ESMAP Technical Paper 097/06

Ghana: Sector Reform and the Pattern of the Poor

Energy Use and Supply




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Energy Sector Management Assistance Program (ESMAP)

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Ghana: Sector Reform and the Pattern of the Poor: Energy Use and Supply

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List of Acronyms and Abbreviations

AGI	Association of Ghana Industries
BOST	Bulk Storage and Transportation
BRV	Bulk Road Vehicles
BSPD	Barrel Stream Per Day
BST	Bulk Supply Tariff
CFL	Compact Fluorescent Lamp
CPI	Consumer Price Index
CSA	Civil Servant Association
DSC	Distribution Service Charge
DSM	Demand Side Management
EC	Energy Commission
ECG	Electricity Company of Ghana
EGF	Embedded Generation Facility
EPA	Environmental Protection Council
ESDP	Energy Sector Development Program
ESMAP	Energy Sector Management Assistance Program
ETU	Electricity Transmission Utility
GDP	Gross Domestic Product
GLSS	Ghana Living Standards Survey
GNA	Ghana News Agency
GNAC	Ghana National Consumers Association
GNPC	Ghana National Petroleum Company
GoG	Government of Ghana
IDA	International Development Association
IPP	Independent Power Producers

kWh	Kilowatt-hour
LPG	Liquefied Petroleum Gas
LV	Low Voltage
MoE	Ministry of Energy
MV	Medium Voltage
MVA	Megavolt Ampere
MWp	Megawatt peak
NED	Northern Electricity Department
NES	National Electrification Scheme
NLC	National Liberation Council
NPP	New Patriotic Party
NPPC	National Petroleum Planning Committee
NPTB	National Petroleum Tender Board
NRES	National Renewable Energy Strategy
OMC	Oil Marketing Companies
PSRC	Power Sector Reform Committee
PURC	Public Utilities Regulatory Commission
PV	Photovoltaic
RET	Renewable Energy Technology
RFCC	Residual Fluid Catalytic Cracker
RKDIP	Rural Kerosene Distribution Improvement Program
SLT-HV	Special Load Tariff - High Voltage
SLT-LV	Special Load Tariff - Low Voltage
SLT-MV	Special Load Tariff - Medium Voltage
TAPCO	Takoradi Power Company
TICO	Takoradi International Company
TOR	Tema Oil Refinery
TSC	Transmission Service Charge
TUC	Trades Union Congress
UPPF	Unified Petroleum Products Fund
VALCO	Volta Aluminum Company
VRA	Volta River Authority

1. Introduction

Background

Over the past two decades, energy sectors the world over have been undergoing reform following a paradigm shift in the conventional wisdom regarding the way energy should be produced and supplied to end-users. Reforms in the energy sector are expected to bring about notable efficiency gains, which could result in welfare improvements. However, there are other unintended social and environmental consequences associated with the process. One important social concern is the likely impact of the energy sector reform on how poor households access modern energy. It is argued that as the State's role in the sector dwindles while that of the private sector surges (as envisaged under reforms), providing access to poor rural and urban households would be seriously compromised. This is because private sector operatives seeking to maximize profit will find it unprofitable to extend service delivery to rural markets (unless obliged to do so through regulation). Access could further be denied or constrained, if as is to be expected, tariffs are adjusted upwards to their economic level, making services unaffordable even when available.

The counter argument however is that reform will, inter alia, increase the amount of resources available for public goods/or targeted subsidies, which are of direct benefit to the poorer members of the society, made possible by the gradual removal of general implicit and explicit subsidies to the sector. So far, there has not been conclusive evidence globally to show whether, on the balance, energy sector reforms impact negatively or positively on the poor. Meanwhile, important lessons on the design of energy sector reforms and how they impact on poor households need to be learned so that appropriate mitigating measures could be introduced into ongoing reforms or incorporated into new reform programs.

It is against this background that the World Bank's Energy Sector Management Assistance Program (ESMAP) is undertaking a study in four developing countries — Botswana, Ghana, the Honduras and Senegal — to establish clearly what the impacts of reforms have been or are likely to be on poor households in these countries. While acknowledging that direct relations may be difficult to establish, the study albeit aims to contribute to the knowledge base both on how the poor use and choose fuels, and which supply channels for these fuels could be affected by energy sector reforms. The study will be conducted in two phases and this report covers the findings made in Phase 1 of the Ghana study.

Objective of Study

The overarching goal of this study, which forms part of the broader project 'Energy Use, Energy Supply, Sector Reform and the Poor', is to establish patterns in the ways poor people in Ghana are accessing and using energy and to identify how changes in the patterns, attributable to energy sector reform and accompanying technological innovations, affect the Ghanaian poor.

Specifically, the study will seek to achieve the following:

- Give an overview of the Ghana's energy sector;
- Provide a description of the energy supply chain in Ghana;
- Provide a description of household choice and use of energy in Ghana;
- Provide a description of Ghana's energy sector reform program and give an assessment of how reform has impacted on the poor in Ghana; and,
- Evaluate how energy sector reform has impacted or might impact on the choice and use of energy by the poor in Ghana.

Methodology

The main research method employed in Phase 1 was a desk study of existing studies and survey data. Key documents reviewed include the *Ghana Living Standards Surveys (GLSS 2 and 4)* published by the Ghana Statistical Service (GSS), the *National Energy Statistics* published by the Ministry of Energy, as well as reports and other relevant publications on energy sector reforms in Ghana. As and when necessary, information gathered through the desk study was supplemented and enhanced by primary information collected through semi-structured interviews with key informants in the Ministry of Energy, the Energy Commission, the Public Utilities Regulatory Commission, Tema Oil Refinery, oil companies and other key energy sector institutions.

Outline of the Report

The rest of the report is divided into eight chapters, which are listed as follows:

Chapter 2: Short Country Profile of Ghana
Chapter 3: Overview of Ghana's Energy Sector
Chapter 4: Socio-economic Characteristics of Households in Ghana
Chapter 5: Household Energy Consumption Patterns
Chapter 6: Energy Supply Chain
Chapter 7: Energy Sector Reforms in Ghana
Chapter 8: Impact of Energy Sector Reforms on Poor Households
Chapter 9: Conclusions and Recommendations

2. Country Profile

Ghana (formerly known as the Gold Coast) is located near the Equator and on the Greenwich meridian between latitude 4^0 and 12^0 N and longitude 30^0 W and 1^0 E. It is bounded by the Atlantic Ocean to the south, Cote d'Ivoire to the west, Burkina Faso to the north and Togo to the east. Ghana has a total land area of 238,540 km which is demarcated into 10 administrative regions with Accra as the capital. Figure 2.1 shows the administrative regions of Ghana.

Figure 2.1: Map of Ghana showing Administrative Regions

Demographic Characteristics

The 2000 Population and Housing Census puts Ghana's population at 18.9 million, an increase of 53.8 percent over the 1984 population of 12.3 million, which translates into an intercensal growth rate 2.7 percent (GSS, 2002). The growth in the population is attributed to lowering, but still high fertility coupled with stable and fairly low mortality. Ghana has a population density of 79.3 persons per sq km. While the figure suggests no great pressure of population on land, it obscures regional and district differences in concentration of the population, and a different picture emerges when regional figures are considered. For example, the population densities of the three mostly densely populated regions are as follows: Greater Accra Region (895.5), Central Region (162.2) and Ashanti (148.1) persons per sq km, respectively. A majority of the population of Ghana (56 percent) lives in rural areas with the remaining (44 percent) living in urban areas. Apart from Greater Accra (87.7 percent) and Ashanti (51.3 percent), the rest of the country remains predominantly rural, in spite of the substantial increase in the level of urbanization since 1984 (43.8 percent compared to 32 percent in 1984).[1] What this means is that nationally, the population is largely concentrated in Greater Accra and to some extent in Ashanti and that regionally, there is over-concentration in the capitals and a few towns (GSS, 2000).

Fifty-one percent of the total population is female compared to 49 percent male. The age structure is characterized by large proportion of children of less than 15 years (41.3 percent) and a small proportion of elderly persons who are 64 and above (5.3 percent). Ghana's population is, however, aging as is evident from the fact that the proportion of the population which is aged 15 and below declined from 45 percent in 1984 to its current level of 41.3 percent while that of age 64 and above increased from 4 to 5.3 percent over the same period (GSS, 2002). A little over 79 percent of the total population of Ghana are aged seven and above[2] and this according to the 2000 population census constitutes the potential workforce, which is defined as the proportion of the adult population that is available and able to work. Sixty percent of the potential workforce is economically active compared to 40 percent which is economically inactive. Of the economically inactive group, 64.8 percent is students while 13.9 percent is homemakers. In the case of economically active group, 11.2 percent is unemployed (that is, without work and seeking one). The four major occupations, nationally, are agriculture and related work (49.2 percent), production and transport equipment work (15.6 percent), sales work (14.2 percent) and professional and technical work (8.9 percent) (GSS, 2002).

