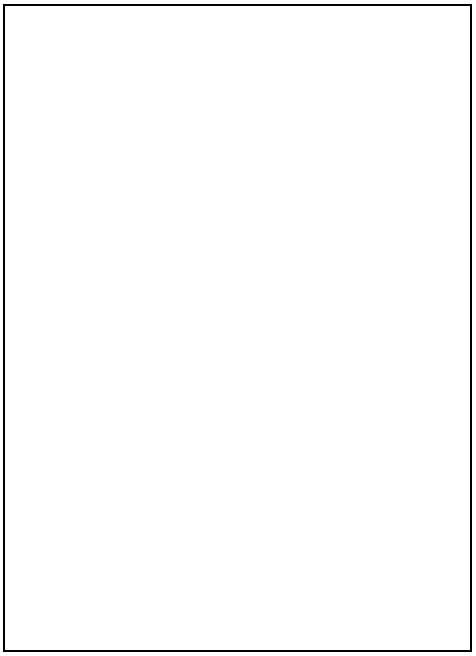

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RESPONSIBILITY FOR ALL
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Short C.V.

UNIVERSAL ACCESS TO ELECTRICITY

RESPONSIBILITY FOR ALL

-Ing. A. T. Barfour, FGhIE

President 2009 - 2010

"And God said Let there be lights in the firmament of the heaven to divide the day from the night and let them be for signs, and for seasons and for days and years:"

(Genesis 1:14)

ABSTRACT

Life in any form (Flora and Fauna) depends on the energy it produces in various forms to survive. The energy from the sun fuels all life on earth. The human body requires energy to do our daily chores, the vehicles burn fuel to get the energy to move from one place to the other. We harness the solar energy to produce heat, electricity or radiation for various purposes in life. We build dams across rivers to tap the hydro potential to produce electricity for diverse uses.

Energy as we all know can be produced from bio-mass, wind, fossil fuel, solar, tidal wave, etc and used as a form of heat to cook, drive, move or processed as electrical energy and used the world over for domestic, commercial and industrial purposes.

The technology for producing electricity is matured and available to all nations. It is, however, observed that the access to this vital commodity in the third world is very low especially in the Sub-Saharan African countries despite being endowed with high potential for the production of electricity. We are informed that Congo DRC alone has hydro potential of about 44,000 MW but its access rate to electricity is about 20%.

It is further observed that the rural communities have lower penetrating factor to electricity compared to the urban and city dwellers even in these developing countries. The aim of the address is to examine some of the challenges of these poor countries and using Ghana's National Electrification Scheme (NES) as a case study to find where we are, how we got there, and how do we achieve the Universal Access to Electricity and whose responsibility it is for us to reach our ultimate goal; thus the theme of the address: "Universal Access to Electricity– Responsibility of All"

1.0 INTRODUCTION

Energy is the engine for driving the economic development of any nation, be it developed or developing.

Electricity as a form of energy has assumed greater importance because.

- It is convenient and versatile for the home, commerce and industry.
- It can be produced from diverse fuel sources.

- There is increased efficiency and economies of scale in its production.

Electricity in its alternating current form as commercially produced now cannot be stored. It is therefore essential that electrical energy produced must meet demand taking into consideration losses in production, transmission and distribution and some spinning reserve.

The process of getting electricity to the population for whatever purposes or use is termed "Access". The rate at which a nation is able to penetrate its countryside with electricity is usually referred to as the "Access Rate" or "Penetrating Factor".

Depending on where one finds oneself, the access rate (penetrating factor) to electricity may be defined in two ways:

A. The number of people who have electricity available to them as compared to the national population i.e.

$$\text{Access Rate (Penetration Factor} = \frac{\text{Number of People with electricity}}{\text{National Population}}$$

or

B. The number of households connected to electricity multiplied by the average persons per household divided by the national population i.e.

$$\text{Access Rate (Penetration Factor} = \frac{\text{No of Hhld with electricity x Avg No of Pers per Hhld}}{\text{National Population}}$$

In Ghana using definition A, the Access Rate (Penetration Factor) is 0.67

Whilst using definition B, the Access Rate (Penetration Factor) is 0.61

Definition A. gives the per capita availability of electricity in the community; B shows the number of households that are actually connected and presumably use electricity in the community.

It is globally accepted that if a nation achieves 90% or more penetration factor then that nation can be assumed to have Universal Access. Most developed or industrialized nations have Universal Access. In Africa, the Northern Arab countries and South Africa have virtually achieved this feat, whiles most Sub-Saharan countries have Access Rates of less than 25%.

Ghana's Access rate of 0.58 as at 2006 is relatively high compared to other Sub - Saharan Countries as shown in Table 1. On the other hand Ghana is far from achieving Universal Access and this address is intended to examine the stakeholders involved and each stakeholder's responsibility for achieving the Universal Access thus the theme: "Universal Access to Electricity– Responsibility of All"

Table 1: Access to electricity in some Sub Saharan African Countries (2006)		
Country	***Population (Million)***	***Penetration Factor (%)***
Angola	**14.6**	**12**
Cameroon	**14.2**	**22**
Chad	**10.1**	**3**
Cote d'Ivoire	**2.9**	**22**
Equatorial Guinea	**11.6**	**39**
Gabon	**0.9**	**27**
Mozambique	**18.6**	**30**
Nigeria	**76.6**	**11**
Sudan	**26.9**	**47**
Ghana	**22.4**	**58**

Source: international Energy Agency

2.0 WORLD PERSPECTIVE

The provision of electricity for communities underpinned by complementary policies can provide the impetus/catalyst for the development of small and medium scale enterprise. This would in turn provide employment and promote other development programmes. It could also have the added advantage of reducing rural – urban migration which is becoming a serious problem in Sub-Saharan Africa. The overall effect is that the citizenry have an improved or better quality of life.

The provision of electricity in the developed and industrialized world started during the period of industrial revolution as a means of increasing industrial output at factories. The expansion of electricity to the rural areas in the developed world started earnestly after the First World War through to the early fifties, that is after the Second World War.

In the Asian countries electricity expansion to rural communities began in the early sixties and by the mid-seventies most Asian countries including China and India had achieved over 88% penetration. As at now, most Asian countries have achieved Universal Access as indicated in Table 2.

Table 2: Electricity Access in Developing Countries

	Population Without Electricity (million)	Percentage of Population with Electricity	Percentage of Urban Population with Electricity	Percentage of Rural Population with Electricity
Region/ Country		Total	Urban	Rural
South Asia	706	51.80	69.70	44.70
Sub Saharan Africa	547	25.90	58.30	8.00
Ghana	10.8	54.00	67.10	16.00
North Africa & The Middle East	48	85.80	91.50	77.50
East Asia	224	88.50	94.90	84.00
China	8.5	99.40	100.00	98.90
Latin America	45	90.00	98.00	65.60
Developing Countries	1569	68.30	85.20	56.40

Source: International Energy Agency

Latin-American countries also embarked on massive electrification programmes from the early fifties and in a span of twenty years most countries had achieved over 90% access rate as shown in Table 2.

In the North African countries like Morocco, Libya, Algeria, Tunisia and Egypt referred to as COMECON Pool the access rate is almost universal as at now as shown in Table 2.

With the exception of South Africa all countries south of the Sahara have penetration factors ranging from 10% to 40 % as at 2005 with an average per capita population access rate of about 25% as of 2008 as indicated in Table 1.

The issue is if the world economy depends on electricity, why have African countries been left behind? We are informed that about 1.5billion people in the world have no access to electricity and that about 500 million come from Africa (almost 33%). Why?

