	Vacant
Director, Planning & Business Development	-	Bernard Kofi Ellis
Director, Centre of Excellence	-	Edwin M. Gbekor
Director, Integrated Generation Information Sys.	-	Ing. Theo Nii Okai
Board Secretary		Raymond J. Lartey
Manager, Corporate Communications Unit	-	Samuel Kwesi Fletcher

Engineering and Operations Branch

Deputy Chief Executive	-	Ing. Isaac Kirk Koffi
Director, Special Engineering Projects	-	Ing. Stephen Doku
Director, Projects & Systems Monitoring	-	Ing. William Amuna
Director, Thermal Generation	-	Ing. Richard N.A. Badger
Director, Engineering Services	-	Ing. William Sam-Appiah
Director, Hydro Generation	-	Ing. Kwesi B. Amoako

Finance Branch

Deputy Chief Executive	-	Alexandra Totoe (Ms.)
Director, Procurement	-	Ing. Richmond Evans Appiah
Director, Finance	-	Ebenezer Tagoe
Director, Investment	-	Samuel K. Gyawu
Director, ICT Infrastructure	-	Dr. Isaac A. Doku

Services Branch

Deputy Chief Executive	-	Maxwell E.Y. Odoom
Director, Legal Services	-	Angelina Mornah Domakyaareh (Mrs.)
Director, Human Resources	-	Isaac K. Aidoo
Director, Corporate Risk Management	-	Ing. Joseph W. Sutherland
Director, Real Estate & Security	-	Vacant
Director, General Services	-	Abla Fiadjoe (Ms.)
Director, Environment & Sustainable Dev't	-	Patrick Okrah Kwakye
General Manager, VRA Schools	-	Arnold Seshie
Ag. Director, Health Services	-	Dr. Rebecca Acquaaah-Arhin (Mrs.)

On Secondment: Mrs. Harriet Wereko-Brobby is on secondment to the West African Gas Pipeline Project as General Manager, Corporate Affairs.

CHAIRMAN'S STATEMENT

Volatile Macro Economic Situation

The macroeconomic situation of 2013 and the business challenges that accompanied the financial year had a bearing on our overall operating environment. Notwithstanding the difficulties within this environment, the VRA made significant progress. Our prospects are bright despite a more volatile macro-situation. We are very positive about the future.

The VRA's Competitive Success

The VRA has a unique advantage because of its depth and breadth. Our customers value our technical depth. And our unique breadth makes the VRA a desired company. What drives the VRA success are three attributes: vision, competence and excellence. At the heart of the VRA's competitive success is a consistent pool of highly skilled, efficient and talented staff supported by a mutually reinforcing training and development system delivered at scale across the Authority.

The VRA is able to capitalize on its strengths and unique capability to deliver results.

The Volta River Authority ended the fiscal year 2013 with an operating profit of GH¢208.11 million compared to a loss of GH¢ of 82.22 million in 2012. The operating profit represents a return of 5.63% on average revalued net fixed assets (2012: negative 2.59%) compared to the covenanted rate of 8%.

Revenue from sale of electricity increased by 26% (GH¢462.69 million) to GH¢2,212.07 million over the previous year's sales of GH¢1,749.39 million.

On behalf of the Authority, I am pleased to report, that the Government of Ghana paid to the VRA an amount of GH¢664.27 million to make up for the acknowledged shortfalls in tariff, effectively a subsidy to domestic consumers in Ghana.

We acknowledge Government's effort to stabilize the VRA's finances. However, the tariff increase by the PURC is still anemic. The tariffs could cover just 60% of the cost of production of electricity

As a reliability-focused organization planned preventive maintenance of auxiliary equipment at both plants at Akosombo and Kpong were 100% accomplished. This enabled us to rely on our hydro facilities to deliver 61% of the total system supply. The Akosombo and Kpong plants combined to perform at 97.5% above ours and the PURC's own performance benchmarks; the Takoradi thermal plants registered 86.91%

availability and 67.75% capacity utilization; while the new Tema thermal plants performed satisfactorily.

Portfolio Growth

The VRA's portfolio sets our potential. Power demand is estimated to maintain growth trajectory of 200 MW annually. Our capability to deliver adequate, safe, and reliable power is particularly crucial to the growth and development of our economy. It is only by investing in power generation that we can sustain growth.

Growth in new capacity has not kept pace with demand, and this has created demand and supply imbalance, resulting in periodic load management.

We are happy that in 2013, inspite of the demanding and challenging economic environment, we continued to make significant progress. We pushed hard toward developing and deploying a suite of generation expansion projects, in a timely manner, which would rely on a diversity of fuels for power generation, to reduce emissions generally, and to mitigate the impact of future price increases for any one fuel, in the short-to-medium term. Taken together, these projects are expected to add 510 MW in new capacity in the short-to-medium term to ensure electricity reliability and security. These include:

- 220 MW Kpone Thermal Power Project expected to be completed in January 2015.
- 110 MW TICO Expansion Project also expected to be completed by first quarter of 2015.
- 180 MW Takoradi 4 Thermal Power Project (T4) expected to be awarded on contract in August 2014.

The VRA has a great deal of responsibility for the availability and performance of the power plants and keeps a close eye on operating costs for its valued customers. Gas is becoming the major driver of competitiveness. We believe that gas will create electricity costs that are competitive, and provide a "tipping point" for fuel substitution. We plan to increase gas power generation, and to participate in the gas supply chain. We continued with our exploration of other alternatives of gas supply, moving to execution with gas producers in Nigeria, and Ghana, including ENI, the holders of the Sankofa Non-Associated Gas field. We stepped up our initiatives to explore the possibility of securing additional gas supplies through re-gasified Liquefied Natural Gas (LNG), imported from around the world. These prospective supplies will supplement current sources in Ghana and Nigeria, and create stability in our operations and overall electricity supply in the country.

Development of Renewable Energy

We are committed to the development of renewable energy, in particular solar and wind energy in our generation mix to reduce fossil fuels imports and associated volatility in crude oil prices while protecting the environment. Our energy development strategy seeks to diversify our sources of generation to reduce the risk of overdependence on just few types of our generation sources. A renewable energy development programme is one of the most constructive, cost effective ways to address the challenges of high energy prices, energy security, air pollution, and global climate change. As oil and gas are expendable products, renewable resources would play an increasingly vital role in our power generation mix over the next century. Hydroelectric power is currently the largest producer of renewable energy in Ghana. Hydro generation currently accounts for 60 percent of the total system supply, and this is the largest share of the ramping capacity.

Solar Power Development

We have developed the first 2 MW solar power plant, commissioned in 2013 by His Excellency President John Dramani Mahama at Navrongo. Commercial production began on April 17, 2013 and a total of 2.672GWh has been generated since its inception. We are planning to develop up to 12 MW of solar power generation in the next three years in the northern part of the country where the resource is abundant. A 12 MW solar PV plant is also being developed in the Upper West Region with funding by KfW, a German bank.

Wind power development

We are planning to develop up to 100-150 MW of wind power at locations in the southern part of the country where conditions are most favourable.. The development of this resource would be carried out through a joint venture arrangement with an internationally reputable partner with expertise in that field. The development of renewable energy demonstrates our resolve to have different fuel sources and technologies to generate electricity so that we can have reliable supply while not being overly dependent on one type of generation.

Emission Credit Development

We are equally planning to identify projects whose carbon emission can be reduced to qualify the VRA to benefit from emission credits. These projects include fuel switching of the Mines Reserve Plant, the fuel switch and expansion of the Takoradi plant, fuel switch at the 50 MW Tema Thermal II Power Plant.

Ghana Energy Development and Access Programme (GEDAP)

To improve electricity accessibility and availability, the VRA is expanding its power system under a project designated *Ghana Energy Development and Access Programme* (GEDAP). The project, which is in two parts, involves the development of the Kumasi Second Bulk Supply Point and distribution networks, funded by the African Development Bank. A sub-component of GEDAP, the *NED Intensification Project*, which seeks to improve access to electricity, is being funded by the International Development Association (IDA) of the World Bank. The project is expected to improve the network operation, supply reliability, power quality and safety and increase access to prospective customers and secure additional revenue.