Poverty Characteristics

Ghana's per capita Gross Domestic Product (GDP) is estimated at US$390 (2001) and ranks 129th out of the 175 countries on the UNDP *Human Development Report* (2003). In 2001, the country joined the unenviable group of countries labeled as "Highly Indebted Poor Countries" (HIPC). In 1998-99, Ghana Statistical Service, as part of the fourth round of *Ghana Living Standards Survey (GLSS 4),* carried out an

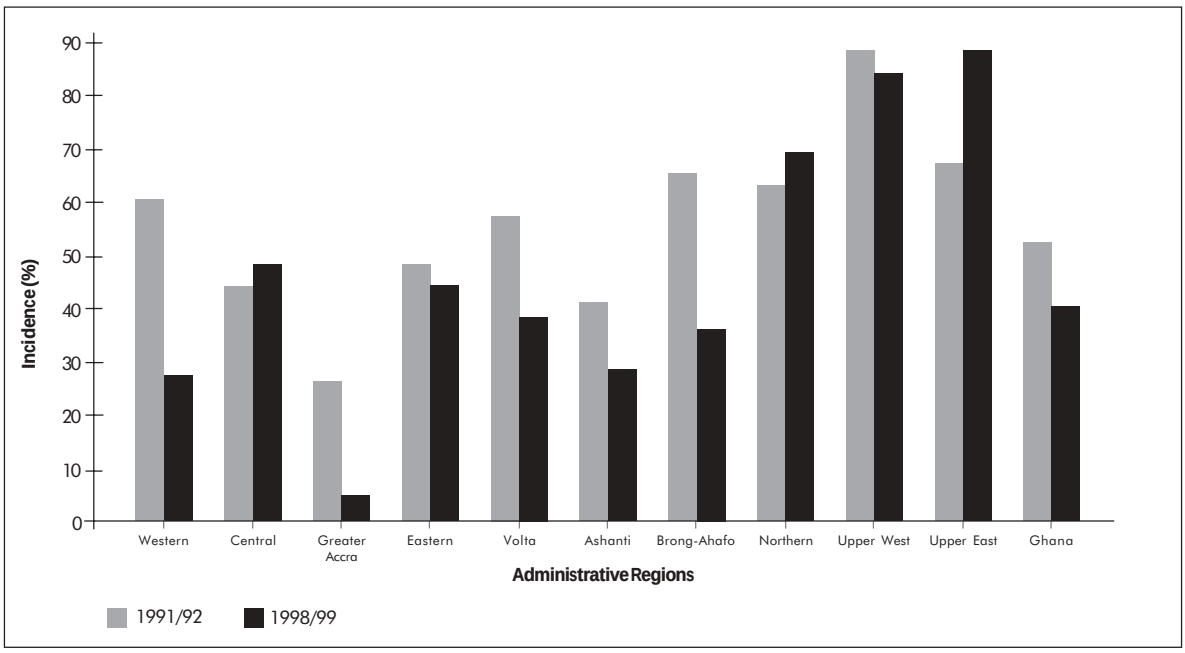
[1] *Indeed, none of the remaining eight regions has a level of urbanization that is above the national average.*
[2] *While the legally defined group in most societies ranges between 15 and 64, there is evidence in Ghana to show that children as young as seven years do engage in family enterprises hence the use of age seven as the lower limit of the range for the potential labor force.*

analysis of the poverty patterns and trends in Ghana during the 1990s. To assess the incidence and depth of poverty in Ghana, two nutritionally-based poverty lines were derived:

- A lower poverty line of 700,000 cedis (US$292) per adult per year: this focuses on what is needed to meet the nutritional requirements of household members. Individuals whose total expenditure falls below this line were considered to be extremely poor, since even if they allocated their entire budgets to food, they would not be able to meet their minimum nutritional requirements.
- An upper poverty line of 900,000 cedis (US$376) per adult per year: this incorporates both essential food and non-food consumption. Individuals consuming at levels above this were considered able to purchase enough food to meet their nutritional requirements, and to be able to meet their basic non-food needs.

The analysis revealed that poverty levels in Ghana during the 1990s had reduced considerably. Using the upper poverty line of 900,000 cedis, the percentage of the Ghanaian population defined as poor fell from almost 52 percent in 1991-1992 to just under 40 percent in 1998-1999 (See Figure 2.2). Extreme poverty (lower poverty line) also declined from 36 percent in 1991-1992 to 27 percent in 1998-1999

Figure 2.2: Poverty Incidence by Administrative Regions



but, in spite of this decline, the incidence of extreme poverty in 1999 was found to be still high with over a quarter of the Ghanaian population being unable to meet their basic nutritional needs, even if they devoted their entire budget to food (GSS, 2000). Figure 2.2 also shows regional variations in poverty levels, with sharp differences in poverty levels even between geographically adjacent regions.

From Figure 2.2, poverty is lowest by far in Greater Accra and highest in the north of the country (notably the Northern, Upper East and Upper West Regions), with significant differences between these extremes. It can also be seen from Figure 2.2 that the pattern of change in poverty between 1991-1992 and 1998-1999 also varies substantially by regions. The significant reductions in poverty at the national level have been concentrated in five regions: Western Accra, Greater Accra, Volta, Ashanti and Brong-Ahafo. Other regions (Central, Northern, and particularly Upper East), however, experienced increases in poverty between these two periods (GSS, 2000). As is to be expected, the poverty study also found that poverty is substantially higher in rural areas than urban and concluded inter alia that "poverty in Ghana is disproportionately a rural phenomenon". Within both urban and rural areas, poverty is disproportionately concentrated in the savannah (northern part of the country) (GSS, 2000).

Conclusions

Ghana, located near the Equator, has a total land area of 238,540 km and is demarcated into 10 administrative regions with Accra as the capital. Ghana's population stood at 18.9 million during the 2000 population census, an increase of 53.8 percent over the 1984 population of 12.3 million, with a growth rate of 2.7 percent. Ghana has a population density of 79.3 persons per sq km, but a closer look at the regional and district differences and concentration shows that population is largely concentrated in Greater Accra and, to some extent, Ashanti regions.

With regards to total population distribution, 51 percent are females compared to 49 percent males. Children less than 15 years account for 41.3 percent and the elderly above 64 years accounts for 5.3 percent. The census figure pegged the potential workforce at 79 percent, however, only 60 percent are economically active, whilst the remaining 40 percent are economically inactive. This economically inactive figure includes 64.8 percent who are students while 13.9 percent are homemakers. Four major occupations, nationally, are agriculture and related work (49.2 percent), production and transport equipment work (15.6 percent), sales work (14.2 percent) and professional and technical work (8.9 percent).

With regards to poverty Indicators, Ghana's GDP is estimated at US$390 and according to the UNDP 2003 *Human Development Report*, it ranks 129th out of 175 countries, and joined HIPC countries in 2001. However, the results of a survey carried out by GSS aimed at assessing poverty lines in the 1990s showed that poverty has reduced considerably in the 1990s, using a lower poverty line of 700,000 cedis (US$292) and an upper poverty line of 900,000 cedis (US$376) per adult per year. Those whose total expenditure fell below 700,000 cedis were considered very poor, whilst those spending over 900,000 cedis were considered being able to meet their basic nutritional requirement. Analysis of the results showed that not only did the population defined as being poor fall from 52 percent in 1991-92 to under 40 percent in 1998-1999, but extreme poverty also declined from 36 percent to 27 percent during the survey year. This notwithstanding, the incidence of extreme poverty in 1999 was still found to be very high.

3. Overview of the Energy Sector

Introduction

Ghana's energy sector is characterized by a huge dominance of traditional biomass resources. Petroleum products rank second to biomass followed by electricity in terms of total annual energy consumption. Although Ghana abounds in renewable energy resources, their exploitation has so far been minimal. There are 13 public institutions, 18 private Oil Marketing Companies (OMCs), countless number of retail outlets and two NGOs who are involved in the energy sector. This section briefly describes each of the different sources of energy and the institutional framework of the energy sector in Ghana.

Biomass

In terms of endowment and utilization, biomass (mainly woodfuels — firewood and charcoal — and to a lesser extent crop residues) is the most important energy resource in Ghana accounting for 69 percent of total energy consumed in 2000 (Ministry of Energy – MoE, 2001).[3] An estimated 18 million tons of fuelwood was consumed in 2000 (Energy Commission, 2003). Used mainly for cooking and water heating, firewood (63 percent) and charcoal (31 percent) combine to supply approximately (94 percent) of the total energy consumed in the residential (household) sector which is the largest energy consumer in Ghana (GSS, 2000).[4] According to GLSS 4, 61 percent of urban households, 13 percent of rural households, and 31 percent of all households in Ghana use charcoal as the main fuel for cooking while 84 percent of rural households, 25 percent of urban households, and 63 percent of all households in Ghana rely on firewood as the main cooking fuel (GSS, 2000). An estimated 1.3 per cent of total cooking energy is produced from crop residue (Togobo, 2000). Apart from providing vital energy for cooking in many Ghanaian homes, the supply of firewood and production of charcoal are also important sources of livelihood for a significant number of poor people, particularly in the rural areas.

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[3] It is important to note that the percentage contribution of biomass to Ghana's energy balance has averaged approximately 71 percent between 1974 and 2001.

[4] The 2000 Population and Housing Census puts the percentages at 55.8 percent and 30 percent for firewood and charcoal, respectively.

Petroleum Products

Petroleum is the second most widely used form of energy in Ghana accounting for 24 percent of total energy and 75 percent of commercial energy consumed in 2000. Despite exploration activities since 1896, which have resulted in the drilling of about 66 wells, no commercially sustainable deposit of oil and gas has been found in Ghana. Consequently, the country imports all of its crude oil requirements and finished petroleum products. Ghana imports 30,000 barrels of crude oil per day from Nigeria on a government-to-government contract. Another 15,000 barrels per day is obtained by international competitive bidding. The crude oil imported is refined at the Tema Oil Refinery (TOR), which is wholly owned by the Government of Ghana, with capacity of 45,000 Barrels Per Stream Day (BSPD). It has been estimated that the country spends as much as 20-30 percent of its export earning on crude oil and petroleum products import depending on the world market prices of these products. An amount of US$528 million, about 27 percent of the country's total export earning was spent on the import of about 1.1 million metric tons of crude oil and 0.8 million metric tons of petroleum products in the year 2000 (Energy Commission, 2002). Annual consumption of petroleum products has been estimated at 1.6 million metric tons, 60 percent of which is consumed by the transportation sector (MoE, 2001).

The main petroleum products used in Ghana are gas oil (diesel), gasoline, kerosene and Liquefied Petroleum Gas (LPG). Gas oil is the most consumed and widely used petroleum product in the country. It is used mainly for haulage of dry and wet cargos and passenger transport on road and water. Other uses of gas oil are for rail transport, industries, agriculture (crop and fishing) and electricity generation. Kerosene is the main fuel for lighting in rural households. According to GLSS 4, it serves as fuel for lighting in 82 percent of the rural households and 22 percent of households in urban areas. The 2000 Population Census puts the total number of Ghanaians who use kerosene as their main source of lighting at 55 percent. LPG serves as the cooking fuel for 6.2 percent of the total population (GSS, 2000) with 10 percent and 0.6 percent of urban and rural households, respectively, relying on it to meet their energy needs for cooking (GSS, 2000).