In May 2007, African Energy and Finance Ministers held a conference on Energy in Accra. The key challenges that confront the poor energy access and usage were identified as:

- High Investment Cost
- Rising Oil Prices
- Weak Regulatory Environment
- Inefficient Pricing Policy
- Poor Institutional Capacity
- Environment not conducive for Private Sector Participation in Energy Sector

3.0 BACKGROUND OF ELECTRICITY ACCESS IN GHANA

Power generation in Ghana started in Sekondi in 1914 by the Railway Administration to serve its operations and merchant stores like AC Leventis, Bartholomew, UAC and UTC. A new department known as Government Electrical Department under the Railway's Administration was setup to operate and maintain the generating station.

In 1922, a limited Direct Current (DC) supply was established in Accra by the Public Works Department (PWD). This was followed by a large Alternating Current (AC) supply in 1924. Kumasi had supply in 1927 and was followed in 1928 by Takoradi.

Between 1929 and 1938 power was extended to Cape Coast and Tamale and between 1949 and 1957 urban town like Dunkwa, Bolgatanga, Oda, Keta, Tema and Ho had supply.

In 1947 the Electricity Department was set up to operate and maintain the generation stations and their Distribution System. Later changed into Electricity Division, the utility provider between 1961 and 1964 increased the capacity of the Tema power Station to 30MW which at the time made it the biggest single diesel generation station in West Africa. The Electricity Division extended the first 161kV transmission line to link the Tema Power station to Accra where the power was largely needed.

In the early 60's the industrial load was very small and the industries did not consume more than 15% of available electrical energy.The sources of electrical energy supply in the country, before the Akosombo project were mainly thermal from diesel powered generators. At the inception of power supply from Akosombo, the Volta Aluminium Company (VALCO), the American Aluminium Smelting Company owned mainly by Kaiser Group of Companies and which partly guaranteed the use of the energy before the then Ghana Government could obtain the necessary American backing for the funds, took about 70% of total energy produced at Akosombo compared to total Domestic Consumption of about 25%.

In 1965 when the National Grid was commissioned, grid power was extended to Accra, Tema, Winneba, Cape-Coast Sekondi Takoradi, Kumasi Nkawkaw, Tafo/Koforidua and mining towns of Tarkwa, Prestea, Obuasi, Konongo and Akwatia. The diesel generating stations in these areas were decommissioned.

Also in 1970, the then Government established a Rural Electrification Committee with the objective of bringing electrification to rural areas as a means of reducing the urban - rural inequalities and increasing economic activities in the rural areas.

This policy of government led to the establishment of diesel generating stations and the electrification of Denu/Aflao, Hohoe, Offinso, Ashanti Mampong, Breman Asikuma, Adeiso, Kibi, Bekwai, Axim, Bibiani, Brekum and Techiman

3.1 **Large Scale Grid Extensions**

Between 1967 and 1975 the then Governments contracted various multilateral and bilateral loans to rehabilitate, reinforce and expand the distribution networks in southern Ghana.

These projects include;

- The Kwahu Ridge Electrification Project
- Grid extension to Ashanti Mampong, Effiduase and Kumawu areas
- Supply to Sefwi area
- Volta Electrification Project Phase 1 (69kV) extension from Asiekpe to major towns of Ho, Kpeve, Kpando, Hohoe and some 44 other communities.

3.2 Other Major Electricity Infrastructure Developments

By 1977 it was foreseen that the capacity at Akosombo was not going to be enough to maintain the growing domestic demand on one hand and the demand from VALCO, Togo and Benin on the other.

VRA therefore embarked on two projects i.e., the building of the 160MW Kpong hydro generating plant in 1981 and the 225kV tie line to La Cote d'Ivoire in 1983 as short term-term interventions. The 225 kV – Tie line was to allow power exchanges between the two neighbouring countries as and when it became necessary. Until 1994, Ghana was a net exporter of electrical energy to La Cote D'Ivoire.

The Kpong Plant came to mitigate the possible electrical energy shortfall at the domestic front since at that time, the VALCO master agreement did not allow VRA to reduce the VALCO guaranteed quota of energy from Akosombo.

In 1982, the Kpong Generating Plant was commissioned and all seemed so well in the interim in our domestic energy requirements until the rains failed in 1982 and 1983 that led to the 1983 electrical energy crisis which resulted in nation-wide load shedding exercises. VALCO had to close down two of its pot-lines. Fortunately the rains subsequently came and filled the reservoir to stop the local energy curtailment exercise.

In the early 90s VRA embarked on the extension of the national grid under the Northern Electrification project. The major towns covered by the project included; Techiman, Sunyani, Tamale, Bolagatanga and others. The project cost about USD 100million and was financed by the African Development Bank (AfDB), the World Bank (IDA) and the European Investment Bank (EIB) with VRA contributing the counterpart fund.

National Electrification Scheme (NES)

The National Electrification Scheme was instituted in 1989 as government's principal instrument to achieve its policy of extending electricity to all parts of the country over a thirty-year period. At the inception of this scheme the following factors prevailed;

- National electrification access was then about 25%.
- Rural coverage was estimated at less than 5% .
- 46 out of the 110 district capitals existing then were connected to the grid.

A National Electrification Levy was instituted and the levies collected were paid into a National Electrification Fund established to support implementation of the national electrification programme.

The implementation strategies used were:

- Comprehensive National Electrification Planning Study undertaken between 1989-1991 by *Acres International* of Canada and *Asare-Tsibu & Partners* of Ghana.
- A comprehensive National Electrification Master Plan for 4,221 communities.
- All possible options of electrification considered including grid extension and off-grid renewable energy-based solutions such as biomass, solar, wind & small hydro.
- 69 grid-based electrification project packages identified and prioritized for implementation over six 5-year phases.
- Connection of district capitals given first priority (64 district capitals in total) and completion of already ongoing projects - Phase One
- Subsequent phases prioritized based on: economic, political, traditional & historical factors that included: - potential for small-scale industry activity, status as commercial market centre, tourism potential, political dispensation and historical importance of the area.

3.3.1 Self-Help Electrification Programme (SHEP)

SHEP is complementary electrification programme instituted to support the main NES. The rationale was to encourage the communities to embrace and support the government's effort of extending electricity to all. It was also to accelerate the extension of the grid to the communities. Communities that initiated their township electrification projects received government's support for completion of the projects earlier than the scheduled date of connection under the NEMP

Criteria for joining SHEP.

The criteria for qualifying to join SHEP were as follows:

- Community must be within 20 km of an existing 11kV or 33kV network suitable for further extension.
- Community must procure and erect all the low voltage electricity poles required for the local network.
- Evidence of a minimum of one-third of houses in the community must be wired and ready to receive electricity supply.

3.3.2 Achievements of the NES

The following major projects have been done under the NES;

- Residual Works on Volta Region Electrification Phase1
- SHEP1, (150), SHEP 2 (42) Emergency SHEP (50), SHEP 3 phase 1, 2, & 3 (1,350) and SHEP 4 phase 1 & 2 (193)
- Grid Extension to Keta I & II (26),

- Juabeso Bia Electrification (41), Electrification of Volta Lake Resettlement Townships (144), Bobikuma Electrification (11), Agomeda – Kordiabe Electrification (8).
- National Electrification Project NEP – Rural–(446)
- Electrification of parts of Western Region by the European Union (EU) – (108)
- Other Projects financed by Bilateral Agencies (272)

Figures in brackets are number of beneficiary communities.

The Table 3 shows the access rate per region in Ghana as at 2008.