Commercialization of Non-Power Generation Functions

The Authority's corporate strategic objective is to commercialize the existing subsidiaries and other non-power functions to ensure value addition and increased profitability. Our strategic approach is aimed at operationalization of Strategic Business Units (SBUs) through internally generated funds.

We are assessing other strategies and financing options for the expansion plans of Akosombo Hotels and operationalization of the Kpong Farms.

Akosombo Hotels Ltd: Consideration is being given to medium-term debt financing from banks/financiers for the hotel expansion project. The hotel needs about \$10,000,000 to complete construction of 65-100 rooms and to complete re-construction of Dodi Princess, which was completely destroyed in a fire incident.

Kpong Farms Ltd: We are considering long-term leasing as a structuring option for private sector participation in Kpong Farms.

Volta Lake Transport Company

The Volta Lake Transport Company, incorporated in 1970, operates river transportation for passengers, bulk haulage of petroleum products and significant quantity of cement, and cross-lake ferry services along the Volta Lake.

With an asset net book value of GHS 92 million, low revenue performance exposes many of the assets to ineffective revenue generation.

I am pleased to report that the Government of Ghana in 2013 procured three new water buses and a 130-tonne ferry which arrived in September.

Other support initiatives from the World Bank include preparation of more landing sites, new port equipment for Buipe and Akosombo Ports and new engines for VLTC ferries.

VRA has spent some US\$1,200,000 in recent years to improve safety on the vessels and appointed a new management team in 2013 to improve the financial fortunes of the company.

Kpong Farms Ltd

In January 2012, minor rice cultivation was started to maintain and enhance the farm, in anticipation of private sector partnership opportunities. This culminated in 27 hectares being cultivated in 2013 of which 129,168 kilos of rice were harvested. A long-term lease arrangement is being considered to revive operations of the Farms.

Enterprise-wide technology enabled organization

We are transforming the way that we operate. We are consistently innovating the VRA. Our innovations are focused on productivity. We are investing in initiatives that can deliver strong gains in productivity. We have digitalized our business processes to enable collaboration. Digital tools will make us build a stronger world class organization. The VRA would be a major beneficiary of simplified systems and mobility.

Performance Management: The Balanced Scorecard

A new performance management system, *the Balanced Scorecard (BSC)* had been introduced since 2011 to provide a framework for aligning individual performance with departmental and corporate goals, and for assessing performance. Applied in 2012, for the third year in a row, the BSC has become the alchemy for corporate productivity.

Corporate Social Responsibility

The VRA recognizes the need to align its corporate social responsibility (CSR) activities to its business strategies and the communities where it operates. As a corporate citizen VRA's CSR initiatives are aimed at contributing to the wellbeing of communities; but also towards skills development, education and enterprise development and in turn promoting jobs, alleviating poverty and improving employability. We are building local capability to deliver local solutions.

An amount of GHS87.9 million (2012: GHS62.3 million) was spent on CSI initiatives during the year.

To further align the Authority's CSR activities, the VRA set up a CSR Unit in June 2013, introduced a draft CSR Policy and undertook the following activities:

- Formulated a draft CSR policy and model.
- Implemented a teaching and career guidance programme for students of Osu-Doku Senior Secondary and Technical School in the Dangbe West District. A total of 13 volunteer staff, a national service person and an intern participated in the programme. This activity falls under the Employee Volunteer Programme.
- Awarded scholarship to 60 youth in VRA communities tenable at second and tertiary schools under the VRA Community Development Programme.
- Signed a Memorandum of Understanding with Safe Water Network to provide quality water supply to VRA communities.

Excellent Team Work

One defining characteristic of the VRA is its great leadership. The VRA has had the benefit of extraordinary leaders and entrepreneurs who have advanced the work and objectives of the VRA. I wish to express gratitude to management and staff for maintaining excellent professional standards. I wish also to thank my predecessor, Professor Akilagpa Sawyerr, previous Board Chairman and his team for their stellar performance and respectability they brought to bear on the image of the VRA.

Conclusion

Energy infrastructure development involves huge investments. The capital outlay is staggering. Energy is becoming the major driver of competitiveness. Increased private-public sector participation in investment, energy efficiency behavior and economic electricity pricing will bring about electricity availability, accessibility and affordability.

It is a privilege to serve the people of Ghana, and we thank the Government for this privilege.

Lee Ocran

CHAIRMAN OF THE BOARD

POWER OPERATIONS

Electricity demand expected to rise by an average of 7% in fiscal year 2014 - 2021

Domestic demand for electricity is expected to rise by an average of 7% in the fiscal 2014-2021 period. Power demand is expected to grow from 1,950 MW to 3,300 MW in 2021 while energy consumption is estimated to increase from 11,400 GWh to 23,200 GWh within the same period. Power demand is estimated to maintain growth trajectory of 200 MW annually.

Inadequate Reserve Margin

Because supply and demand for electricity must balance in real time, rapid growth in demand creates operational challenges for the electric system and generating unit operators. Meeting the increasing demand can be stressful particularly ordering generators to ramp up efficiently while maintaining reliability during periods of fewer units availability, resulting from maintenance outages and other challenges, such as uncertainty in gas supply, rising crude oil prices, exacerbated by declining capacity reserve margin available in Ghana's electricity system. For example, during the first half of the year, an average capacity reserve margin of -6.96 was recorded due to inadequate generation. The supply of gas resulted in positive reserve margin for the system. The average reserve margin for the second part of the year was 11.48%, while the average for the whole year was 1.28%. The ideal level of reserve margin is over 20%.

Major drivers of electricity demand growth

The rapid growth in electricity demand is driven largely by significant GDP growth, bolstered by improved oil and gas production, increased private-sector investment, improved public infrastructure development and sustained political stability. For policy purposes, energy efficiency behavior and electricity pricing also affect electricity demand.

In 2013, Ghana's electricity demand grew by 13 per cent and this is consistent with a real growth of 10% over the last five years. However, growth in new capacity has not kept pace with demand, and this has created demand and supply imbalance, resulting in periodic load management.

Portfolio Growth

To meet the growing electricity demand, the VRA is developing and deploying a suite of generation expansion projects, in a timely manner, which would rely on a diversity of fuels for power generation, to reduce emissions generally, and to mitigate the impact of future price increases for any one fuel, in the short-to-medium term. Taken together, these projects are expected to add 510 MW in new capacity in the short-to-medium term to ensure electricity reliability and security. These include:

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Development of Renewable Energy