The structure of the petroleum sector in Ghana today is the result of various attempts by the Government to ensure a reasonable level of supply within the limits of availability of foreign exchange. Thus the Government is virtually responsible for the entire production chain of petroleum products. The OMCs are essentially only responsible for retailing (MoME, 1996). Ex-pump prices and margins of petroleum products are fixed by the MoE. In arriving at the retail price of petroleum products, the MoE is guided by the following principles (Energy Commission, 2002):

- The prices of petroleum products must ensure full cost recovery of all investments in the procurement, refining, transportation and marketing, and that ex-refinery prices are set equal to or lower than the import parity prices.
- To generate revenues for current and future investments in specific areas (e.g., oil and gas exploration, development of strategic (reserve) stock for gasoline, gas oil, kerosene and LPG, Road Fund, Bulk Oil Storage and Transportation Company (BOST) operations, etc) as well as provide a portion of the annual national revenues for implementing the Government's development programs. Special levies and taxes for the purpose of revenue generation have therefore been incorporated into the price structure.

- The retail or ex-pump prices of petroleum products are to be uniform throughout the country through the Unified Petroleum Products Fund (UPPF) scheme.

The final retail price for the various petroleum products is a build-up of the ex-refinery prices, margins for the various portions of the supply chain — primary distributors, dealers and marketers — and several other taxes/levies (i.e., excise duty, debt recovery fund, road fund levy, exploration levy and stock fund levy). The Ministry of Finance, with the approval of Parliament, has the responsibility of setting the applicable levels of taxes, charges, duties or levies in order to achieve revenue targets for the national budget. The margins for the distribution companies are fixed annually through negotiations with the companies and are usually higher for kerosene because it is consumed in remote rural areas. The Government of Ghana (GoG), in the year 2001, published a petroleum products pricing formula which is supposed to automatically adjust the ex-refinery prices based on changes in the world market price of crude oil, the import parity price of petroleum products and the exchange rate of the cedi to the dollar. Although this is yet to be implemented, the Government in January 2003 mandated and conferred independent authority on the National Petroleum Tender Board (NPTB) which is mandated to make monthly adjustment in maximum petroleum product prices according to the automatic adjustment formula, without further approval by the MoE (Osafo Marfo and Acquah, 2003).

Electricity

Electricity accounted for between 7 percent and 8 percent of total energy consumed in Ghana in 2000. According to 2000 Population Census, 43.7 percent of the total population has access to electricity. Access to electricity is, however, skewed towards urban households: Seventy-seven percent of urban households have access to electricity compared to only 17 percent in rural areas (GSS, 2000).[5] Electricity is produced by Volta River Authority (VRA) from two main sources — hydro and thermal. Ghana also relies on some amount of imports from neighboring La Cote d'Ivoire to supplement domestic supply, especially during peak hours. The country has the capacity to import between 250 MW and 300 MW of electricity from Cote d'Ivoire. Total installed generation capacity is 1,652 MW, comprising 1,072 MW of hydro and 550 MW of thermal. In addition to these, there is a 30 MW diesel plant at Tema, which is operated only during contingencies. The electricity supply mix in the country is expected to change by the year 2010 from the largely hydro-based system to a largely thermal-based one relying on natural gas as the main source of fuel. This transition would be made possible by the West African Gas Pipeline Project, which is expected to transport natural gas from Nigeria through Benin and Togo to Ghana (Energy Commission, 2002). The supply and distribution of electricity is carried out by the Electricity Company of Ghana (ECG) in the southern half of the country and Northern Electricity Department (NED) (subsidiary of VRA) in the northern part of the country.

Prior to the establishment of the Public Utilities Regulatory Commission (PURC) in 1997, electricity tariffs were fixed by the MoE. The procedure for tariff-setting then was that the utilities would make tariff proposals to the MoE, which reviews and revises the proposals in consultation with the utilities. The agreed tariffs were

[5] *Preliminary results from the 2003 Core Welfare Indicators Questionnaire (CWIQ) shows that access to electricity has increased to almost 50 percent of the total population.*

then submitted to the cabinet for approval. Following cabinet approval, the tariffs, especially the level of in-built taxes, are sent to Parliament for approval. With the advent of the PURC, however, electricity tariff proposals from the utilities are vetted and approved by the PURC through a series of consultations and dialog with all relevant stakeholders. For the purpose of pricing, consumers have been categorized into five main groups namely, residential, non-residential, SLT-LV, SLT-MV and SLT-HV. Consumers who fall in the first three categories are generally classified as Low Voltage (LV) consumers. Those in the last two groups are classified as Medium Voltage (MV) consumers. The end-user tariffs approved by the PURC consist of Bulk Supply Tariff (BST) and the Distribution Service Charge (DSC). The BST is the sum of the Bulk Generation Charge (BSC) and the Transmission Service Charge (TSC). Both residential and non-residential customers pay electricity tariffs on the basis of energy consumed in Kilowatts-hours (kWh).

Renewable Energy

Ghana's renewable energy resources include solar, modern biomass, wind and small hydro. The country receives an average solar radiation of about 4-6 kWh/m^2/day and sunshine duration of 1,800 hours to 3,000 hours per annum. However, solar radiation in Ghana shows strong geographical variations with the highest level of solar radiation found in the northern regions of the country. Wind resource assessment studies conducted in Ghana have shown that the annual average wind speeds along the coast range between 4 miles per second and 6 miles per second. Modern biomass resources that are available in Ghana include sawmill residues, agricultural wastes, animal waste, municipal wastes and energy crops. Of these, sawmill residue and energy crops are the most promising for energy purposes. In Ghana, the well-tested applications for biomass-based technologies are cogeneration, biogas production from anaerobic digestion and, very recently, bio-diesel production. The small/mini hydro potential of Ghana has been assessed to about 10 MW (NRES, 2002).

Ghana's renewable energy potentials are largely untapped. The use of solar energy, particularly for PV electricity, and, to some extent, solar crop drying and water heating have seen some use over the years. Total installed capacity for PV systems is estimated at 1 Megawatt peak (MWp) as of end 2002. Modern biomass has been exploited only to a very limited extent, given its potential, while the wind and small hydro potential remain unexploited.

National Energy Consumption Patterns

Consumption of all forms of energy in Ghana has been growing consistently over the last decade as shown in Table 3.1. This trend is expected to continue with the consumption of woodfuel, electricity and petroleum products projected to grow at annual rates of 3 percent, 7 percent and 8 percent, respectively (MoE, 2001).

The household sector is the most important sector in Ghana, being the largest energy consumer in the country with consumption made up almost entirely of woodfuels for cooking. As mentioned earlier, over 90 percent of total biomass energy consumed annually is utilized by household sector for cooking. About

47 percent of electricity sold annually by distribution utilities in Ghana is consumed by residential consumers (households) compared to 37 percent and 16 percent utilized by industrial and non-residential consumers, respectively (MoE, 2001). Kerosene and LPG are the two main forms of petroleum products used directly in the household sector. Virtually all the kerosene produced in Ghana is used by the households sector mainly for lighting[6] and partly for cooking. In the case of LPG, 76 percent of total consumption was used in the household sector in 2000, compared to 14 percent and 10 percent for the industrial and commercial sectors respectively (Energy Commission, 2002).

Table 3.1: Growth in Energy Consumption (1990-2000)

Fuel Type	*% Growth Per Year*
Gasoline	1.5 - 4.0
Kerosene	0.2
Diesel	1.2 - 1.3
LPG	14.0
Electricity	10
Firewood	2.5 - 3.0
Charcoal	3.0 - 5.0

Source: Adopted from Quaye-Foli, 2002.

Energy Sector Institutional Framework

A total of 13 public institutions, 18 private OMCs, two NGOs and about 1,200 retail outlets are involved in Ghana's energy sector. Table 3.2 lists all institutions and provides a brief description of their functions.

Table 3.2: Energy Sector Institutions and their Functions

Institutions	*Functions*
Ministry of Energy (MoE)	Formulation of policies and setting prices of petroleum products
Energy Commission (EC)	Licensing, regulating and monitoring of energy service providers, development of indicative national energy plans and advising the Minister on energy policy issues

[6] *Kerosene is the main fuel for lighting in about 60 percent of households in Ghana.*

Institutions	*Functions*
Public Utilities Regulatory Commission (PURC)	Regulating the setting of tariffs for and enforcement of customer services obligations of all public utilities and Independent Power Producers (IPPs)
Volta River Authority (VRA)	Generation and transmission of electricity
Electricity Company of Ghana (ECG)	Distribution of electricity in Southern Ghana
Northern Electricity Department (NED)	Distribution of electricity in Northern Ghana
Tema Oil Refinery (TOR)	Import of crude oil, petroleum products, refining of crude oil, and bulk sale of petroleum products to OMCs and bulk consumers
Ghana National Petroleum Corporation (GNPC)	Exploration of oil and gas
National Petroleum Tender Board (NPTB)	Supervision of international competitive bidding and award of contracts for the procurement of crude oil and petroleum products for TOR
Bulk Oil Storage and Transportation Company (BOST)	Planning for laying and management of strategic stocks of petroleum products
Environmental Protection Agency (EPA)	Distribution, monitoring and enforcement of environmental policies for the country, including the energy sector
Oil Marketing Companies (OMCs)	Distribution and marketing of petroleum products
Retail Outlets	Retailing of petroleum products to the public
KITE	Energy policy studies and analysis/clean energy enterprise development
Energy Foundation	Promotion of energy efficiency/conservation measures and renewable energy technologies
New Energy	

Source: Authors' Construct

Energy Sector Policy Framework

The development objectives and strategies for Ghana's energy sector in the 1990s were enshrined in the Government's '*Vision 2020*'[7] Policy Document. Based on the provisions of the Document, the then Ministry of Mines and Energy (now Ministry of Energy) formulated the Energy Sector Development Program (ESDP):

[7] *Vision 2020 is basically a policy document aimed at bringing Ghana to the status of a middle income country by the year 2020.*

1996-2000 to guide its activities in the energy sector over a five-year period. The ESDP contained policies which were shaped by the following realizations at the time (Ministry of Mines and Energy – MME, 1995):

i. The need to plan for sustained provision and security of energy supply;
ii. The need to increase the reach of energy resources to all sections of the country to facilitate their socio-economic improvements, especially the majority rural people;
iii. The need to overcome the constraints on existing resources via measures to resuscitate dilapidated infrastructure and institutional weaknesses in the energy operating entities;
iv. The need to consolidate the gains achieved since the inception of the Economic Recovery Program (ERP);[8] and
v. The need to enhance private sector investment in the development of the energy sector.