Table 3: Regional Access to Electricity in Ghana as at 2008

Regions	Electrified Communities		Un-Electrified communities		Access to Electricity
	Number	Population	Number	Population	
Western	404	1,362,668	14,815	935,105	59.30%
Central	464	1,418,450	7,828	619,270	69.61%
Ashanti	1,021	3,735,166	18,662	881,386	80.91%
Greater Accra	333	3,615,565	1,536	159,506	95.77%
Volta	531	1,180,601	3,087	843,276	58.33%
Eastern	470	1,589,509	12,661	1,001,614	61.34%
Brong Ahafo	445	1,399,903	17,111	838,735	62.53%
Northern	192	1,091,015	3,833	1,415,903	43.52%
Upper East	139	345,524	1,252	791,591	30.39%
Upper West	71	228,040	1,107	485,735	31.95%
Ghana	**4,070**	**15,966,441**	**81,892**	**7,972,121**	**66.70%**

Source Ministry of Energy

3.3.3 Financing of NES / SHEP

NES Projects are financed through a mixture of Local and External Sources (grants and soft loans from a consortium of financing institutions including the Multilaterals & Bilateral funding agencies).

The local sources include funds from the consolidated fund, a levy on consumers, contribution from utility agencies and supplier's credit. The local contribution may also come from the Local Government i.e. District Assemblies; Member of Parliament's Common Fund and the Community through provision of wooden poles or labour.

Table 4 shows the summary of the various sources of funding, costs, and beneficiary communities undertaken under the NES.

Table 4:Summary of Source of funding, Beneficiary Communities and Capital Cost

Source of funding	Beneficiary Communities	Capital Cost Foreign (million)USD	Capital Cost Local (million)USD
Bilateral	422	102.58	4.00
Multilateral	554	163.03	0.28
Government of Ghana	1,865	207.80	118.14
TOTAL	2,841	473.41	122.42

Source: Ministry of Energy

4.0 **STAKEHOLDERS IN ELECTRICITY SECTOR**

The Electricity sub-sector has a number of stakeholders. The stakeholders are Government, Legislature, Judiciary, Regulators, Electricity Utility Providers, Customers, Poles and Conductors Manufacturers, Consultants/Licensed Electrical Contractors, Electrical Appliance Dealers and Other Stakeholders (Development Partners, Non-Governmental Organizations, Media).

4.1 Government

The Ministry of Energy has responsibility for setting policy guidelines relating to power, petroleum and renewable energy.

The Ministry of Finance and Economic Planning is the official shareholder of all State-Owned Enterprises and also has the responsibility for approving and monitoring the liabilities of all SOEs including the utilities in the Power Sector.

4.2 Legislature

The legislature makes and amends the law (bills and legislative instruments [LIs]) that governs the nation. The Power Sector is governed, regulated and controlled by over 20 acts and legislative instruments that have been mentioned at various stages in this address.

4.3 Judiciary

The Judiciary interprets the laws of the nation, and administers justice. The utilities and the regulatory bodies can all sue and be sued in any court of competent jurisdiction.

4.4 Regulators

There are two regulatory bodies in the power sector, namely, the Public Utility Regulatory Commission (PURC) and the Energy Commission (EC). They were set up in 1997 through Act 538 and Act 541 respectively as part of the power sector reforms.

4.4.1 Public Utility Regulatory Commission (PURC)

The PURC is an independent body tasked, among others, to:

(a) Provide guidelines on rate chargeable for provision of Utility Service
(b) Examine and approve rates chargeable for provision of Utility Services.
(c) Protect the interest of consumers and providers of utility services
(d) Monitor standards of performance for provision of utility services
(e) Initiate and conduct investigations into standard of quality f services given to consumers.
(f) Promote fair competition among utilities

The PURC has made efforts of bringing tariffs to economic levels but has not as yet succeeded because of relatively high inflation, foreign exchange fluctuation and unpredictable prices of crude oil.

4.4.2 Energy Commission (EC)

The Energy Commission, on the other hand, has as its objectives and functions, among others;

a. Regulate and manage the utilization of energy resources in Ghana and coordinate policies in relation to them.

b. Recommend national policies for the development and utilization of indigenous energy resources.

c. Advise the Minister on national policies for the efficient, economical and safe supply of electricity, national gas and petroleum products having due regard to the national economy.

d. Receive and assess applications and grant licenses under the Act to public utilities for the transmission, wholesale supply, distribution and sale of electricity and natural gas.

e. Establish and enforce in consultation with the PURC, standards of performance for public utilities engaged in the transmission, wholesale supply, distribution and sale of electricity and natural gas.

The EC through legislative instruments, the issuing of procedures and guidelines has introduced technical performance standards for regulating and controlling the utility providers in the sector.

4.4.3 Other Regulators

Apart from the above main regulators there are other regulators whose functions affect the utility providers and for that matter access to electricity. These regulators include: the Environmental Protection Agency (EPA), the Bank of Ghana (BOG), the Public Procurement Authority (PPA), the State Enterprise Commission (SEC), the Water Resources Commission (WRC), and the Ghana Standards Board (GSB).

4.5 Electric Utility Providers

The institutions in the power sector are the Volta River Authority (VRA) which generates, the Ghana Grid Company (GRIDCo) that transmits power and the Electricity Company of Ghana (ECG) which is the main distribution company with the Northern Electricity Department (NED) of VRA as the other distributor.

4.5.1 *Volta River Authority (VRA)*

The Volta River Authority (VRA) is the only state owned generating utility in the country. It came into existence in 1961 under the Volta River Development Act, Act 46. The Company's sources of generation of electric power are Hydro-electric and Thermal.

Figure 1: Akosombo Dam Source: VRA

The Hydro sources at Akosombo and Kpong have a combined installed capacity of 1,180 MW-Akosombo is rated at 1020 MW (after a recent retrofit project) whilst Kpong is 160 MW.

The thermal sources have an installed capacity of 756 MW consisting of:

- 330MW Combined Cycle Plant owned by VRA;
- 220MW: Simple Cycle Plant – a joint venture between VRA and TAQA;
- a 126MW Simple Cycle Tema Plant and an 80MW Mines Reserve Plant at Tema.

It has since 1987 been distributing power to the northern part of Ghana, through its subsidiary - NED. NED recorded aggregate peak demand of 120MW and sold about 391.5 GWh of energy to a customer population of 278,476 in year 2008. The details are provided in Table 6.

4.5.2 Other Generating Sources

Ghana experienced energy crisis in 2006/7.Due to crisis the government of Ghana embarked on various generating projects including;

- Installation of 136MW Emergency diesel plants at Tema and Kumasi.
- The signing of a management contract to rehabilitate, maintain and operate the 125MW Osagyefo Barge at Efasu (not commissioned due to lack of natural gas from Tano fields).
- The construction of 49.5MW Tema 2 Plant and

- The construction of 223.4MW Kpone Tema Plant
- The development of the 400MW Bui Hydro project which is under

construction. Other Independent Power Producers in the country include;

- The 126 MW Osunor Power Plant (being built at the same site as VRA's 126MW at Tema to allow for later upgrade of the two sets to a 330 MW combined cycle plant).
- The 200MW Sunnon Asogli Power Plant at Tema.

4.5.3 Ghana Grid Company (GRIDCo)

Ghana Grid Company Limited (GRIDCo) was incorporated under the Companies Code, Act 179, (1963) in December 2006 as a limited liability company to be the Electricity Transmission Utility.

This was pursuant to the:
Energy Commission Act, 1997 (Act 541)
Volta River Development (Amendment) Act, 2005 Act 692

Its mandate is to:
Undertake economic dispatch and transmission of electricity from wholesale suppliers to bulk customers

Provide fair and non-discriminatory transmission services to all power market participants.

Acquire, own and manage assets, facilities and systems required to transmit electrical energy

Undertake metering and billing services.

Carry out transmission system planning and implement investments necessary to provide the capacity to reliably transmit electric energy.

Manage the Whole Sale Power Market.

Figure. 2: Transmission Network of Ghana. Source: GRIDCo

GRIDCo's transmission system is made up of 36 Bulk Supply Points (BSPs) and about 4000 km of mainly 161 kV lines. GRIDCo is interconnected to La Cote d'Ivoire by a 225kV line and Togo and Benin by 161 kV lines.