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Emergency Preparedness Plan

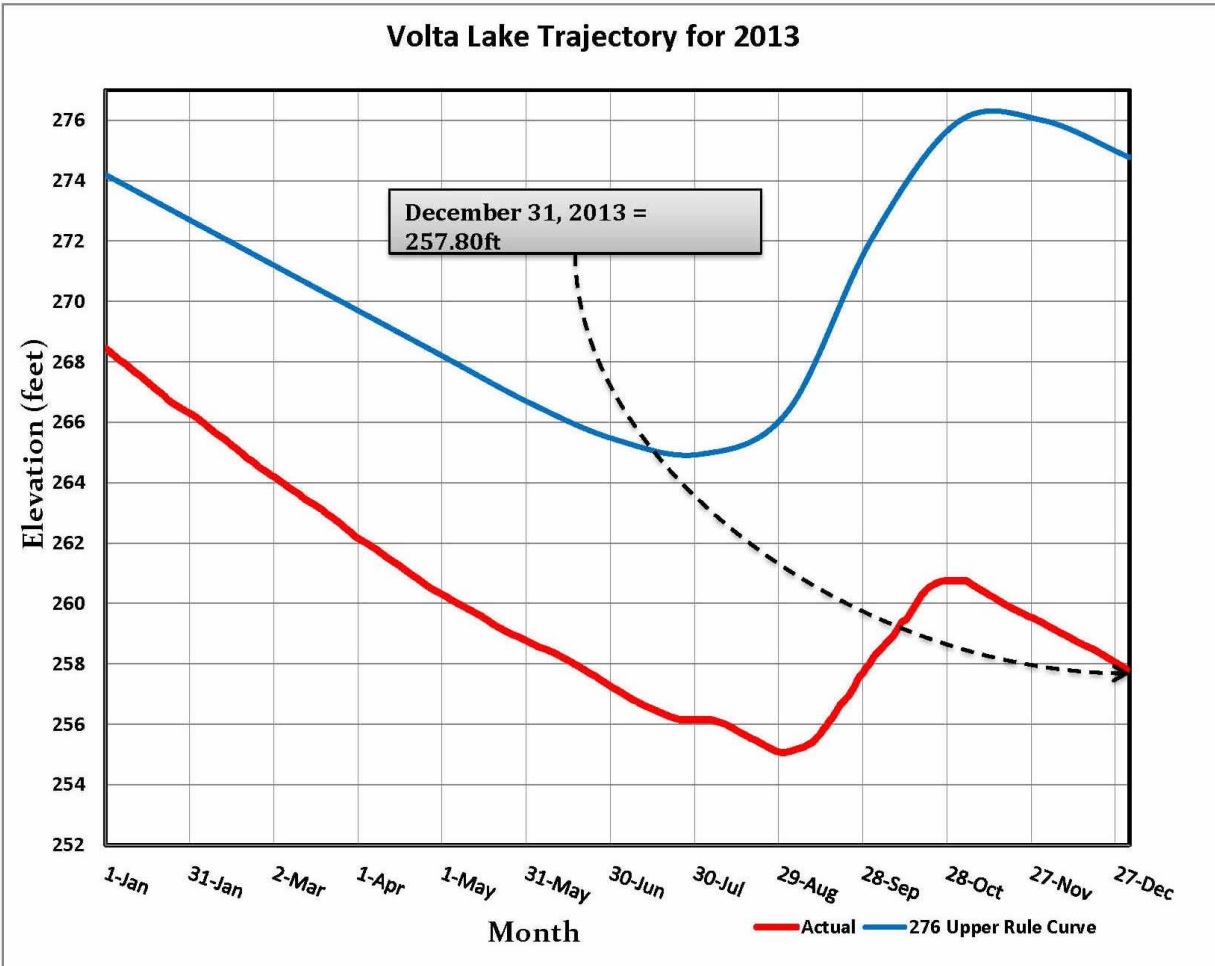
An Emergency Preparedness Plan has been developed to forestall any eventuality in the event of a spill or breach in the two hydro dams at Akosombo and Kpong.

Volta Reservoir Level and Inflows

The Volta reservoir maximum elevation at the beginning of the year (January 1, 2013) was 268.44ft. The year ended with an elevation of 257.80ft. Total net inflow into the reservoir was 16.5 MAF during the flood season.

The Volta Lake was regulated between elevations 81.82 m (268.44 ft.) at the beginning of the year and 77.74 m (255.06ft.), the minimum lake elevation at the end of the dry season. The lowest Volta Lake elevation was recorded on August 30, 2013. This represents a drop of 4.08 m (13.38 ft. from the beginning of the year. The Volta Lake attained a maximum elevation of 79.48 m (260.75 ft.) on November 4, 2013, representing a rise of 1.74 m (5.69 ft.).

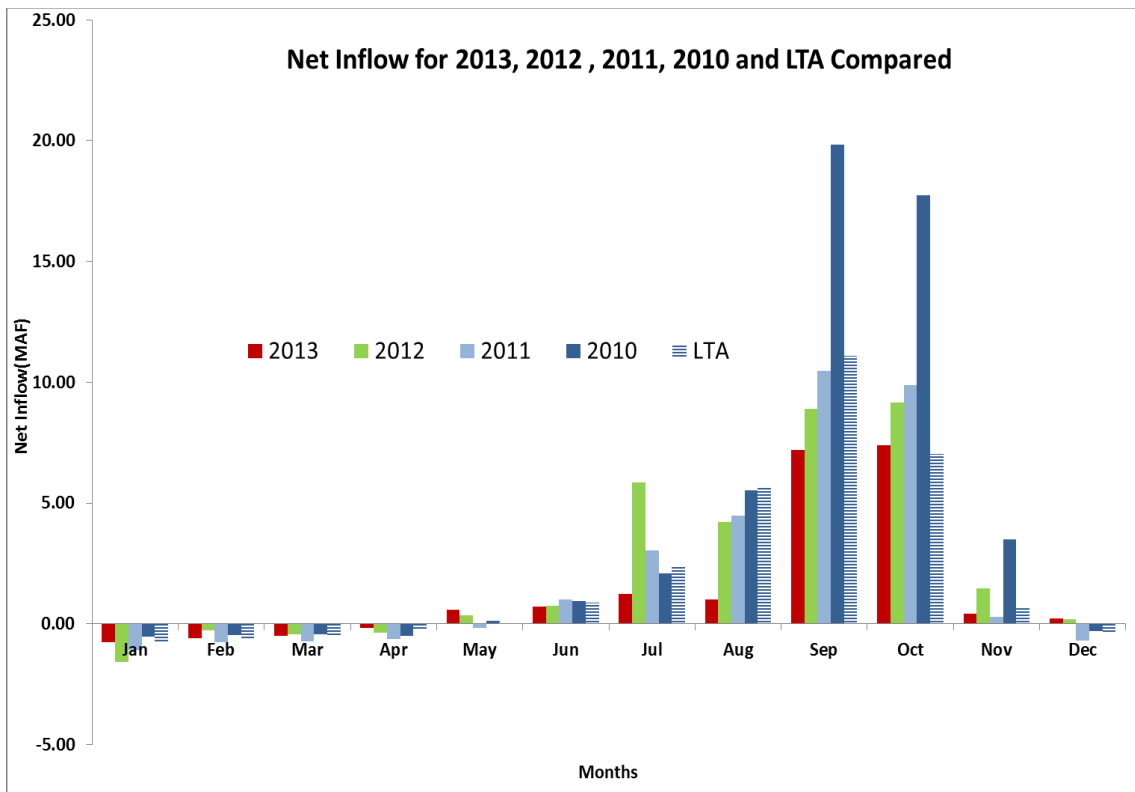
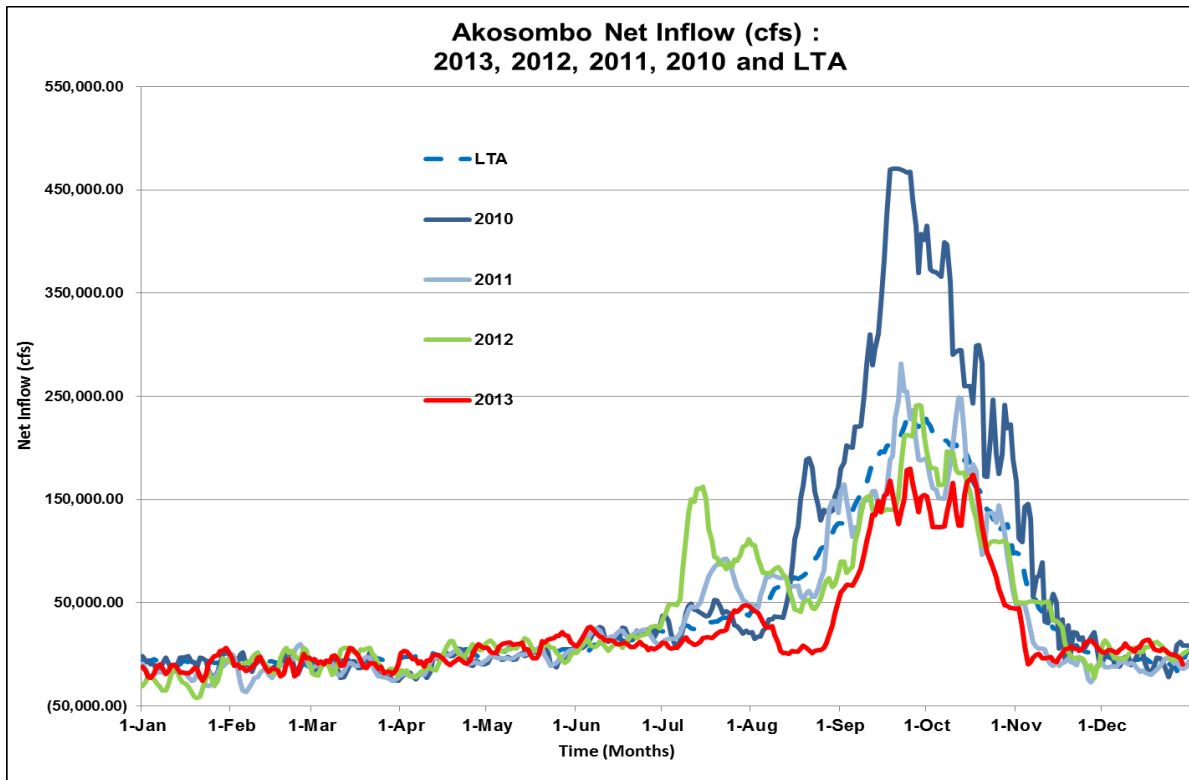
Chart 1 below shows the Volta Lake Trajectory for 2013.