Within the framework of meeting Ghana's energy requirement for sustained growth and development, the energy sector goals and prioritized objectives elaborated in the ESDP were focused around a strategy whose principal aims were:

i. To improve productivity and efficiency in the procurement, transformation, distribution, and use of all energy resources;
ii. To reduce Ghana's vulnerability to short-term disruptions in energy resources and supply bases;
iii. To consolidate and further accelerate the development and use of Ghana's indigenous energy resources, especially woodfuels, hydro-power, petroleum solar energy; and
iv. To secure future power supply through thermal power complementation of the hydro-based electricity generation system.

The programs and activities implemented by the MME and the energy sector institutions to achieve the above objectives were categorized into five broad areas:

i. The Renewable Energy Development Program
ii. The National LPG Promotion
iii. The Energy Efficiency and Conservation Program
iv. The Petroleum Sub-Sector Development Program
v. The Power Sector Development Program

The ESDP officially ended in 2000 and a new policy framework was introduced by the newly elected New Patriotic Party Government in November 2001. According to the policy document titled *Energy for Poverty Alleviation and Economic Growth: Policy Framework, Programs and Projects*, the vision of GoG for the energy sector is to develop an "Energy Economy" that would ensure reliable supply of high quality energy services for all (both urban and rural) Ghanaian homes, businesses, industries, and the transport sector while making significant contributions to the export earnings of the country.

[8] *The ERP was initiated in 1983 following negotiations with the Bretton Wood Institutions.*

Within the context of this stated vision and also to respond to the developmental priorities of the Government, the 2001 Energy Policy document enumerated seven policy objectives as constituting the framework for the development and implementation of energy sector programs and projects in the country and these objectives (MoE, 2001):

Consolidate and improve the existing energy supply system

To meet this short-term policy objective, the MoE intends to pursue the following actions:

- Secure private sector investment in partnership with the public sector for recapitalization of the energy supply system. To this end, the MoE will work to conclude negotiations for the financing and completion of the second phase of Takoradi Power Plant (Takoradi 2) to bring the total capacity to 330 MW.
- Expedite the ongoing retrofit program of the Akosombo hydropower plant.
- Reinforce and expand the high voltage electricity transmission system.
- Reinforce, expand and modernize the electricity distribution network.
- Ensure efficiency in the management of the existing energy supply system through the restructuring of the utilities and unbundling of electricity supply system and the deregulation of the petroleum sector. The restructuring of the GNPC, ECG and the creation of the power transmission company will be completed.
- Ensure cost-recovery in energy supply through efficient pricing of all energy services.
- Create adequate strategic stocks for petroleum products to take care of unexpected shocks.

Increase access to high quality energy services

In order to meet this objective the following actions would be pursued:

- The MoE will continue to expand Government support for rural electrification from both grid extension and decentralized sources such as solar Photovoltaic (PV) and mini-hydro.
- The ongoing SHEP 3, which is intended to provide electricity to over 621 remaining towns and rural communities, will be completed. In addition, the Ministry has initiated a SHEP 4, which will commence in 2002 and is intended to extend electricity to about 2,000 rural communities. In a critical departure from the past, the MoE will initiate vigorous program support for productive uses of electricity in the rural areas in line with the objectives of creating jobs.
- To electrify rural communities unlikely to be connected to the national grid within next five to 10 years via solar PV systems. This would be done in partnership with the utility companies and private sector operatives. Under this program, Solar PV power will be used to provide lights for rural schools, power computers and television, and also provide potable water. The Ministry of Education has identified a number of distressed schools in the country, which will benefit from this program. In addition, the MoE will provide solar PV-based power to all remote health posts and health centers, which do not have access to electric power and rely on kerosene for lighting and other energy needs. These PV systems will be used for

lighting, vaccine refrigeration and provision of potable water. This will improve healthcare delivery in the rural areas.
- Expand the supply and reach of LPG to substitute woodfuel use in homes and small businesses. The MoE will ensure the timely completion of the secondary conversion unit at the TOR to increase the production of LPG from the current 26,636 tons to 117,142 tons.

Secure future energy supplies

To realize this policy objective, the following actions would be pursued:

- Diversify Ghana's energy supply sources by promoting the exploitation of alternative energy supply sources.
- Pursue the development of the West African Gas Pipeline to make available to Ghana the huge reserves of natural gas in Nigeria.
- Promote the use of indigenous renewable energy such as wind energy, solar energy, small hydro as well as biomass energy.
- Promote end-use energy efficiency and conservation.
- Intensify hydrocarbon exploration in Ghana under a more private sector-friendly policy environment and with a more focused GNPC. GNPC will therefore be restructured to concentrate on its core business of finding hydrocarbons.
- Put in place requisite legal and regulatory mechanisms to facilitate the participation of IPPs.

Stimulate economic development

This policy objective is intended to provide an impetus to the energy sector to become a major contributor to the economic growth and prosperity of the country. The following actions would be pursued in order to achieve this objective:

- Export of energy: This is to be achieved through the sale of Ghanaian energy services to neighboring country markets. By this, the MoE will pursue a strategy to expand electricity supply capacity in the country in order to become a net-exporter in the West African Power Pool. The MoE also intends to expand petroleum product supply to neighboring countries by expanding the TOR and, in the medium term, commission the building of a new and modern refinery.
- Enhance productive uses of electricity in rural areas: This activity will be pursued under the Rural Electrification Program and is intended to ensure that electricity supplied to the rural communities is used to support agriculture and the establishment of small-scale businesses in the rural communities.
- Enhance Government revenue generation: The MoE will ensure that the energy sector will continue to provide a basis for the enhancement of Government revenue through efficient taxes and levies on energy supply and consumption.
- Employment generation: This will be achieved through the expansion and operation of indigenous energy supply services such as electricity generation and refining of crude oil.

Minimize environmental impacts of energy supply and consumption

To achieve this objective, the MoE will:

- Promote the gradual increase of more environmentally friendly energy supply sources such as renewable energy (solar, wind and small hydro) in the energy mix of the country.
- Promote a shift from oil to gas wherever gas is a viable substitute.
- Support and actively participate in international efforts and cooperate with international organizations that seek to ensure sustainable delivery of energy to mitigate climate change. The MoE endorses the United Nations Joint Implementation (JI) and Clean Development Mechanism (CDM).

Strengthen institutional and human resource capacity and R&D in energy development

To satisfy this policy objective, the MoE will pursue the following actions:

- Support institutional reforms in the energy sector in line with the provisions of the EC Act 541 and PURC Act 538.
- Strengthen existing regulatory agencies PURC and EC to enhance the regulatory environment in the energy sector.
- Support the training of Ghanaians in all fields of energy development and management.
- Redirect the use of the "Energy Fund" for the support of energy R&D activities.
- Support the transformation of Ghanaian energy research institutions into Centers of Excellence in Africa for energy research and development.
- Strengthen the EC to compile and maintain a comprehensive energy information database for the country.

Special concerns

According to the MoE, it recognizes the adoption and scale-up of Renewable Energy Technologies (RETs) to be of critical importance to meeting two of the policy objectives listed: securing future energy supplies and minimizing the environmental impacts of energy supply. Cognizant of the fact that RETs face significant barriers, the MoE aims to accelerate the development and utilization of renewable energy sources by pursuing the following policy actions:

- Create a level playing field for renewable energy by removing all fiscal and market barriers.
- Encourage utility companies to adopt renewable energy in their supply mix.
- Institute a "RET-Friendly" pricing framework in competitive applications such as in grid-connected supply.
- Provide Government funding support for non-grid-connected RETs for economic activities (such as agriculture) and social services (such as schools, health centers, provision of potable drinking water).

- Support technological development and cost reduction through pilot demonstration projects and local manufacture of RETs.

The policy objectives, actions, programs and projects discussed here were to be consolidated into a "Strategic National Energy Plan (SNEP)" with a 20-year horizon. Out of the SNEP, a medium-term plan spanning a five-year period was also expected to be prepared and implemented in two-year rolling phases. The SNEP, which commenced before the formulation of the 2001 Energy Policy Framework, is yet to be completed and it is unclear whether the medium-term plan was prepared. This notwithstanding, the energy policy of Ghana has since 2002 been guided by the dictates of the 2001 policy framework document.

Essentially, provision of access to modern energy (electricity and LPG) to unserved rural communities and households continues to be a key priority identified in the 2001 Energy Policy Framework. However, while previous electrification attempts have tended to focus on grid electrification and conventional energy, the current document gives room for the use of decentralized options using renewables in situation and localities where the economic realities do not support the extension of the national electricity grid. Another significant deviation of the current policy from previous one is the recognition of energy efficiency and conservation as a viable alternative to increasing supply of the various energy forms.

Conclusions

The chapter focused on providing an overview of Ghana's energy sector, which shows a huge dominance of traditional biomass resources, followed by petroleum products and then electricity. Although Ghana abounds in renewable energy resources, their exploitation has so far been minimal. *Biomass* (mainly firewood and charcoal) is the most important energy resource in Ghana, accounting for 69 percent of total energy consumed in 2000.

Petroleum products, which are the second most widely used form of energy in Ghana, accounted for 24 percent of total energy and 75 percent of commercial energy consumed in 2000. Annual consumption has been estimated at 1.6 million metric tons, 60 percent of which is consumed by the transportation sector. Gas oil (diesel), gasoline, kerosene and LPG are the main petroleum products used in Ghana. The Government is virtually responsible for the entire production chain of petroleum products. The OMCs are essentially only responsible for retailing. In arriving at its retail price, the MoE is guided by some principles which include: prices must ensure full cost recovery of all investments, generate revenue for current and future investments, provide revenue for the Government's development program and the uniformity of all petroleum products.