Its peak demand stood at 1404 MW with a total energy generation of 8324 GWh in 2008. VRA/GRIDCo exported and wheeled 536 GWh to Burkina Faso, Togo and Benin in 2008. VRA/GRIDCo imported from La Cote d'Ivoire about 275 GWh of energy in the same year.

4.5.4 Electricity Company of Ghana (ECG)

Electricity Company of Ghana Limited (ECG) formally known as the Electricity Corporation of Ghana was established in 1967 pursuant to the Electricity Corporation of Ghana Decree of 1967 (NLCD 125) and Executive Instrument No. 59 dated June 29, 1967 which vested all assets and liabilities of the former Electricity Department in the corporation. ECG was converted into a private limited liability company pursuant to the statutory Corporations (Conversion to Companies) Act, 1993 (Act 461) to take over the assets and operations of the Corporation.

Currently, the Act prescribe the objects of ECG as follows:

To purchase, take over or acquire the undertaking and business previously carried on by the Electricity Corporation of Ghana as well as its goodwill, assets, properties, rights, debts, liabilities and obligations;

To transmit, supply and distribute electricity;

To purchase electrical energy in bulk (from the Volta River Authority) or any other supplier for distribution;

To construct, reconstruct, install, assemble, repair, maintain, operate or remove, sub-transmission lines, distribution lies, transformer stations, electrical appliances, fittings and installations; and

Other activities incidental to the attainment of the above objectives.

ECG had a non-coincident aggregate peak demand of 927.53 MW and purchased a total of 5,759.5 GWh of energy from VRA and sold 4,315.8GWh for 2008. It had a customer population of 1,722,245 as at December, 2008. The system losses stood at 25.1% as at December, 2008.

Table 5 gives the network statistics of ECG as at December, 2008

Table 5: ECG's NETWORK STATISTICS

No. of Bulk Supply Points – 23no

Type	Overhead Lines (OHL) km	Underground (UG) Cables km
Services (Insulated)	32,553	2,557
Low Voltage (Bare)	38,458	870
Medium (11kV)	5,934	1,738
High/Sub-transmission (33kV)	5,200	310

Transformers			**Voltage Levels**	
Power Transformers	-	107no.	Three voltage levels	
Distribution Transformers	-	7904no.	Sub-transmission/High Voltage	–
Primary Stations	-	83no.	Medium Voltage	33kV –
Maximum Demand (non coincident)		-924.3MW	Low Voltage	11kV – 415/230v

Source; ECG

4.6 Customers

The customers are classified into tariff groups as residential (domestic), Non-Residential (Commercial) and industrial. Table 6 shows the customer population, energy consumption and revenue generated per each class for ECG and NED. Whiles the industrial customers are few, their energy consumption and corresponding contribution to the revenue are quite high

Table 6: ECG/NED Customer Classifications

	Customers	Energy Consumption (MWh)	
	Residential	Non Residential	
ECG	1,405,756	315,363	
NED	231,175	47,266	
Total	**1,636,931**	**362,629**	

1GHc = 1.50 USD

Source; ECG & NED

4.7 Poles and Conductors Manufacturers

The two industries that have had tremendous impact on the electricity sector are the Poles and Cable & Conductor Manufacturing Entities.

The Pole group includes the African Concrete Products (ACP) for concrete poles and the Wood Poles Treatment Plants, notable amongst them are the Dupaul Wood Treatment Plants at Takoradi and Offinso, the Busi & Stephenson Plant in Kumasi, the Byes & Wyes Plant also in Kumasi and the Ipalco Plant at Ho.

There are three Cable & Conductor manufacturing factories namely;

Nexans Kablemetal, Tropical Cable & Conductors Ltd. and Reroy Cables Ltd., all situated in the industrial port city of Tema.

These manufacturers are able to supply their products to the Ministry of Energy and the Utility Agencies on credit and under flexible payment terms.

4.8 Consultants/Licensed Electrical Contractors

The Ministry of Energy has most of the time used the services of Consultants to design and supervise its access projects which are executed by the utility agencies or licensed electrical contractors,

The wiring of houses, offices, and industries are invariably done by licensed Electrical Contractors whose contribution in the Universal Access to electricity cannot be overemphasized. The consequences of poor wiring causing destructive fires that consume whole factories, markets, houses, etc and sometimes can lead to fatal results are well known and need not be equally over emphasized.

4.9 Electrical Appliance Dealers

The success of the electricity industry partly depends on the group who sell the electric cables, conductors & wires (insulated and bare) radios, television sets, air conditioners, electric motors, and other appliances for use by the consumers when electric power is connected to their homes, offices, factories, etc.

In some jurisdictions, the Utility Agencies have their own appliance stores where consumers can purchase such electrical goods for their use.

Some unscrupulous dealers tend to create problems for the industry by importing cheap energy inefficient electrical gadgets into the system to exacerbate the system losses situation.

4.10 Other Stakeholders

4.10.1 Development Partners

The government has over the years depended on its development partners to execute most of the electrification projects in the country. The Donor Fund Initiatives (DFIs) come in the form of Soft Loans or Grants. The multilateral institutions like World Bank's International Development Association (IDA), the European Union and the African Development Bank have all supported electricity development in Ghana.

The bilateral support comes in the form of Concessionary Loans, Export Credits, Suppliers Credit, Grants and others. Ghana has benefited from bilateral agencies like; JICA (Japan), DANIDA (Denmark), CIDA(Canada), SECO (Switzerland), KfW (Germany), SIDA (Sweden), GIEK (Norway), AFD (France), DFID (UK), ECGD (UK), Kuwait Fund (Kuwait), US Exim Bank, Indian Exim Bank and others.

4.10.2 Non Governmental Organizations (NGOs)

Non Governmental Organisations (NGOs) have also championed the electrification project especially in the advocacy role. The Energy Foundation for instance has promoted the productive uses of electricity in the communities and has been on the forefront of the efficient use of electrical energy.

The NGOs also promote the rapid and extensive use of renewable energy sources especially the solar lanterns and Photo Voltaic (PV) Home Systems in the rural communities.

4.10.3 Media

The media, both electronic and print, has over the years helped in the promotion of electrification projects. The utility agencies also use the media a lot in disseminating information on their operations especially during emergency periods.

5.0 CHALLENGES OF UNIVERSAL ACCESS

"Technical challenges can be daunting and credit crunch is biting but in too many African countries politics continue to pose a greater challenge to infrastructure projects and the wider development agenda" – African Energy – Jon Marks, Editor

A number of challenges informs the provision of universal access to electricity. These are discussed under a World Perspective and the Ghanaian.

5.1 World Perspective

The main challenges from the world point of view are:

Lack of Political Will, Conflicts and Wars, Lack of Investment, Capital, Abject Poverty of the rural people, the Issue of Tariffs, the Issue of Subsidies, and the Peri-Urban Challenge.

5.1.1 Lack of Political Will

Most poor countries have competing demands on their meagre resources and the Politicians tend to lack courage to embark on seemingly expensive energy projects**.**

5.1.2 Conflicts and Wars

In the world over, conflict and war-torn areas tend to have very low access to electricity. Obviously the infrastructure become targets and it is also inconceivable to extend electricity supply to conflict zones otherwise the contractors and their workforce become victims. The many conflicts and wars in Africa (Somalia, Liberia, Sierra Leone, Sudan, Chad, DR Congo, etc.) may account for the very low access rate in sub-Saharan Africa.

5.1.3 Lack of investment capital

Most nations with low penetrating factors are poor and cannot afford to raise the investment capital through their own budgets nor attract private capital easily. The level of investment required per consumer in rural areas is between two to five times greater than that required in urban areas.

5.1.4 Abject poverty of the rural people

Most rural people live below the poverty line (earn less than USD 1.25 per day) and therefore are unable to invest in productive ventures when electricity is extended to them. The administrative cost of operation and maintenance of electricity supply in rural areas are more than for urban areas but corresponding revenues are ridiculously low.