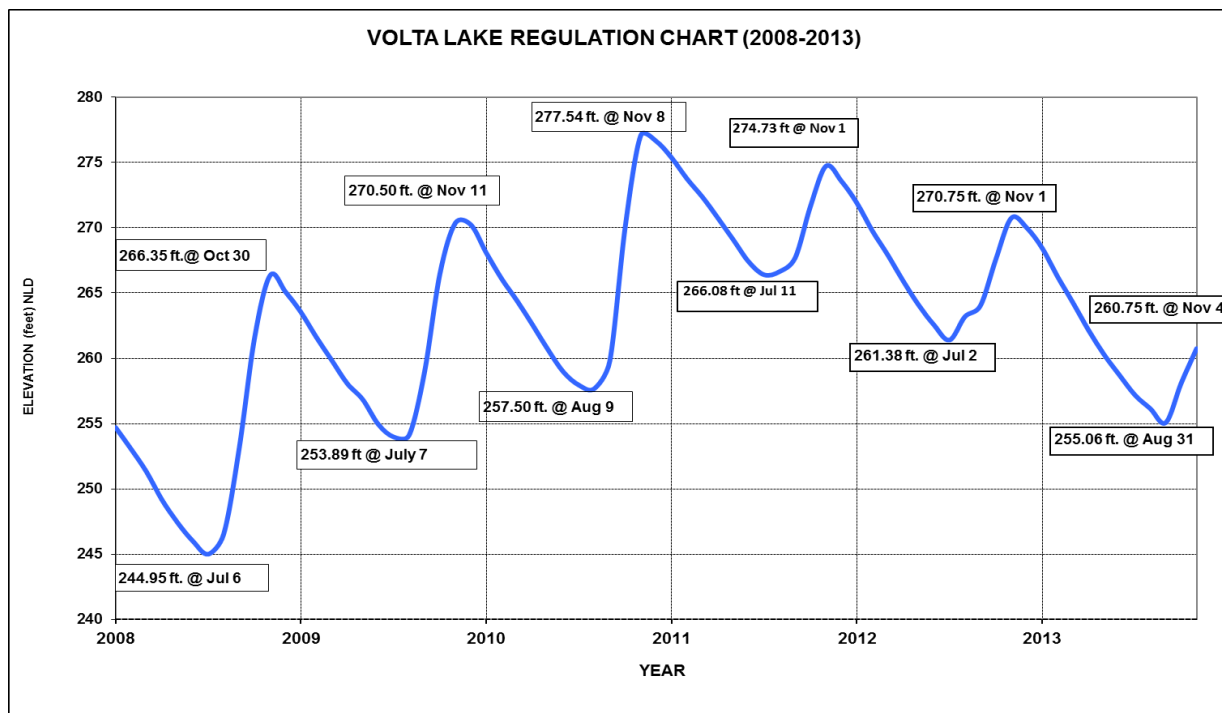


Hydrograph Pattern

The net inflow into the Volta Lake during the 2013 flood season was 20,634 MCM (16.73 MAF). This was about 33% below the long-term average net inflow of 31, 007 MCM (25.14 MAF). The instantaneous peak inflow into the reservoir was 5,793m³/s (204,563 cfs), which occurred on August 26, 2013.

The 2013 Inflow Hydrographs and monthly Net Inflow Comparison for 2013, 2012, 2011, 2010 and LTA are as shown on figures 1 and 2 below:





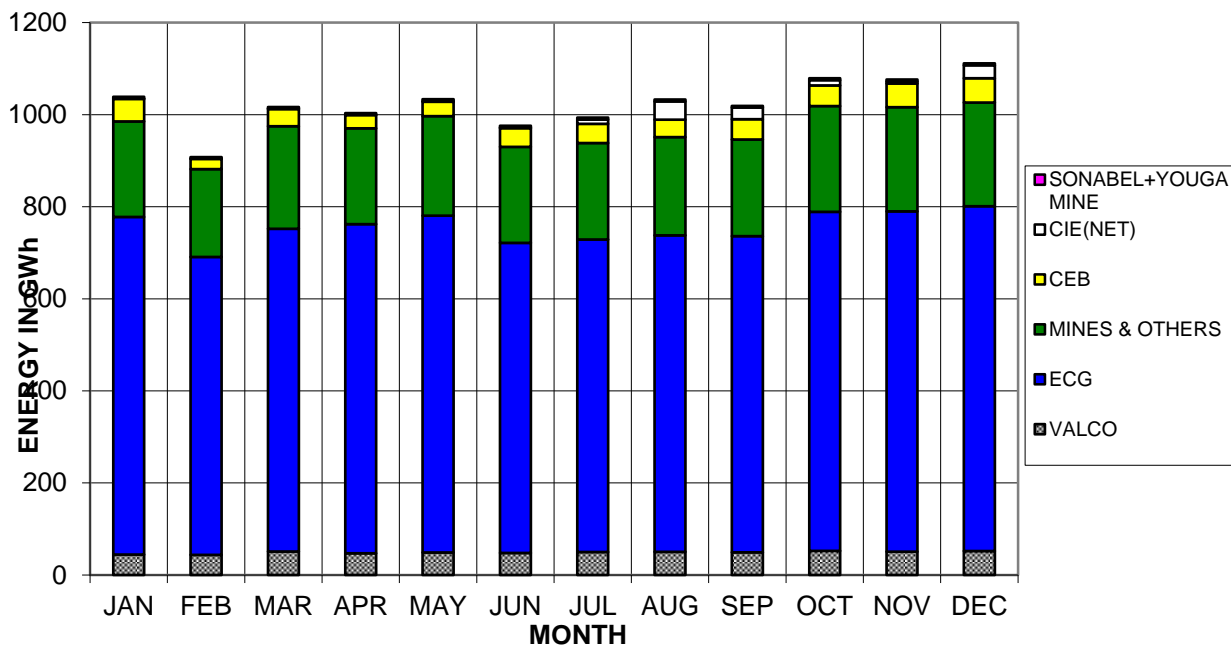
Electricity Generation

The maximum system peak recorded for the year was 1,942.9 MW. This is yet the highest peak load, reflecting the growing demand for electricity. The average peak for the period was 1,704.1 MW. Hydro thermal mix was 69% and 31% for the VRA plants. The Mines Reserve plant did not operate during the year. The plant was shut down for refurbishment to enable the units run on gas. The T3 plant which commenced operation in February 2013 was shut down in May, 2013 due to *hot corrosion* in the gas turbine units and a fire outbreak. Because of non-availability of gas supply and high cost of DFO, the TT2PP units were also operated occasionally during the year until gas supply became available.