Electricity accounted for between 7 percent and 8 percent of total energy consumed in Ghana in 2000. The 2000 Population Census shows that access to electricity is 43.7 percent; this is, however, skewed towards urban households (77 percent urban as compared to 17 percent in rural areas). VRA produces electricity from two main sources — hydro and thermal; this is, however, supplemented by some amount of imports from neighboring La Cote d'Ivoire during peak hours. The electricity supply mix in the country is

expected to change by the year 2010 from the largely hydro-based system to a largely thermal-based one relying on natural gas as the main source of fuel, through the West African Gas Pipeline Project which is expected to transport natural gas from Nigeria through Benin and Togo to Ghana.

Renewable energy resources in Ghana include solar, modern biomass, wind, and small hydro. Modern biomass resources available include sawmill residues, agricultural wastes, animal waste, municipal wastes and energy crops. Of these, sawmill residue and energy crops are the most promising for energy purposes. Unfortunately, the renewable energy potentials remains largely untapped. The use of solar energy, particularly for PV electricity, and to some extent solar crop drying and water heating, have seen some use over the years.

National *energy consumption patterns* in Ghana show that consumption of all forms of energy has been growing consistently over the last decade. This trend is expected to continue with the consumption of woodfuel, electricity and petroleum products projected to grow at annual rates of 3 percent, 7 percent, and 8 percent, respectively. The household sector is seen as the largest energy consumer of energy with consumption almost entirely of woodfuel; over 90 percent for cooking. Households again consume about 47 percent of electricity, compared to 37 percent and 16 percent, utilized by industrial and non-residential consumers, respectively. The two main petroleum products used by households in Ghana are kerosene and LPG. Virtually all the kerosene produced in Ghana is used mainly for lighting and partly for cooking.

With regards to the *Energy Sector Institutional Framework*, a total of 13 public institutions, 18 private OMCs, two NGOs, and about 1,200 retails outlets are involved in Ghana's energy sector.

Ghana's policy objectives and strategies for the Energy Sector Policy Framework were enshrined in the Government's *'Vision 2020'* Policy Document. Based on this, the 'Energy Sector Development Program (ESDP): 1996-2000' was formulated to guide activities in the sector over a five years. The sector goals and prioritized objectives as elaborated in the ESDP, focused around a strategy whose principal aims include: the improvement, productivity, and efficiency in the procurement, transformation, distribution and use of all energy resources, and to secure future power supply through thermal power complementation of the hydro-based electricity generation system.

With the official end of ESDP in 2000, a new policy document, *'Energy for Poverty Alleviation and Economic Growth: Policy Framework, Programs and Projects'*, was introduced by the New Patriotic Party government in November 2001. The document outlined the vision of the Government to develop an 'Energy Economy' that would ensure reliable supply of high quality energy services for all (both urban and rural). The 'Strategic National Energy Plan (SNEP)' with a 20-year horizon, was to be consolidated comprising the policy objectives, actions, programs, and projects. A five-year medium-term plan was also expected to be prepared and implemented within a two-year period. SNEP is, however, yet to be completed and it is unclear whether the medium-term plan was prepared.

4. Energy Sector Reform

Introduction

Since Ghana's independence in 1957, the production and supply/distribution of modern commercial energy in the country has been carried out almost entirely by public utilities. Over the years, these utilities have become cash-strapped and debt-ridden due mainly to operational inefficiencies and inefficient pricing of their energy services. The utilities thus lack the financial requirements for new investments in the sector to meet ever-growing demand and remove supply bottlenecks caused by deteriorating physical infrastructure. With support from traditional financiers of the sector, i.e., the Government and multilateral organization dwindling, it became imperative that alternative sources of funding, most likely private capital, should be secured by the utilities. In a bid to attract private sector investment in all aspects of Ghana's energy development, a number of reforms have been initiated in the energy sector, particularly in the power and petroleum sub-sectors, with the primary aim of creating the necessary policy and regulatory environment for private sector participation. This chapter discusses the various reforms that have been implemented or are under way in the energy sector.

Electricity Sector Reform

In 1995, GoG initiated a process to comprehensively reform the power sector. The decision to reform the power sector in Ghana was taken in fulfillment of a World Bank conditionality that was attached to an International Development Association (IDA) credit facility granted to the GoG/VRA to build a 330 MW thermal power plant at Aboadze near Takoradi. GoG saw reforms in the sector as the most pragmatic response to the myriad of problems bedeviling the sector at the time although it was a conditionality. However, as soon as GoG agreed to reform the power sector, it (GoG) assumed total control over the design and implementation of the process when it refused to follow the Bank's prescriptions. Thus while GoG accepted the World Bank's diagnosis of the problems of the sector, it disagreed with its prescriptions. The Bank's role was subsequently reduced to a reviewer of the process; ensuring that the process proceeds in line with its principles of reforms (Edjekumhene *et al*, 2003). The stated objectives of the reform are:

- Enhance transparency in the regulation of the power sector, and also increase management accountability in the existing public utilities, including more effective commercialization of the operations of the power utilities.

- Effect structural changes that would move the power sector away from the existing monopolistic and centralized structure towards a more decentralized structure that would expose the utilities to competition in both generation and distribution of electricity.
- Encourage private sector investment in the power sector through the establishment of independent power production schemes, and the provision of open access transmission service to facilitate direct electricity sales by IPPs to consumers.
- Minimize the extent to which public resources and/or GoG sovereign guarantees are relied upon by the power utilities to finance power generation projects by introducing alternative arrangements to address specific non-commercial (country-specific) risks to be faced by investors, and to target the application of available public resources to enhance the cost-effectiveness of power transmission and distribution projects under the NES.
- Establish a regulatory framework that is transparent and at the same time enables healthy competition to occur in the sector.

GoG established a Power Sector Reform Committee (PSRC) to work out the modalities, milestones and timetables for the reform process. The PSRC finished its work in 1997 and submitted a report which recommended the following:

- Enactment of new legislation to establish a regulatory framework that will introduce explicit regulation, rules of practice and standards of performance to cover all aspects of power sector operations;
- Engender competition in wholesale power supply transactions and introduce open access transmission services to facilitate competition in the supply of power to large customers and distribution utilities;
- Reorganize existing utilities into "strategic business units" and recapitalize them through public-private partnerships and joint ventures; and
- Introduce specific guidelines and procedures to ensure transparency in the setting of tariffs for the power sector.

Key Components of Reform

Regulatory Reform

Although the PSRC recommended the establishment of one regulatory body, the cabinet directed GoG to proceed with regulatory reforms under a two-tier regulatory framework.[9] Consequently, in October and November of 1997, Parliament passed two laws — the Public Utilities Regulatory Commission Act (Act 538) and the Energy Commission Act (Act 541), respectively. Acts 538 and 541 together provide the legal framework for sweeping reforms in the electricity sector while establishing a new framework for regulation of the sector at 'arm's length' from GoG policy and strategy.

[9] The decision to opt for two regulatory bodies instead of one recommended by the PSRC was to satisfy a constitutional requirement. The 1992 Ghanaian Constitution requires that certain key sectors, including energy, should have a commission set up under the sector ministry to serve as the technical wing.

The PURC is an independent multi-utility[10] regulatory body which has the mandate to establish and apply criteria, guidelines and transparent procedures to regulate all aspects of the commercial interface between public utilities and their customers. The main functions of the PURC are to receive, vet, and approve specific tariffs proposals of public utilities for electricity supply services, and also to develop and enforce regulations to protect the interests of the customers of the power utilities. The EC, on the other hand, is the formal advisory body to the MoE. It advises the Minister on strategies to achieve efficient, economical and safe supply of electricity. Apart from its advisory role, the EC also has the mandate to regulate the activities of the power sector operators. Specifically, the EC grants licence to control the entry and exit to and from the energy sector by commercial operators, and also controls the conduct of licensees through the enforcement of 'rules of practice' and 'standards of performance' that are supplementary to the Electricity Regulations.[11]

Structural Reforms

Generation

In an effort to increase the availability of power, the generation of electricity is to be opened to other generators besides VRA, referred to here as IPPs. This means that VRA's monopoly in wholesale power supply to distribution utilities is to be phased out and GoG will arrange through competitive procurement of additional thermal power generation capacity, to establish a 'Power Pool' comprising independent power production companies. VRA would therefore compete as a generator and would not be privatized. Thus both private and public electric power generators would operate in the market.[12] Electric power generators can trade power among themselves or sell power directly to distribution enterprises, major consumers, intermediaries, or the system. This would be made possible through the proposed Wholesale Power Supply Market (WPSM) and the use of 'open access' transmission services.

Transmission

The transmission system is to be operated by a publicly owned national grid company, to be called Electricity Transmission Utility (ETU). This is to be created in order to avoid a situation whereby VRA, as the current transmission utility, is tasked with carrying electricity generated by its potential competitors. The ETU would therefore be an 'open access', 'non-discriminatory' facility.[13] The institution of the transmission system as a 'common carrier' facility is critical to enhancing competition in the restructured market. On the other hand, wholesale competition is limited as only distribution concessions and large consumers have access rights to transmission services.