5.1.5 The Issue of Tariffs

The relative high cost of operation in the rural setting implies that the tariff to be charged should be higher than for the urban setting except where it is a national policy such as in Ghana, where tariff must be uniform country-wide. Rural customer cannot pay full cost recovery tariffs. A tariff structure must be designed in such a way that rural consumers will be willing to pay or some subsidy arrangement must be in place.

5.1.6 The Issue of Subsidies

By virtue of the level of poverty persisting in the rural setting, there is a need for subsidy in the provision of infrastructure, on energy consumption or built into the tariff. In South Africa for instance subsidies are given to the poor in the form units, say 30 units per month to a poor household by the council but Eskom is fully credited with the full cost.

Ghana applies both the Capital subsidy (free service connection for the first eighteen months) and tariff subsidies (life line tariffs) whilst Peru combine all the three types of subsides for its rural consumers.

5.1.7 The Peri-Urban Challenge

It is in most cases accepted that rural areas are poor and therefore some remedial actions are normally taken to mitigate the impact in extending power supply to them in the form of subsidies as mentioned above. On the other hand, poor urban dwellers living in dirt and squalor (The Sodom & Gomorrah of Accra, Khalitsha of Cape Town, and the Kebira of Nairobi) tend to be denied decent power supply.

The residents extend power illegally on unacceptable sub-standard distribution lines that compound the system losses of the utilities.

South Africans and Kenyans are embarking on extensive intensification programmes to regularize these illegally connected systems with Aerial Bundled Conductors (ABC) and install prepayment systems to enable them pay.

5.2 Ghana's Challenges

The major challenges facing Ghana's Electricity Sector includes but not limited to:

Poor Generation Mix, Planning for Energy Resources, Lack of Investment Capital, Inadequate Tariffs, High Demand Growth, High System Losses, and Inefficient use of Energy.

5.2.1 Poor Generation Mix

Dependency on only one generating source like hydro puts the nation at the vagaries and mercy of the weather. Any prolonged drought affects the output of hydro plants. Ghana has a lot of experience with droughts in 1983/84, 1998, 2002 and 2005/2006 in the catchment area of the lake Volta reservoir the consequences of which we are all witness to.

On the other hand, if one depends on thermal sources only, the cost of operation becomes unbearable especially when oil prices rise.

There are other sources like Nuclear, Solar (Photo-Voltaic & Thermal), Renewables-Wind, Biomass, and Tidal Wave which can be harnessed in Ghana.

5.2.2 Planning for Energy Resources

There have been various studies and reports by international consultants like Acres International who produced both VRA's Generation and Transmission System Master Plans and ECG's Sub-transmission and Distribution System Master Plans. In 2002 the Energy Commission using these documents came out with the Strategic National Energy Plan (SNEP) but the problem with the plan is that it did not identify the source of funds to be used to implement it.

5.2.3 Lack of Investment Capital.

Sometimes Strategic Plans are made but funding for such plans may not be identified.

Most times it is difficult for developing countries like Ghana to attract private investment capital especially when their economies are weak.

Our tariffs do not have any investment component and, therefore, internally -generated funds by the Utility Agencies cannot support any major new investment.

5.2.4 Inadequate Tariffs

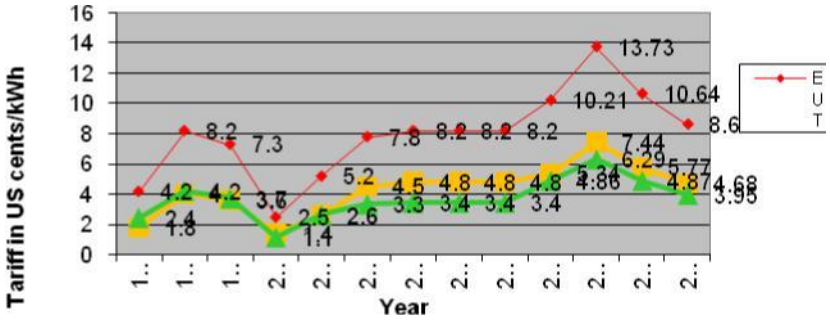
With inadequate tariffs the Utility Companies are unable to generate enough revenue to meet their running costs like operation and maintenance costs, interest and loan repayments, planned improvements and development costs let alone to have some margin to undertake major investments like planned generation mix projects or investing in network expansion schemes to meet growing demand.

Charging economic prices for electricity has been a thorny issue between the Utility Companies and the Government. The Government in most cases takes cognizance of the political and social impact a tariff adjustment can have on the general public and is not very

comfortable with the exclusive use of economic or financial analysis to determine appropriate tariffs.

The Public Utilities Regulatory Commission (PURC) as mentioned earlier has tried to set a realistic tariff over the period but most cases the tariffs have been eroded by either inflation or foreign exchange fluctuation.

The graph in Fig. 3 illustrates the tariff regime set by PURC from 1998 to June 2009.



Tariff Trends In Electricity

5.2.5 High Demand Growth

Since the Economic Recovery Programme (ERP) era of the PNDC Government with World Bank support from 1983, the national economy has improved in relative terms especially in the mining and services sectors. The cities and urban areas have been expanding uncontrollably.

The resultant effect is the high demand for electricity for mining, industrial, commercial and domestic use.

The annual energy demand growth for the past five years has been about 6-8% and is among the highest in the world. VRA has had to import sometimes up to 200MW of power from La Cote d'Ivoire to supplement the domestic consumption especially during peak periods. It is very difficult for any Utility Company to meet such high demand growth in an economy which cannot support a realistic economic price for energy.

Fig. 4 shows the energy consumption pattern from 1995 to 2008. It can be observed that despite the institution of a National Load Management Programme in 2006/2007 the energy consumption was quite high.

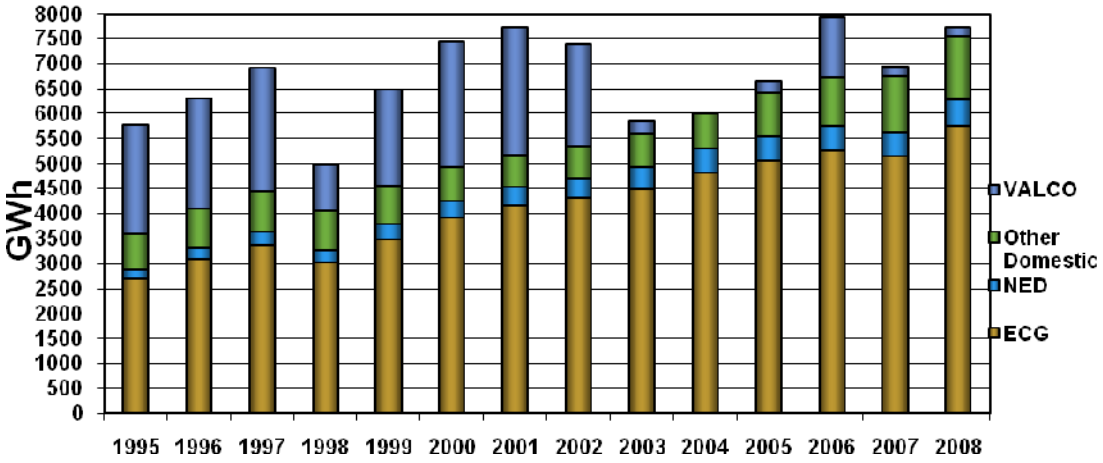


Fig. 4 **Annual Energy Consumption 1995 – 2008** Source**:** VRA/GRIDCo

5.2.6 High System Losses

The system losses of the Distribution Companies, over the period have hovered around 23 to 25% and that of transmission between 3 to 4.5%

These figures are relatively very high compared to international standards that give a range of 3 to 10% for distribution and 1 to 2% for transmission losses depending on the level of voltage for distribution or transmission.