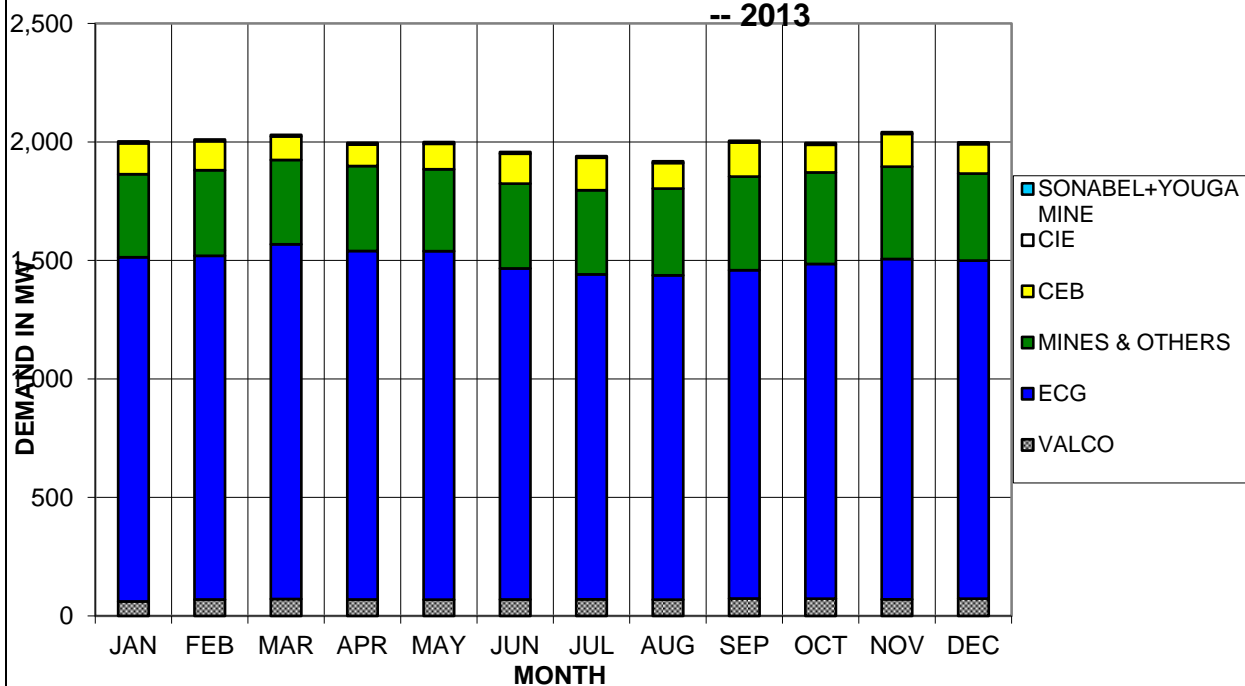
Load Management

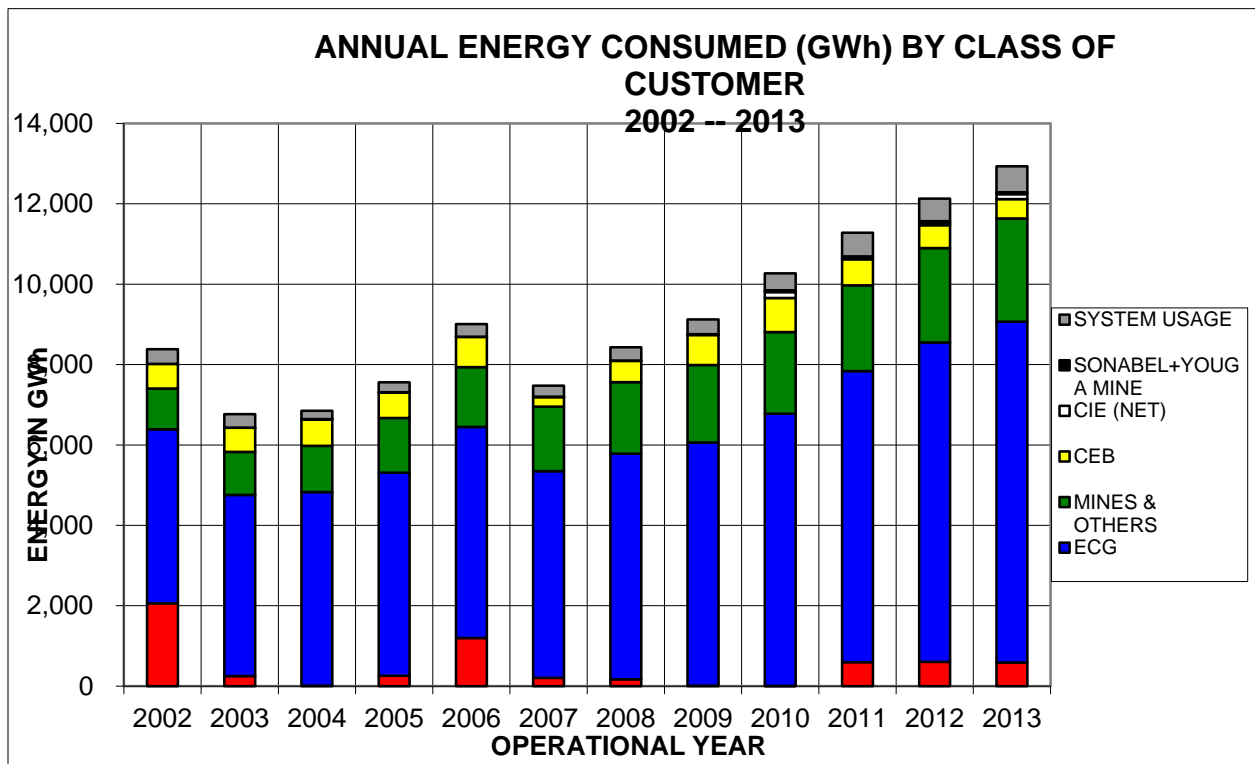
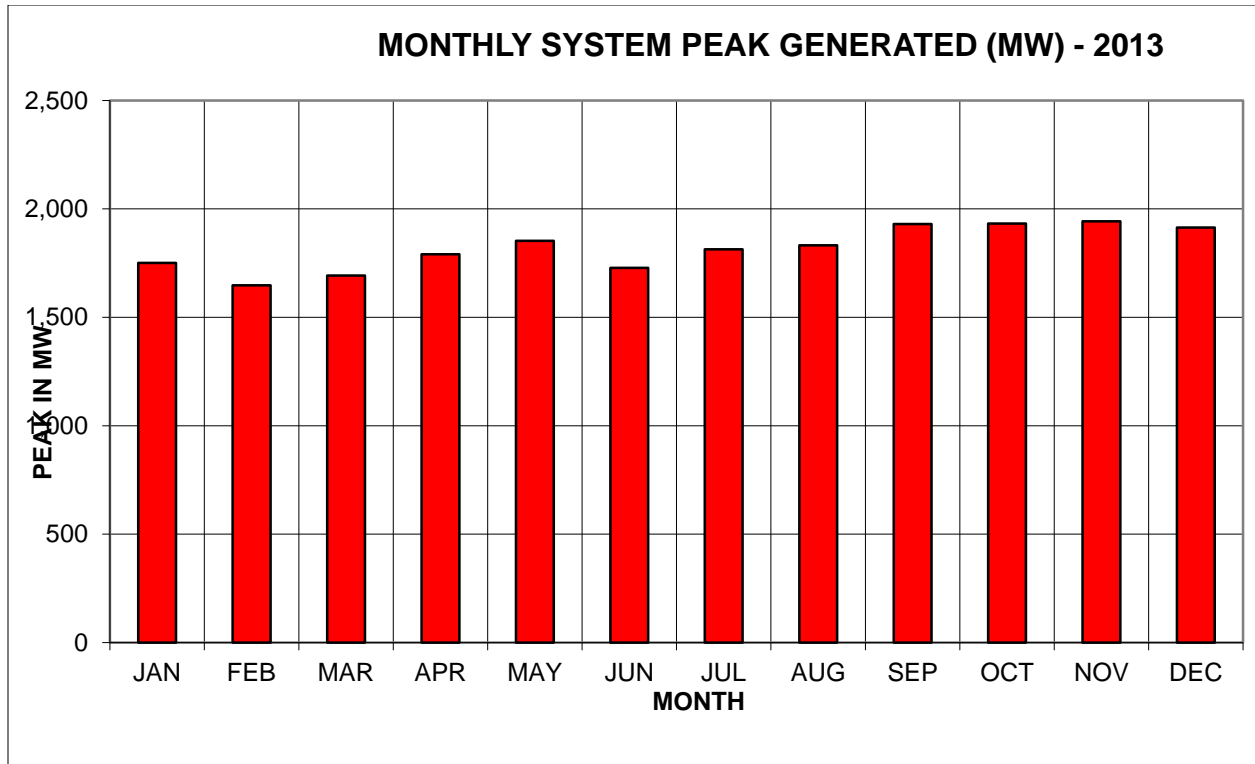
The disruption in gas supply from Nigeria resulting from a damage to the West Africa Gas Pipeline (WAGP) caused a generation deficit of about 200 MW. The situation necessitated frequent load shedding in 2013 due to shortage of fuel and non availability of gas supply. In terms of energy supply a total of about 366.18 GWh was shed from January to August. Planned load shedding did not take place from September to December because of significant improvement of gas supply and adequate generation capacity