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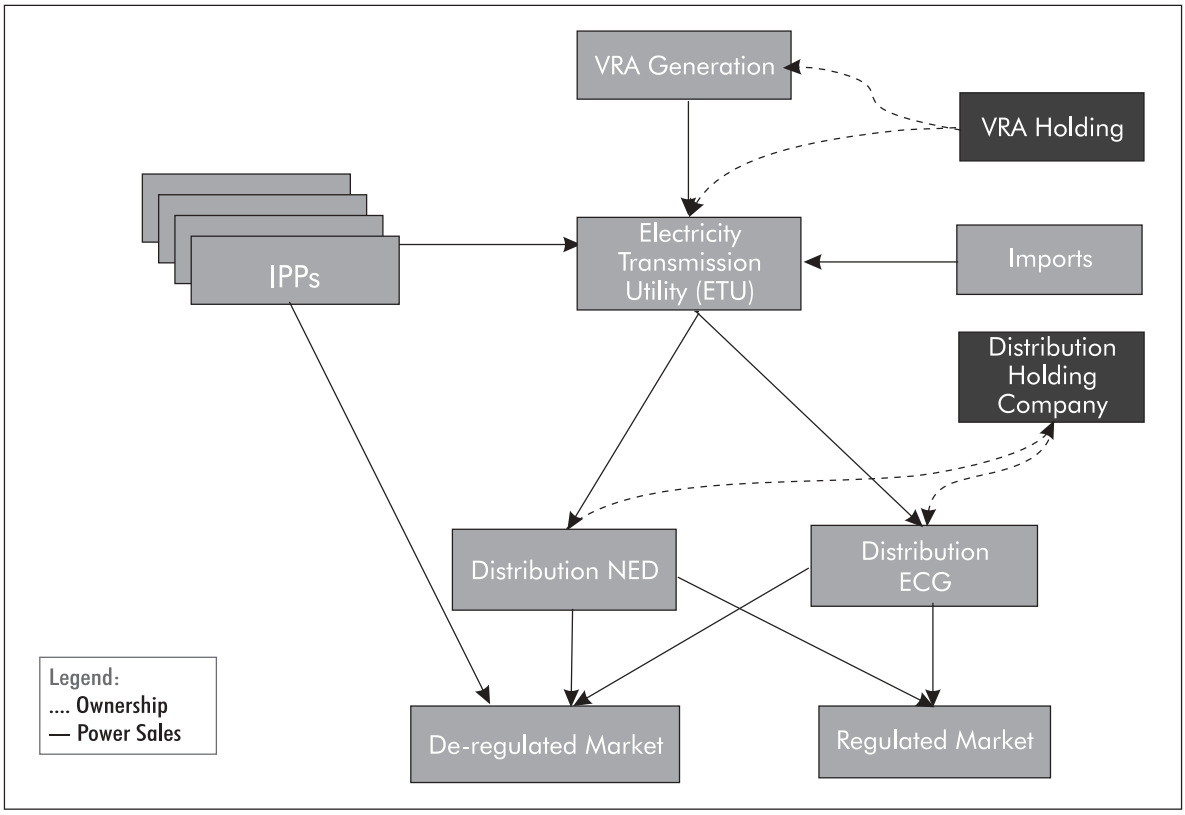
[10] PURC also regulates the water sector.
[11] The Electricity Regulations is a Legislative Instrument (LI), containing a core set of rules and regulations, which has been enacted to coordinate the implementation of power sector reforms.
[12] Although VRA will not be privatized, it is statutorily required to functionally unbundle its operations. It is proposed that VRA should be separated into four distinct strategic business units (SBUs). Under this arrangement, VRA will retain control over its core hydropower operations but it (VRA) will be required to transfer the use and control of the thermal power generation to the private sector through joint ventures.
[13] This implies that all generators and distributors will have access to its use based on agreements reached with the grid company.

Distribution

To create an incentive for IPPs to enter the power market, the proposed plan for the distribution segment of the electricity supply chain is to divide the market into a 'regulated' market of consumers under 5 MW and a 'deregulated' market of consumers with demand exceeding 5 MW. In the regulated market, the reform proposal is to merge ECG[14] and NED and then split them into two main distribution regions (originally into five distinct distribution concession areas). To introduce competition in the supply of electricity, the plan is to provide any customer whose demand exceeds 5 MW with the option of switching from the regulated market to the deregulated markets. This aspect of reform is intended to rationalize the prevailing arrangements whereby VRA sells power directly from the transmission system to mining and industrial customers whose demand falls in the range from 2 MW to 300 MW.

In summary, GoG pursued a power sector reform agenda aimed at ensuring the evolution of an unbundled and (wholesale) competitive market. To this end, the envisioned market structure for the electricity sub-sector is as represented in Figure 4.1.

Figure 4.1: Proposed Market Arrangement for Electricity Sector



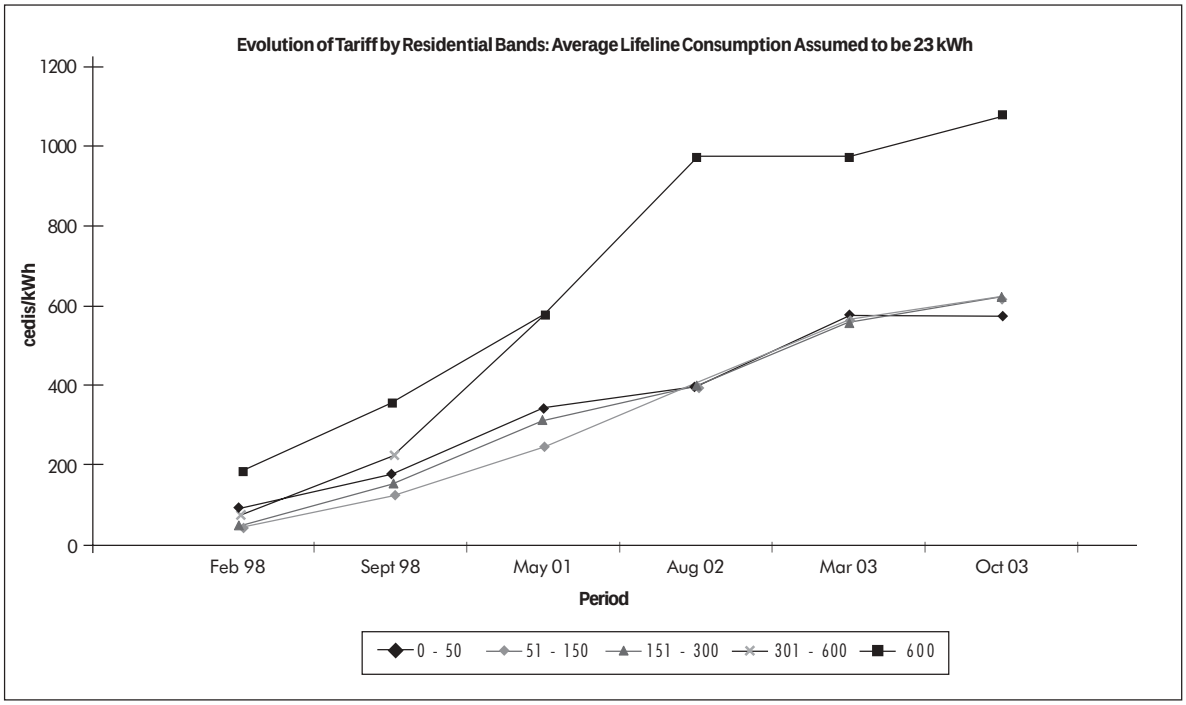
[14] *Originally a public corporation, the ECG was in 1997 converted into a limited liability company as part of a commitment made to the World Bank under the Structural Adjustment Program in the 1980s.*

Pricing reform

Pricing reform or rationalization of electricity tariffs towards their economic/cost recovery levels has also been a prime objective of the reforms in the electricity sub-sector. As mentioned earlier, one of the key recommendations of the PSRC was the institution of specific guidelines and procedures that would ensure transparency in the tariff-setting process. The key objective of pricing reform was to ensure transparency for all stakeholders, cost recovery for power utilities, and protection of customer interests (PSRC, 1997). The PURC was therefore tasked with the responsibility of ensuring that electricity tariffs are moved to their economic levels while providing adequate protection for the poor and vulnerable end-users.

Since its inception in November 1997, the PURC in consultation with all stakeholders has developed the guidelines for electricity rate-setting. The Commission has also carried out four major tariff adjustments, the first in February 1998, the second in September of the same year, the third in May 2001, and the last in July 2002.[15] Tariffs were again slightly adjusted in October 2003 following the implementation of an automatic tariff adjustment formula. These tariff adjustments have resulted in significant increases in end-user tariffs for all categories of consumers as shown in Figure 4.2. The levels and trend for all other end-users are captured in Annex 2.

Figure 4.2: Evolution of Tariff by Residential Bands (cedis/kWh)



[15] *The PURC approved an average increase of 72 percent but this was implemented in two steps. The first round of increases of 60 percent came into effect in August while the second round was introduced in March 2003. So the March 2003 was just an extension of the July 2002 tariff increase and not a major tariff review.*

Figure 4.3: Evolution of Electricity Tariffs by Residential Bands (US$)