System losses have two components namely technical and non-technical (commercial) losses

The effects of high system losses affect Universal Access in several ways but the significant ones are:

- Revenue loss to the Utility Agencies.
- Energy that otherwise could be free for new consumers are locked up.
- Investment in generation source becomes crucial.

5.2.7 Inefficient Use of Energy

In Ghana, most customers either ignorantly or deliberately leave their lights on when they do not need them. According to the Energy Foundation, 30% of our electricity is used inefficiently. Buildings and factories are put up without proper lighting designs which could save a lot of electrical energy. Most electrical gadgets or appliances imported into the country are second hand, energy inefficient goods, rejected elsewhere or cheap inferior energy consuming types.

Fortunately the Energy Commission has come out with Legislative Instrument (LI) 1815 – Energy Efficiency Standards and Labelling (Non-Ducted Air Conditioners and Self-Ballasted Fluorescent Lamps) Regulations, 2005 that will regulate the importation and manufacture of air conditioners and self ballasted fluorescent lamps.

6.0 THE WAY FORWARD

6.1 World Successful Programmes

Over the long term, the benefits of providing electricity to all including poor rural communities are quite high. This is attributed to a positive relationship between electricity consumption and gross domestic product.

Research has shown that rate of electrification is related to the percentage of a country's population that is above the poverty line.

The productive effect of rural electrification can be substantial. Small scale enterprises like small commercial shops, hair dressing salons, corn mills, saw mills etc. do spring up in rural settings with access to electricity to improve their income levels.

Countries with successful rural electrification programmes do not follow one institutional model. So far three models namely 1. The Cooperative, 2. The Centralized Public and 3. The Private or Decentralized are recognized worldwide.

The Cooperative model has been successfully practiced in the United States (National Rural Electric Cooperative Association – NRECA), Costa Rica, Bangladesh and Philippines. The Cooperatives have the people being served as the owners of the distribution company. They operate under strict commercial or business principles.

The second model looks at rural electrification as an extension through public companies. Successful public companies can be found in Republic of Ireland (Electricity Supply Board-ESB), Thailand (Provincial Electricity Authority – PEA), Mexico (the Comision Federal de Electricidad-CFE) and Tunisia (Societe Tunisienne de l'Electricite et du Gaz-STEG).

The third model involves private or decentralized electrification companies that can be found in Chile. Local companies are supported by the central government to become independent distribution companies that operates within a franchise or concession

Ghana has so far been practicing the second model but whether we will call our system successful is the judgment for the users. We can look at the decentralized model under the Rural Electrification Agency (REA) concept and see how private operators can be nurtured to construct, operate and maintain distribution systems in rural areas. In fact ECG with the assistance of the United States Trade and Development Agency (USTDA) is piloting a scheme where local electrical contractors have been selected and trained to initially operate and maintain some rural portions of the distribution network in various regions.

In the African context, the Energy Ministers having identified the challenges mentioned earlier also proposed the actions below to address them:

- Strengthen Regional Integration
- Build Regional Energy Infrastructure
- Make Best Use of the Continent's Hydro-Power, Natural Gas and other Resources.
- Explore wider variety of Financing Sources – Concessional & Non-concessional
- Expect G8 & other Development Partners to treat Africa as a Priority
- Encourage Consumers to use Energy Efficiently through Efficient Energy Pricing and Public Awareness Programmes

- Mobilise Domestic Resources through New Financing Instruments such as Appropriate Energy Pricing
- Accelerate Capacity Building Programmes at all Levels
- Encourage Energy Related Scientific Cooperation-Technology Transfer among Africans and Development Partners.

It is incumbent on various governments to ensure that these actions are implemented without further delay since in the past two years only a few concrete steps have been taken to implement these actions in individual countries or in their economic blocs.

It is also suggested that governments encourage institutional, legal and organizational reforms in the power sector and encourage interconnection of the transmission and distribution systems (cross-border electrification) for the socio-economic development of the people.

6.2 The Future of the Electricity Industry in Ghana

To improve and expand the electricity industry in Ghana in order to achieve a universal access, the following need to be addressed:

Availability of investment capital, Availability and adequacy of generation, Reliable transmission and distribution systems, Efficient and effective management structures, Efficient operations and maintenance system, Effective electricity market structure, Adequate and cost reflective tariffs, an Independent regulatory regime and the active involvement of all stake holders.

6.2.1 Availability of investment capital

According to sources from the Ministry of Energy, Ghana requires about Three Billion US Dollars (US$ 3 billion) in the electricity subsector within the next 5 years to improve generation and reinforce and expand the existing infrastructure in the transmission and distribution systems as well as extend supply to new areas. To achieve Universal Access by year 2020 the government will require additional funding of about USD500 million.

Under the Ghana Energy Development & Access Project (GEDAP), some USD237.18 million has been provided for intensification and extension of supply to the existing urban, peri-urban and rural electrification projects throughout the country. About 170,000 new connections are expected at the end of the project in 2012.

The Chinese and the US Eximbank have offered some USD170 million and USD350 million Suppliers credit respectively for the extension of supply to some 300,000 households.

There is still a gap of about USD2.8 billion that the government must take the initiative to provide the needed investment capital from its own budgetary sources, levies from consumers, and seek bilateral and multilateral assistance to support the programme. It is also essential that the government creates the necessary platform to attract private capital into the industry especially in the generation and distribution ends of the business since its traditional sources alone cannot generate the needed capital.

The District Assemblies and communities should be encouraged to continue to support themselves as it is being done under SHEP presently.

6.2.2 Availability and Adequacy of Generation

According to Energy Commission's projection, Ghana requires an additional 200MW of generation annually to meet projected demand and spinning reserve. It is government policy that such additional generation must come from private sources. The government's generation target of 5000MW by 2012 implies a gap of about 1700MW which must be produced from private sources. It is important that the government comes out with a framework attracting Independent Power Producers (IPPs). The framework should clear and cover incentives (tax holidays, Repatriation of profits, Number of expatriates staff allowed, etc.), the prevailing electricity market structure, guaranteed power purchase agreements, licensing regime, transmission open access, independent regulatory regime, etc.

6.2.3 Reliable transmission and distribution systems.

There is a need to improve, reinforce and develop the transmission and distribution systems to meet projected demand and to conform to international standards of quality, reliability and safety.

Some of the equipment currently in use are old and obsolete and require rehabilitation. It is critical to apply modern technology on the network to improve reliability. It is also essential that some amount of redundancy is built into the system to improve security, quality and reliability of service

6.2.4 Efficient and effective management structures

All the three utility providers are public organizations that require to have effective and result-oriented management structures to be in place in order for them to deliver to meet the expectations of stakeholders. All the three do not seem to have good balance sheets and cannot borrow on their balance sheets to invest in their operations. They all lack adequate working capital.

VRA's situation is the worst because they import expensive crude oil at world market prices for their thermal generation and sell the energy produced at ridiculously low prices that do not allow them to recover their costs.

The Government, being the owner and the only shareholder of these institutions, needs to critically examine the activities of the electric utilities especially their financial issues and restructure to inject some new capital into their operations. Maybe we can study and adopt the Kenyan experience where Kengen and Kenya Power & Light Company (KPLC) are all listed on the Kenyan stock exchange where they generated the needed capital for their operations and investments.

6.2.5 Efficient operations and maintenance system

By installing appropriate modern technology like Supervisory Control and Data Acquisition (SCADA), secondary automation system (Rural SCADA) on the transmission and distribution networks quick faults location and restoration of supply can be achieved. Real-time analysis of events can be seen and managed quickly on a computerized system and thus issues like overloading of part of the system can easily be identified and resolved before any serious incident occurs.