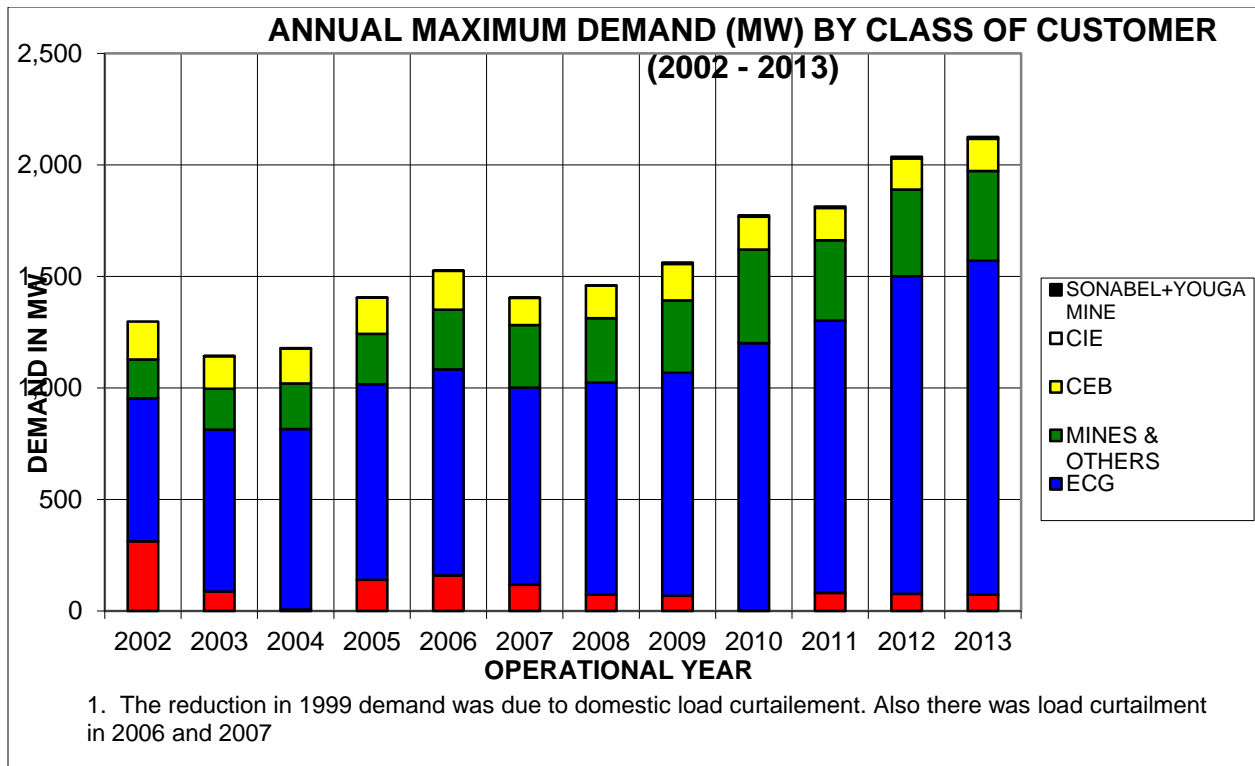
MONTHLY ENERGY CONSUMED (GWh) BY CLASS OF CUSTOMER) - 2013



MONTHLY MAXIMUM DEMAND (MW) BY CLASS OF CUSTOMER -- 2013







Electricity Production and Transmission.

A table of electricity produced and transmitted for 2012 and 2013 is as follows:

		2012	2013	Change
A	Total Energy Generation at Akosombo GS	6,949.518 GWh	6,726.692 GWh	-3.2%
B	Total Energy Generation at Kpong GS	1,121.134 GWh	1,144.452 GWh	2.1%
Bi	Bui Power Station		361.630 GWh	
C	Total Energy Generation at Takoradi 1 Thermal GS	1,061.019 GWh	1,782.973 GWh	68.0%
Ci	Total Energy Generation at Takoradi 3 Thermal GS	-	102.428 GWh	
D	Total Energy Generation at Takoradi (2) Thermal GS (TICO)	1,167.760 GWh	1,031.960 GWh	-11.6%
E	Total Energy Generation at Mines Reserve Power Station	19.645 GWh	.000 GWh	-100.0%
F	Total Energy Generation at Tema Thermal 1 Power Station	622.240 GWh	475.020 GWh	-23.7%
G	Total Energy Generation at Tema Thermal 2 Power Station	140.532 GWh	94.295 GWh	-32.9%
H	Total Energy Generation at CENIT Power Station an IPP	94.168 GWh	454.345 GWh	382.5%
I	Total Energy Generation at Sunon-Asogli Power Station an IPP	847.760 GWh	693.505 GWh	-18.2%
J	Total Energy Generated at all Generating stations (A+B+Bi+C+Ci+D+E+F+G+H+I)	12,023.776 GWh	12,867.300 GWh	7.0%
K	Energy imported from CIE for VRA use	96.993 GWh	15.119 GWh	-84.4%
Ki	Inadvertent Import from CIE		11.828 GWh	
L	Energy imported from CEB for VRA use	-	-	-
M	Total Energy Imported From CEB and CIE (K+L)	96.993 GWh	26.947 GWh	-72.2%
N	Total Energy Generated Plus Imports (J+M)	12,120.769 GWh	12,894.247 GWh	6.4%
O	Total Energy Used at all Generating Stations	36.393 GWh	61.182 GWh	68.1%
P	Energy Input to Transmission Systems (M-O-E)	12,064.731 GWh	12,833.065 GWh	6.4%
Q	Energy used in the Substations	5.461 GWh	5.495 GWh	0.6%
R	Energy Exported & Sold to CEB From VRA	566.107 GWh	481.952 GWh	-14.9%
S	*** Energy Exported & Sold to SONABEL From VRA	43.879 GWh	48.361 GWh	10.2%
T	Energy wheeled to CEB From CIE	49.372 GWh	93.958 GWh	90.3%
U	Energy Exported to CIE From VRA	57.117 GWh	122.313 GWh	114.1%
V	Total Energy Exported and wheeled (R+S+T+U)	716.475 GWh	746.584 GWh	4.2%
W	Total Consumption within Ghana (incl. VALCO)	10,920.682 GWh	11,688.621 GWh	7.0%
X	Total External Sales (CEB,CIE & SONABEL) (R+S+U)	667.103 GWh	652.625 GWh	-2.2%
Y	Total Energy Billed (W+X-E)	11,568.140 GWh	12,341.246 GWh	6.7%
Z	Transmission Losses (P+T-Q-V-W+E)	491.130 GWh	486.324 GWh	-1.0%
AA	Percentage of Transmisson Losses $Z/(P-Q)*100$	4.1%	3.8%	-6.9%
AB	Maximum Peak Generated (MW)	1,728.9 MW	1,942.9 MW	12.4%
AC	Average Demand (N/8.76) (MW)	1,383.6 MW	1,471.9 MW	6.4%
AD	Load Factor (AC/AB)	80.0%	75.8%	-5.3%
AE	Average plant discharge at Akosombo GS	1,360.55 cu.m/sec (48,076.00 cfs)	1,370.58 cu.m/sec (48,430.56 cfs)	0.7%

Note:

1. ** Generation from the Emergency Diesel Station is injected directly into the ECG network.
- 2.*** Energy exported to Sonabel includes supply to Youga Mine which started from October 2009

Hydro Energy Generation

Total hydro generation delivered was 7,871.44 GWh, 0.12% below the annual projected generation of 7,881.00. This was made up of 6,726.692GWh and 1,144.452GWh for Akosombo and Kpong GS respectively. This constitutes 61% per cent of Ghana's total energy generated. The Thermal Power plants also generated 3,475.83GWh of power, representing 27% of total energy generated for consumption in Ghana. These figures bring to 88% of VRA's energy output to Ghana's electricity sector. Total power generated in 2013 was 11,346.02 GWh.