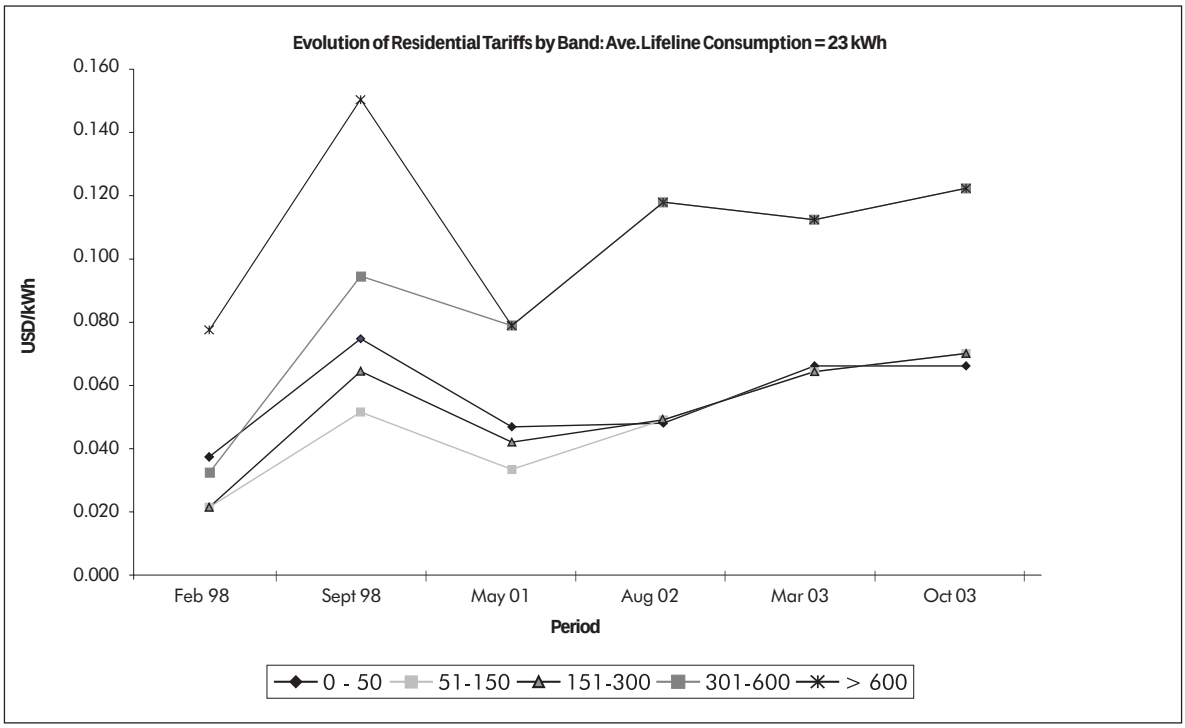


Figure 4.2 indicates that tariffs have increased in cedi terms with the rate of increase highest among customers consuming over 600 kWh/month. The figure also suggests that tariff paid by lifeline consumers (0-50 kWh) was increasing at a faster rate than that for the next tariff bracket (50-300 kWh) until the introduction of the Government subsidy in 2002 (see subsidies on Page 25). As can be seen from Figure 4.3, a similar picture emerges when tariff increases are viewed in dollar terms, except that in this case there is less dramatic increase in residential tariffs over time, with actual declines in tariffs between September 1998 and May 2001. The decline in tariff can be attributed to the rapid depreciation of local currency of up to 30 percent of the original value over the period 1998 to 2001.

In spite of the various tariff increases, electricity tariffs are still not at their economic levels. As of June 2002, tariffs did not cover the PURC-defined economic cost of electricity supply, let alone what the utilities assess to be the economic tariffs (see Table 4.1). At that time, the average end-user tariff payable by residential consumers was only up to 50 percent of the PURC indicative economically efficient cost of supply and 40 percent of what was proposed by the utilities, while high and medium voltage consumers were close to paying economic rates. The difference between the PURC indicative economic tariffs and those proposed by the utilities is explained largely by the fact that the former excludes the inefficiencies of the utility companies, which is assessed to be 2 cents/kWh (PURC, 2002). PURC does not allow any inefficiency to pass through to the tariffs for end-users. However, recent tariff increases have brought the end-user tariffs closer to covering economic costs.

While the electric utilities are demanding the approval and charging of economic tariffs, the PURC does not believe that inefficiencies or poor management should be passed on to the consumer in the form of higher tariffs and thus has adopted a strategy of phasing in an economic tariff over a four-year period under a transitional plan.[16] In essence, PURC seeks to create an incentive for utilities to improve their performance by setting tariffs below cost, but at a level that an efficient utility should be able to manage. The utilities clearly would have preferred an immediate attainment of economic (cost-reflective) tariffs, and oppose the phased approach to tariff increases.[17]

Table 4.1: PURC Economic Tariffs Versus Utility Proposal, June 2002

Customer Classification	*Current Tariff (as of June 2002) (Cents/kWh)*	*Efficient PURC Tariff (Cents/kWh)*	*Current Tariff as % of Economic Tariff*	*Tariff as Proposed by Utility (Cents/kWh)*
Residential:				
Lifeline	1.95	4.58	43%	6.80
Others	3.99	8.01	50%	10.05
Non-residential:	7.21	10.80	67%	14.56
Industrial/Commercial:				
Low Voltage	6.85	10.60	64%	11.23
Medium Voltage	5.98	6.33	94%	10.09
High Voltage	4.54	5.11	89%	8.94
Overall Average Tariff (Cents/kWh)	5.00	8.60	58%	10.60

Source: PURC Transitional Plan, 2002.

Subsidies

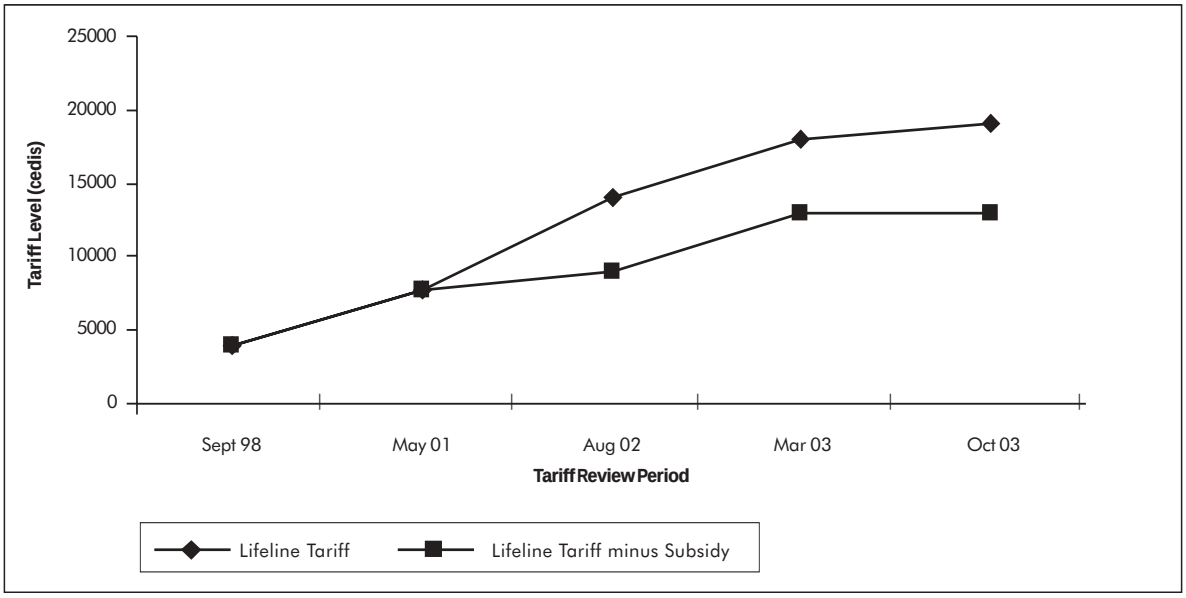
The move towards cost-reflective and economic tariff has warranted the gradual but steady removal of both direct subsidies to utilities and cross-subsidies among electricity consumers. However, to help mitigate the impact of price increases on low income and poor households, the PURC as part of guidelines for setting tariffs, instituted the 'lifeline tariff' mechanism. This has been defined as a social tariff well below the cost of supply and targeted at the poor and low income households. The lifeline philosophy contends that electricity is an essential service rather than a luxury and people of low income should not be deprived of it because they cannot afford to pay the full cost of supply.

[16] According to the PURC, the transitional plan has been couched in a manner that will afford the PURC the opportunity to transit current electricity tariffs with respect to generation, transmission and distribution, to economic rates, without imposing undue financial burden on all classes of customers. The plan is also expected to give ample time to customers to gradually adjust to the economic tariffs and, simultaneously, enable utility providers to cover their operating and maintenance costs and also to make a reasonable rate of return on their average revalued net fixed assets.
[17] An official of VRA is on record as having said, "Delay in implementing realistic tariff adjustments was doing VRA a lot of harm". According to him, "the delays indeed …have driven VRA near bankruptcy". He noted that the transitional plans do not state how to get money to balance the books on their operations and so they would constantly be running at a cash deficit (June 24, 2001, Accra Mail).

The lifeline tariff was first recommended by ACRES International (a Canada-based consulting firm) in 1992 and pegged at a lifeline consumption of 50 kWh per month. This was subsequently increased to 100 kWh per month in 1994 but it was reverted to 50 kWh per month during the 1998 tariff review by the PURC. It is estimated that the lifeline consumption of 50 kWh is adequate to satisfy the basic monthly requirement of rural customers and urban poor who may be earning the Government-approved minimum wage.

Until August 2002, the lifeline consumption of 50 kWh was enjoyed by all residential consumers (regardless of one's consumption level). The August 2002 tariff review, however, restricted the eligibility of beneficiaries of the lifeline tariff to only consumers whose consumption do not exceed 50 kWh in a month but introduced a 40 percent per unit subsidy for all residential consumers whose consumption falls within the next tariff bracket of 51-300 kWh. As can be seen from Figure 4.4, the lifeline tariff has been increasing with tariff reviews: from 4,000 cedis in 1998 to 7,800 cedis in 2001 to 14,000 cedis in 2002 to 18,000 cedis in March 2003.

Figure 4.4: Evolution of Lifeline Tariff in Ghana



However, after the August 2002 tariff increases, the Government announced a relief package of 5,000 cedis per customer to reduce the full impact of the tariff increase on lifeline consumers. This meant that instead of the PURC-approved lifeline tariff of 14,000 cedis per month, lifeline customers were only supposed to pay 9,000 cedis to the ECG every month. GoG, according to that announcement, committed itself to paying the difference of 5,000 cedis as a direct subsidy to the ECG. When the tariff was again increased to 18,000 cedis in March 2003, the Government continued to absorb the 5,000 cedis, which meant that lifeline customers only paid 13,000 cedis instead of the approved amount of 18,000 cedis. When tariffs were again slightly adjusted to 19,080 cedis in October 2003, following the implementation of the automatic tariff adjustment formula, lifeline customers continued to pay 13,000 cedis, implying that GoG's direct subsidy to the ECG increased to 6,080 cedis.

Status of Electricity Sector Reforms

The implementation of the reform proposals has progressed at a rather slow pace. Apart from the enactment of the EC Act (Act 541) and the PURC Act (Act 538) and rationalization of electricity tariffs, which were meant to be precursors for high level reforms, none of the proposed structural reforms has progressed beyond the conceptual stage. As a matter of fact, the whole process was stalled during the period just before and after the change of Government in January 2001.