By acquiring and installing appropriate software, optimization of generation and economic dispatch of our generators can be handled easily. Operating and maintaining the system efficiently using available technologies, technical losses can be reduced considerably thereby increasing the revenues of the transmission and distribution units as well as save on generation investments.

6.2.6 Effective electricity market structure.

Presently, we use the single buyer, single seller model i.e. VRA buys all the generated energy and sells all to its customers (ECG, NED, VALCO, some of the big mining companies [Anglogold Ashanti, Newmont, Prestea Bogosu Ltd.]

By law, according to LI 1937, from January 2010 we are supposed to implement the Wholesale Electricity Market (WEM) where the generators, distributors and deregulated market players. (Customers with power demand beyond 3.0MW and consume 6 GWh of energy annually) will go on the sport market to buy or sell differences in supply from signed Power Purchase Agreements (PPA). There will be an independent system operator under GRIDCo to manage, operate and maintain the system. Meanwhile the infrastructure (hardware and software) to be used to implement such a complex system is neither in place nor the market rules. Apart from the timing issue there is the complication of what tariff regime will prevail for the regulated market (all other consumers connected to ECG & NED whose power demand is below 3.0MW). It's been suggested that on the WEM, Short Run Marginal Cost (SRMC) should prevail. This implies that the cost of last generation to meet peak demand on daily basis will be the cost to apply to all generators dispatched that day. This will result in the hydro group getting a lot more revenue than their cost. It is being proposed that the wind fall revenue the hydro generation sources will realize should be channeled into some equalization fund that could be used to subsidize targeted vulnerable/ poor consumers.

The English and Wales experience on the WEM is that the prices where high and that the big generators were exercising their market power to influence the SRMP. They had to institute the New Electricity Trading Arrangements (NETA) from 2003 and since then wholesale prices have fallen. May be we can study the English system and adopt to suite our objective if we insist on the WEM Structure.

The South Africans with all their level of advancement uses the single buyer single seller model, why do we have to change when we are not technologically ready neither do we have the capacity in terms of the human resource to manage a WEM system for Ghana. The figure 5 shows a proposed WEM structure for Ghana.

Fig. 4 **Wholesale Market Structure** Source**:**

6.2.7 Adequate and cost effective tariff.

It is necessary to guarantee adequate and cost effective tariff to the players in the industry especially if we want to attract Independent Power Producers (IPPs). We would recommend that PURC task itself to study the dynamics of the cost and pricing of electricity generation, transmission and distribution and come out with appropriate tariff regime that will be acceptable and affordable to all players especially those in the regulated market.

6.2.8 Independent regulatory regime

On paper our regulators are independent but in reality they lack that independence. The government should give them the financial autonomy so that their source of financing is re– defined not to depend on Ministry of Finance's budget cutting procedures but say, their budgets are allowed to be vetted by Parliament and once cleared by the Legislature, the Government finds the money for them to operate freely..

6.3 Responsibility of Stakeholders

6.3.1 Government

- Set the right policies and monitor the implementation of the policies.
- Continue to fund the NES
- Seek more support from Developing Partners,
- Encourage private sector participation in the electricity industry,
- Give full independence (financial and operational) to the Regulators
- Continue to give financial support to the electric utilities until a cost recovery tariff is in place.
- Review the National Rural Electrification Master Plan (NREMP)
- Ministry of Energy should consider establishing a REA and Rural Electrification Fund (REF). (The REA system is being practiced in Kenya, Tanzania, Mozambique etc).

6.3.2 Regulators

- Set cost recovery tariff.
- Ensure a workable electricity market is in place
- Monitor and ensure electric utilities deliver on their mandate.
- Ensure financial viability of the utility providers.
- Continue to setup appropriate technical standards and monitor its implementation.
- EC must come up with comprehensive Strategic National Energy Plan as early as possible
- Build the necessary capacity to ensure operational and financial autonomy/ independence from Government.

- EC and PURC should encourage the use of Renewable Energy sources of electricity as alternative generation sources especially wind mills, solar pv and mini-grids by promoting and educating the general public to accept their installation in the communities and set appropriate feed-in tariff.

6.3.3 Electric Utility Providers

- Ensure availability, security and quality of supply that is adequate, reliable, and safe.
- Build the necessary managerial and professional capacity to run their operations as efficiently as possible.
- Make efforts to reduce their system losses to acceptable international standards.
- Encourage demand side management (DSM) principles as being done by ESKOM in South Africa

6.3.4 Independent Power Producers

The Government as much as possible should create the necessary conducive atmosphere for the private sector and for that matter Independent Power Producers (IPPs) to take up the challenge of producing the necessary generation gap.

6.3.5 Customers

Customers must use power efficiently by practicing demand-side management principles in their everyday use of power.

Customers must be prepared to promptly pay their bills to ensure the utility providers are liquid enough to meet their obligations of ensuring that quality, reliable and safe supply of electricity and also have enough funds to be able to extend the supply to those who do not have.

6.3.6 Judiciary

Should quickly dispose of illegal connection cases brought before them and prescribe deterrent punishments to those who are found culpable.

6.3.7 Parliamentary/Legislature

Continue to support the Electricity Industry by passing appropriate laws to enhance accessibility of power be it for generation, transmission, distribution or for regulatory purposes.

Educate their constituents on the efficient use of electricity. Continue to give financial support to their communities in SHEP programmes.

6.3.8 Educational Institutions

To achieve the Universal Access requires some amount of manpower to manage, plan, design, construct, operate and maintain the system.

As you are aware, this requires the recruitment of all manner of professionals, skilled and unskilled labour.

It is therefore incumbent on our educational facilities to churn out quality engineers, accountants, administrators, legal experts, technicians, marketers, public relation experts, and others for the day to day management, operation and maintenance of the human, financial and material resources.

Inculcate in the school children starting from the primary level the efficient use of electricity.

6.3.9 Ghana Institution of Engineers (GhIE)

The Ghana Institution of Engineers (GhIE) is expected to continue to organize relevant professional workshops, seminars and continuous professional development to the Engineers and Technicians in the sector for them to improve their capacity and professional output.

It is the duty of GhIE in collaboration with GSB to develop and set appropriate technical standards for the guidance of the professionals and the electric utilities in the sector.

6.3.10 Electrical Materials Manufacturers

The existing manufacturers of concrete & wood poles, cables and conductors are doing well but sometimes they are constrained with capacity when large consignments of goods are demanded of them. There is therefore the need for them to expand and modernize their operations to meet increasing demand.

There is also an opportunity for the industrial sector to setup a transformer, repair and manufacturing plant to cut our dependence on imported ones.

It is not clear whether the local manufacturers exercise their rights to the domestic content provisions of the procurement law when they go in for international competitive bidding (ICB) projects since most ICBs are won by multinational companies that do not manufacture locally or buy from the local companies.

6.3.11 Media

Continue to inform and educate the general public on the efficient use of energy and champion the crusade against theft of power through illegal connections.

6.3.12 General Public

The general public is the eventual benefactor of the Universal Access to electricity and therefore needs to be vigilant and report those who extend supply or use power illegally to the Utilities under strict confidential cover. This would in effect reduce non-technical losses that will free more energy for access by those who do not enjoy them yet.

7.0 CONCLUSION

Universal Access to Electricity means anyone, irrespective of one's location, in pressing a switch can use lights, radio, television, computers, machines, tools, and many other

appliances that enable one to read, be entertained, be informed and participate in productive ventures.

Universal Access to Electricity improves the socio-economic development of the people and brings small scale industrialization to the rural people that empower them to create wealth and thereby reduce their poverty levels.

Non achievement of universal access is not a technical or technological problem. It has partly sociological and financial problems. Universal Access is mainly a political problem. Policy makers and for that matter, political leaders must therefore take the bull by the horn and show leadership in carrying all stakeholders along in the quest for Universal Access to electricity to all within the shortest possible time.