Plant Performance Review

As a reliability-focused organization planned preventive maintenance of auxiliary equipment at both plants at Akosombo and Kpong were 100% accomplished. This enabled us to rely on our hydro facilities to deliver 61% of the total system supply.

Plant availability for Akosombo and Kpong generating stations were 97.27% and 97.78% respectively. The availability values compare favourably with industry average and median of 86.91% and 90.95% respectively.

Plant availability and capacity utilization factors attained at the Takoradi Thermal Power Station were 86.58% and 67.75% respectively, a marked improvement from the 2012 plant availability and capacity utilization factor figures.

Unit 1 of the Tema Thermal Complex was shut down for the entire period for turbine overhauls and gas conversion to dual firing capabilities. The Gas Conversion Project is expected to be completed and the plant commissioned on natural gas by the end of first quarter 2014. The 46G1 generator was shipped to the USA in February 2013 for overhauling while the 46G3 unit was unavailable at the end of December 2012 due to *"high breather pressure, metal chip detection and high vibration alarms"*.

Unit 2 remained in service throughout the year, but was shut down for an installation of water cooled check valves and hot gas path inspection (HGPI) in January and November 2013. Fuel nozzle coking due to dual fuel usage and control problems accounted for most of the unplanned outage periods. All five units at the station were available and on standby except for unplanned outage periods. However, 50G6 unit was shut down in September 2013 as it had exceeded its mandatory run hours while 50G5 unit became unavailable from October to December 2013 due to excitation failure.

Total energy generation from the Tema Thermal Complex was 538.18GWh while the Complex's consumption was 11.95GWh.

Major System Disturbance

One major system disturbance occurred during the year. The incident happened on July 18, 2013 at 18.44hrs, and was caused by the tripping of all Akosombo generators by the plant line protection relays when the dc supply to the relays was lost. Modifications have since been

carried out on the plant protection relays to prevent the tripping of the generators when the dc supply is lost.

Business Information quality

Business data quality and availability increase productivity, from optimizing its processes to creating a viable strategy. That is why the VRA is developing an *Integrated Generation System (IGS) Project* that would integrate the Authority's power generation sources to provide real time information about the VRA's power generation business in a format that enhances decision-making and provides quick solutions to system problems. The IGIS project in collaboration with ABB and GRIDCO successfully completed a "Thin-Client" Solution that extended "View-Only" access of the new GRIDCO Supervisory Control and Data Acquisition/Energy Management System (SCADA/EMS System) to provide exclusive real-time view of VRA generation.

The benefit of the project is that the Chief Executive, Deputy Chief Executive, Engineering and Operations Branch, other senior management as well as the various plant managers and key engineers have a real-time view of all the VRA Generators and their respective outputs for decision-making.



EUCG STATISTICS

The VRA renewed its membership with the Hydro Productivity Committee of the Electricity Utility Cost Group (EUCG) of the USA in 2013. The EUCG is a global association of energy and electric utility professionals, who discuss current and emerging industry issues, share best practice and exchange data for benchmarking purposes. Our involvement in the activities of the EUCG demonstrates our commitment to world class excellence. As a consequence, the Akosombo Generating Station has been ranked by the EUCG, in the top 5 in the world.

Environmental Review

No major significant environmental problems occurred during the year.

NO_x and SO₂ Emission Monitoring

Stack NO_x and SO₂ monitoring at the Takoradi Thermal Power Station was carried out for most part of the year. The NO_x and SO₂ emission levels show compliance with EPA acceptable limit (for NO_x and SO₂ of 1000 mg/m³ and 120 mg/m³ respectively).

Emission Credit Development (CDM)

The VRA appointed Stanbic Bank to undertake preparation and registration of the VRA solar and wind energy projects with the CDM Executive Board. ENRCAP of France is undertaking CDM for the Kpone and Takoradi 3 Thermal Power projects.

Wind Power Project

In line with our vision of increasing our renewable energy portfolio, the VRA has since October 2013 commenced wind measurement for eight (8) wind sites. Masts have been installed and data is being collected for feasibility studies on the two best sites, expected to commence by the end of 2014.

Review of Power Sales Contracts

We largely concluded negotiations for a Draft Power Sales and Purchase Agreements with the following customers:

- Newmont Ghana Gold Ltd
- Enclave Power Company Ltd
- Diamond Cement Ghana Ltd
- Perseus Mining Ghana Ltd
- AngloGold Ashanti Ltd
- Goldfields Ltd
- Golden Star Resources (Bogosus/Prestea)
- Golden Star Resources (Wassa)
- Adamus Resources Ltd
- Savanna Diamond Cement Ltd

- Aluworks

New Markets

Three potential customers namely Sentuo Steel Ltd. GHACEM Ltd and Tema Steel Ltd. requested for direct power supply to their respective factory sites. We held a series of meetings and completed negotiations for a Draft PSPA except the respective tariff offers.

KGRL, a mining company located in the Amansie West District of the Ashanti Region. requested the VRA to supply its Esaase Mine with 20 MW of power, but this would be considered on completion of the Esaase Mine project.

Reconciliation Meeting

The VRA held two meetings (February 21-22, 2013) with CEB in Lome to negotiate the proportion of firm and excess hydro allocation for 2012 and 2013 respectively and to determine the tariffs for 2013. An Addendum to the Power Exchange Agreement between the VRA and CEB was signed based on the pricing model for 2012. The Addendum was in respect of energy consumed in excess of the Guaranteed Energy and Firm Hydro allocation.

Customer Survey

To improve our service, we conducted a survey, using questionnaires, administered to our customers. The response rate was 60% and the overall customer satisfaction index stood at 81.90%.

Regulatory Affairs

The VRA held a meeting with the Energy Commission (EC) to discuss payment for energy supply from CIE used in supporting supply during slight supply shortfalls. The EC's position was that GRIDCo should be responsible for the payment of the balancing energy but the PURC would have to allow GRIDCo to recover the cost from customers.

Consultation with Tema Free Zones Stakeholders

The Ministry of Energy facilitated a meeting on the dispute between the Ghana Free Zone Board (GFZB) and Enclave Power Company (EPC), at which the EPC and GFZB were to cooperate in the supply of electricity to the Tema Export Processing Zone.

The dispute has had a detrimental effect on the VRA receivables and we are working to resolve the dispute to achieve the following objectives:

1. To recover debts owed to VRA by GFZB and the International Land Development Company (ILDC),
2. To agree on a tariff regime, and to enter into a PPA with EPC for the Tema Free Zone.

Tariff

Following a major review of electricity tariffs, the PURC approved new tariffs effective October 1, 2013, resulting in an increase in the VRA's Bulk Generation Charge (BGC) which increased from GHp 8.4495/kWh to GHp 11.49/kWh. Although this represented a 36% increase in the BGC, the average End User Tariff (EUT) increased by 63%, that is from GHp 22.33/kWh to 36.34/kWh.

Since the tariff increase was of concern to labour and industry, the Government appointed a Technical Working Group (TWG) on Utility Tariffs, chaired by Dr. Joe Abbey of Centre for Policy Analysis (CEPA). Along with ECG, GRIDCo and TUC, the VRA participated in the working sessions of the TWG. In its Interim Report, the TWG strongly recommended the implementation of the Automatic Tariff Adjustment Formula.

Contracts

The VRA met with the mining companies on November 27, 2013 to discuss LI1937 Regulation. It was emphasized that bilateral contracts between VRA and the mining companies should be lodged with the Energy Commission (EC) and PURC. Since hydro is not subject to bilateral contract, the pricing formula would be revised by excluding hydro in the computation.