It is the responsibility of all but the needed vision or guidance lies with the political elite.

THE TIME TO ACT IS NOW!

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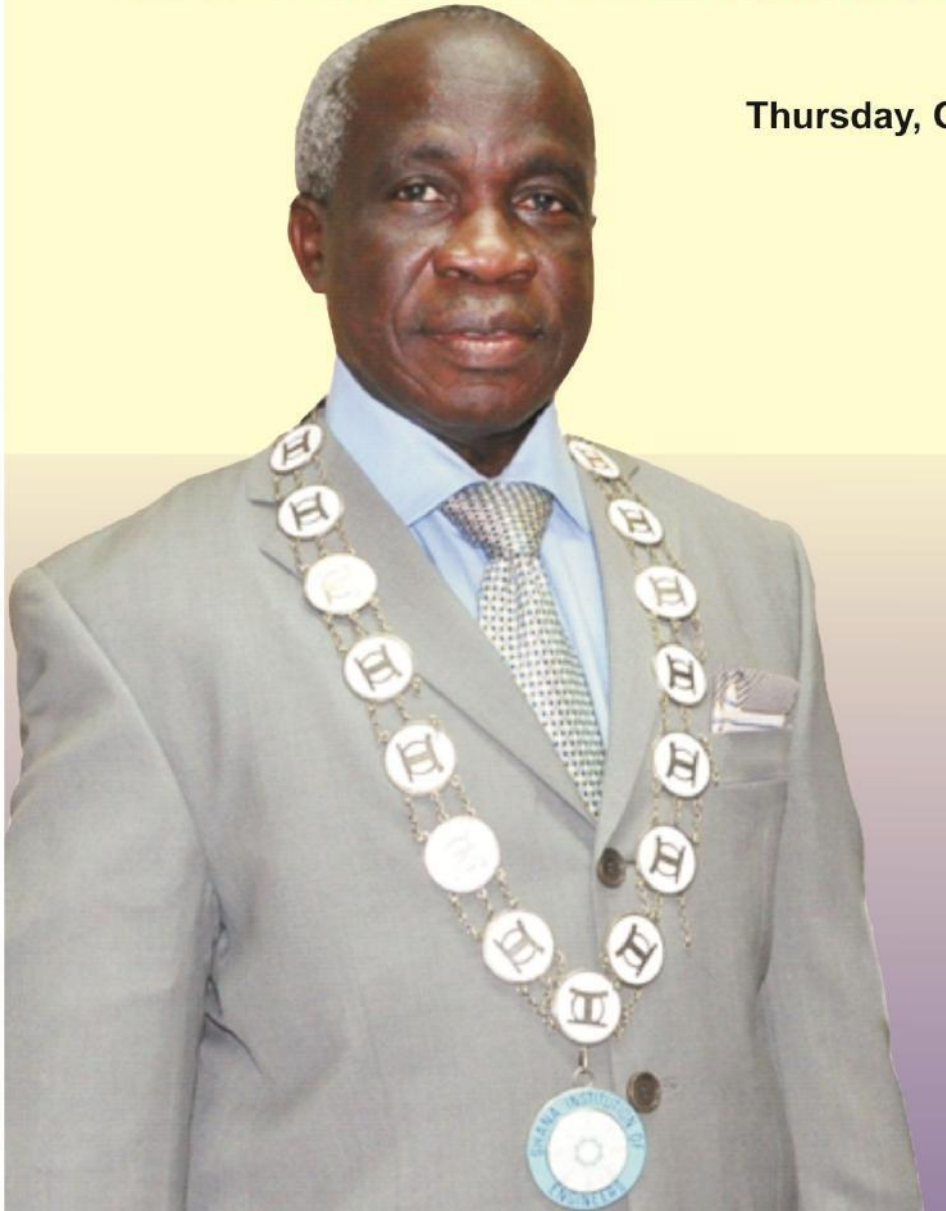
Ghana Institutio of Engineers (GhI

40th Presidential Addre

Thursday, October 15



Ing. Andrew Tonto Barfour FGhIE

President 2009/2010

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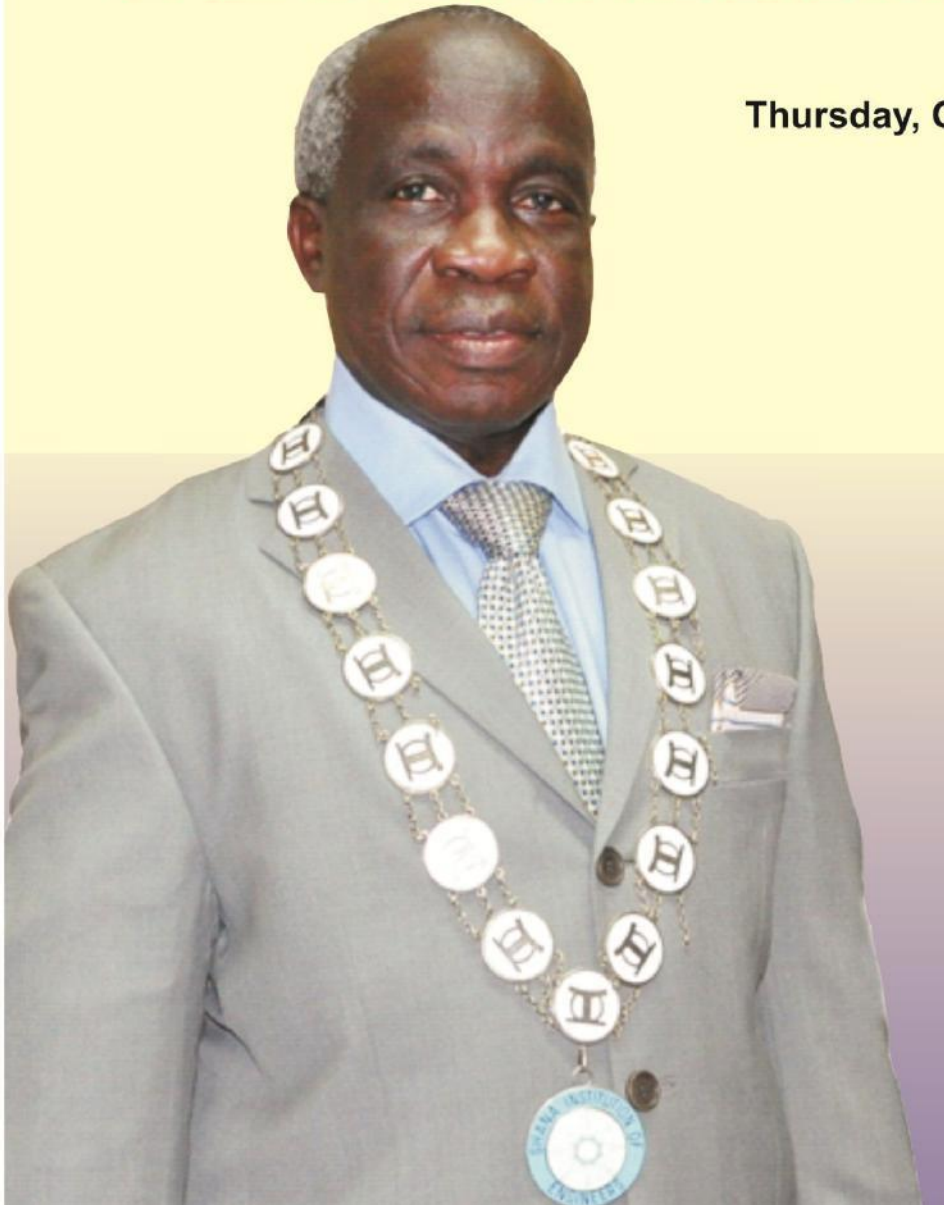

Ing. Andrew Tonto Barfour FGhIE

President 2009/2010

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