NON - CORE OPERATIONS

Rewarding Employee Commitment and Service

The VRA employs efficient and talented staff, and lays emphasis on training and development, which gives the VRA an incredible power. A total of 560 courses, including off-shore training were organized for employees.

Many of these employee, who have committed their entire career in the VRA, have built a strong track record of expertise and success. The VRA has developed unique incentives for long serving staff, who receive special recognition at elaborate ceremonies for loyalty.

The VRA's business varies from power generation and health delivery to education and real estate. It employs a little over 3000 people across the country. At the end of the year the corporate staff strength for permanent staff stood at 2,999 while the contract strength was 166. .

Human resource activities are digitalized to ensure efficiency and real time value. Reward and performance management systems have been computerized with new Web-Based Jeasy Software for job evaluation, and customization of performance management system are now carried out on HRMS Oracle platforms.

Health and Safety Management

The VRA places a high premium on health and safety, and implores employees to eternalize these principles, which are codified in a corporate handbook while lessons and demonstration on these principles are taught across the organization. Annual medical examination is mandatory for all staff and this forms part of reward and management systems.

Our priorities are to enhance health and safety. We strive to be a safety leader in our industry, a world-class operator, a responsible corporate citizen and a good employer.

We are working to build a stronger, safer VRA that plays to its distinctive strengths and capabilities

As a signatory of the UN Global Compact, the VRA has built a strong culture of engagement with staff leadership to promote industrial harmony.

What drives the VRA success are three attributes: vision, competence and excellence.

Today, the VRA is the second largest utility in sub-Saharan Africa, after South Africa's ESKOM.

Enterprise-wide technology enabled organization

We are transforming the way that we operate. Digital tools will make us build a stronger world class organization through technology to make us faster and more efficient.. We are investing in high performance technology so that we can lower cost and drive speed. We have digitized our Oracle HRMS applications and conducted the final Conference Room Pilot (CRP) to

showcase customized forms and the process of computation of Employee Performance score and outcome, and have demonstrated how the system could be used for purposes of reward management systems.

We conducted user training as part of training aimed at equipping selected officers with the skill and ability to train other staff on how to use the PMS tools on the Oracle HRMS to set individual performance targets, review targets and assess staff competency using the 360 degree framework. The HR System Administrators and the PMS team were exposed to the system administration responsibilities and how to organize and publish performance plans and notify staff. The user training covered 17 officers drawn from different departments and professional backgrounds.

We continued to expand our ICT to enable our staff work with ease and speed. During the year under review, we undertook the following projects:

- Rehabilitation & extension of the Local Area Network/Wide Area Network (LAN/WAN) Project (Southern) Sector; extension of WAN network connectivity to the Navrongo Solar Plant with the assistance of Vodafone that provided terminal equipment at the site and laid the fibre cable to the solar plant.
- Upgrade Data Centre (DC) and Disaster Recovery (DR) Solution Project
- Audio/Video Conferencing
- Bandwidth Optimization

The Authority also rolled out the following business applications:

- **Digital Attorney**
Phase I (Time Tracker and Billing Module) was installed and configured and is being tested by Legal Services Department after resolving database and application connectivity challenges.
- **Hospital Management Information System (HMIS)**
Implementation of the HMIS continued through the year, with various modules being rolled out. The VRA provided training to staff on the following modules which have gone live:
 - ❖ The Pharmacy (Phase I) Module- dispensing drugs for NHIS as well as cash and carry patients.
 - ❖ The e-Claims Module- will enable VRA send claims to the Ghana Health Services electronically.
 - ❖ The Records Module (Updated) - will take care of Registration, Transfer and Discharge of patients.

With the completion of LAN/WAN in VRA locations, plans are underway to complete the deployment of all modules in all three (3) VRA hospitals.

- **Transport Management System (TMS)**

As fuel prices continue to rise, the VRA has been considering effective ways to streamline its fleet operations and achieve cost reduction from transportation optimization, and improved service performance. Through the VRA's Transport Management System, we have deployed a new transport management software to optimize performance in the following domains:

- ❖ General Ledger (GL) Interface Run for Fuel and Receipt Issues.
- ❖ Upgrade the vehicle control module
- ❖ Review of TMS in Akosombo.
- ❖ Maintenance module of TMS

We plan in the coming year to undertake a comprehensive transport management system in the VRA to deliver productivity. This will deliver substantial savings.

Document Management

The Authority is building a digitized documents system for easy storage and retrieval.

Corporate Social Responsibility

VRA recognizes the need to align its corporate social responsibility (CSR) activities to its business strategies and the communities where it operates. As a corporate citizen VRA's CSR initiatives are aimed at contributing to the wellbeing of communities; but also towards skills development, education and enterprise development and in turn promoting jobs, alleviating poverty and improving employability. We are building local capability to deliver local solutions. The VRA has the largest presence in the communities. An amount of GHS87.9 million (2012: GHS62.3 million) was spent on CSI initiatives during the year.

To further align the Authority's CSR activities, the VRA set up a CSR Unit in June 2013, introduced a draft CSR Policy and undertook the following activities:

- Formulated a draft CSR policy and model.
- Implemented a teaching and career guidance programme for students of Osu-Doku Senior Secondary and Technical School in the Dangbe West District. A total of 13 volunteer staff, a national service person and an intern participated in the programme. This activity falls under the Employee Volunteer Programme.
- Awarded scholarship to 60 youth in VRA communities tenable at second and tertiary schools under the VRA Community Development Programme.
- Signed a Memorandum of Understanding with Safe Water Network to provide quality water supply to VRA communities.

SUBSIDIARIES

The Authority's corporate strategic objective is to commercialize the existing subsidiaries and other non-power functions to ensure value addition and increased profitability. The strategy has shifted from a Public Private Participation (PPP) approach, to operationalization of Strategic Business Units (SBUs) through internally generated funds.

We are now assessing other strategies and financing options for the expansion plans of Akosombo Hotels and operationalization of the Kpong Farms.

Akosombo Hotels Ltd: Consideration is being given to medium-term debt financing from banks/financiers for the hotel expansion project. The hotel needs about \$10,000,000 to complete construction of 65-100 rooms and to complete re-construction of Dodi Princess, which was burnt down in a fire incident.

Kpong Farms Ltd: We are considering long-term leasing as a structuring option for private sector participation in Kpong Farms.

Volta Lake Transport Company

The Volta Lake Transport Company, incorporated in 1970, operates river transportation for passengers, bulk haulage of petroleum products and significant quantity of cement, and cross-lake ferry services along the Volta Lake.

VLTC financial reports suggest they did not generate sufficient funds to meet running costs. The company reports a net operating loss of ₵1,126,311 before depreciation. Loss for the year 2013, including depreciation stood at ₵7,088,811.

The loss is mainly attributed to loss of revenue from the ferrying of cement to the North following an accident earlier in the year that rendered one of the barges un-operational. In addition, BOST, hitherto a major client, did not use the lake for fuel shipments causing a huge fall in the revenue base.

With an asset net book value of GHS 92 million, the low revenue performance exposes many of the assets to be ineffective in generating revenue. It could also be due to a low pricing strategy to provide a social service to the community, an ineffective billing procedure, or the procurement of equipment for VLTC that are not fit for operational reasons. Plans have been made to get Private Partnership in the running of VLTC.

The Government of Ghana in 2013 procured three new water buses and a 130-tonne ferry which arrived in September.

Other support initiatives from the World Bank include preparation of more landing sites, new port equipment for Buipe and Akosombo Ports and new engines for VLTC ferries.

VRA has spent some US\$1,200,000 in recent years to improve safety on the vessels and appointed a new management team in 2013 to improve the financial fortunes of the company.

Kpong Farms Ltd

In January 2012, minor rice cultivation was commenced to maintain and enhance the farm, in anticipation of private sector partnership opportunities. This culminated in 27 hectares being cultivated in 2013 of which 129,168 kilos of rice were harvested.

A long-term lease arrangement is being considered to revive operations of the Kpong Farms.