Some analysts and industry experts have attempted to adduce reasons as to why the highly elaborate reform program has been moving at such a 'snail's pace'. Edjekumhene and Dubash (2002) and Edjekumhene, *et al*, (2003) blamed the stalled process mainly on difficulties and/or inability on the part of the regulator, and by extension the Government, to take critical decisions that will impact harshly on the general populace. At the root is the problem of tariffs that are low when viewed through the eyes of utilities and investors seeking to recover their costs, but high when viewed through the eyes of end-users. Edjekumhene and Dubash (2002) concluded inter alia: "Indeed the Ghanaian problem with tariffs in a climate of macro-economic uncertainty may be a nearly intractable obstacle to applying a profit-making model to the electricity sector in a poor country."

The decision to unbundle (restructure) VRA (generation and transmission), instead of focusing on the ECG (distribution) has also been cited as another reason for the slow pace of reforms. The distribution aspect of electricity supply has long been identified as the weakest link in the supply chain yet, proposed structural reforms were targeted primarily at reorganizing the generation and transmission functions without any significant changes to the distribution sector. Even the proposed horizontal unbundling of the distribution function has been found to constitute a structural impediment to reform given the smallness of the distribution sub-sector (Amissah-Arthur and Edjekumhene, 2004).

Despite the seemingly insurmountable barriers, power sector reforms received a new lease of life in November 2002 when the new cabinet commissioned a Review of the Power Sector Reform Program, which was completed in March 2003. The broad strategy recommended by the Review was approved by the cabinet. Under the current implementation schedule, the following major activities were outlined to be carried out between May 2003 and June 2004:

- Establishment of the Power Sector Reform Implementation Secretariat;
- Preparation of a legal framework for the reform program;
- Formation of VRA holding company;
- Development of rules for operating the national transmission grid and the electricity market;
- Formation of a distribution holding company consisting of ECG and NED;
- An action plan to ensure the financial viability of the power sector focusing on automatic tariff adjustments for ECG and VRA. Financial restructuring of the sector including ECG and VRA; and
- The implementation of a performance-based management contract for ECG.

A Power Sector Reform Implementation Secretariat has already been established at the MoE to coordinate and manage the day-to-day activities of the reform program. A Steering Committee, under the Chairmanship of the MoE, has also been formed to oversee the work of the Secretariat.

A committee has been formed to review all the legal issues related to the formation of the VRA Holding Company and make recommendations for its incorporation. In addition, a Planning Committee, made up of representatives from VRA, MoE, and CMS Energy Ltd, has been formed to review and make recommendations on the joint venture/management contract between the VRA and CMS Energy Ltd, with the aim to improve the operational efficiency of the Takoradi Thermal Power Complex, as well as reduce the cost of power generated at the Complex.

The Transmission Restructuring Committee has also been formed to look at issues related to the formation of the Transmission Company and the preparation of rules for its operation. The legal aspects of the formation of the Transmission Company are being discussed with a team from the Attorney General's Office. Draft rules for the operations of a National Grid Company and also an electricity market, are currently being reviewed by the Committee.

A Planning Committee, under the Chairmanship of the ECG Managing Director, together with a technical team has been formed for the purpose of assisting the MoE in creating the Distribution Holding Company. In pursuance of the objective of improving the management and technical operations of ECG, a draft performance-based management contract for the company has been prepared.

With the aim of enhancing the improvement of the performance of VRA and ECG, GoG has decided to sign a performance-based management contract with ECG to improve its financial management, commercial operations, technical operations, and quality of service. The contract will, among others, address the fundamental problems of non-payment of bills and of high non-technical losses.

Petroleum Sector Reform

Unlike the electricity sub-sector, limited attempts have been made to reform the petroleum sub-sector. So far, two main reform initiatives have been proposed for the sub-sector — deregulation of the distribution and the liberalization of the pricing of petroleum products, both of which are intended to enhance competitive marketing and pricing of petroleum products at the pump. With taxes and levies constituting a significant proportion of the retail price of petroleum products (see Annex 1), it is the hope of all stakeholders that liberalization of the sector will, inter alia, help reduce the price paid by consumers. In the medium term, the plan is to allow OMCs operating in Ghana to import finished products or crude oil directly for processing at the refinery at a fee. Again private sector investors will be allowed to build, own and operate refineries in the country within the policy of deregulation (MoE, 2001).

A major step towards the deregulation of the sector was the inauguration of a National Petroleum Planning Committee (NPPC) in November 2003. The mandate of the NPPC is to prepare and operate the modalities for the implementation of proposed reform in the distribution of petroleum products. Deregulation is expected to be carried out in two phases and would be completed by February 2005. In Phase I, which begun in January 2004, the OMCs were allowed to import refined petroleum products to supplement those imported by the TOR while Phase II will involve the import and refining of crude oil by the OMCs (Ghana News Agency, 2003). The final stage of the deregulation exercise will result in the pricing of petroleum products by the private sector.

The MoE is developing a pricing formula which would be used to guide the private sector in the pricing of the products. One of the key elements within the formula will be ensuring that there was equalization as the products would be bought at the same price anywhere in Ghana. The formula would, in addition, allow for cross subsidization in favor of the rural poor and the vulnerable in terms of kerosene and premix fuel for fishermen. According to GoG, its decision to deregulate the sector was informed by the more than 2.3 trillion cedis debt TOR had incurred by 2001 as a result of its inability to price the products to break even. The EC is expected to have oversight responsibility over the deregulated sector. Apart from being responsible for the technical regulation of the electricity sub-sector, Act 538 also mandates the EC to regulate the operations of the petroleum sector through the issuance of licenses and the prescription of technical and operational practices for the refining, storage, bulk transport, marketing and sale of petroleum products (Energy Commission Act, 1997).

On the upstream side, the Government intends to intensify the pace of oil and gas exploration in the country particularly in deepwater where there is growing evidence of potential accumulation of hydrocarbons. To that effect, the existing legal and regulatory framework for oil and gas exploration and production is being revised to make it more attractive for investors. Again the Ghana National Petroleum Corporation (GNPC) is being restructured to refocus its operations on its core business of exploring and developing oil and gas (MoE, 2001).

Woodfuel Sector Reform

Since the production and supply of woodfuel are already private sector-driven, reform in the sector is expected to focus on initiating and supporting appropriate regulatory mechanisms that will ensure the sustainability of the sector. Accordingly, reforms in the sector would concentrate on the rationalization of the fiscal framework for woodfuel exploitation, transportation and distribution in order to create economic incentives for the better management of woodfuel production and supply (MoE, 2001).

Energy Sector Reforms and Provision of Public Benefits

The term 'public benefit' has been used to denote social, environmental and development energy-related 'goods and services' which bring about notable welfare improvements (Clark, 2002). Examples of such

goods and services include programs focusing on environmental protection, energy efficiency and renewable energy, integrated energy planning, 'good' customer services (including quality and reliability of supply, and satisfactory service provider-customer interface), and programs that seek to increase poor people's access to modern energy supplies. Patterson (2000) refers to these goods and services as 'public service obligations' in that they must be taken care of — either directly or indirectly — by the public sector.

Patterson argues that unless the public sector takes these public service obligations seriously, they will fall through the gaps i.e., not be invested in by anyone, even though everyone benefits from them. This is because public benefits have free-rider properties, and/or the market generally will not invest in them because it does not in most cases pay financially and directly to do so (Clark, 2002). There is a growing concern that as the role of the public sector dwindles while that of private sector actors surges, as envisaged under energy sector reforms, the provision of these public benefits, hitherto promoted by the former, will be compromised unless explicit attention is paid to their incorporation during the design of the reforms. To what extent have energy sector reforms in Ghana catered to the provision of public benefits?

According to Edjekumhene *et al*, 2003, the power sector reform program being implemented in Ghana has factored in fairly adequate safeguards against expected adverse effects on the provision of public benefits while simultaneously introducing measures to exploit potential opportunities created by reforms. The issue of access to electricity even under reform was made an explicit goal by the Government. The GoG asserts that its decision to reform the power sector was primarily inspired by its commitment to electrify the whole country by 2020 through the National Electrification Scheme (NES) (MME, 1999).[18] This it hopes to do through the funding of more electrification schemes with concessionary loans from donors and a strategy to allow private distribution concessionaires to participate in the NES. In addition, provision appears to have been made under the PURC Act (Act 538) to ensure that consumers are able to pay for services provided by utilities through the gradual phase-in of economic tariffs and the introduction of a lifeline consumption level of 50 kWh per month. Again a Demand-Side Management (DSM) program introduced as part of the reform, originally intended to free tied-up electricity in key sector of the economy, has also been targeted to help consumers cut down on their energy consumption.

Unlike social issues, environmental issues were not explicitly addressed; either by the Government or civil society. However, the EC Act (Act 541) and the Environmental Protection Act (Act 490) provide adequate safeguards against negative environment impacts of reform, such as pollution. In addition, two reform outcomes — the Embedded Generation Facility (EGF) and DSM — are expected to result in positive environmental outcomes even though they were not included specifically for that purpose. The EGF, for instance, was introduced to allow for diesel power generation during a power crisis in 1997-1998 while, as mentioned earlier, the DSM program was introduced mainly to free tied-up power for development (Edjekumhene, *et al,* 2003). For at least two reasons, the EGF has come to be seen by both energy practitioners in Ghana and by donors as a

[18] *It should be noted, however, that this goal was never articulated at the inception of the reform of the power sector and that for much of the early reform period, policies to promote universal access to electricity services proceeded on parallel track to reform efforts (Edjekumhene and Dubash, 2002).*

potential tool for promoting renewable energy technologies, particularly wind and solar. First, by creating a legal space for private generation and sale of electricity on a small-scale, the EGF will open a door to all small-scale generation technologies in Ghana. Second, the EGF will provide a further boost for RETs through rate-setting guidelines. Specifically, the PURC is required to set bulk tariffs based on avoided costs plus the transmission service charges saved by generating electricity close to the end-user. Consequently, renewables are expected to be favored by distribution licensees as a cheaper alternative to meeting their service obligations than relying on centrally generated electricity (Edjekumhene and Dubash, 2002).

With regards to governance issues, it has been found that power sector reform has helped institute a transparent governance system for the power utilities. The PURC has incorporated several principles of good governance in its structure and functioning. These include institutional representation of industry, labor, and domestic consumers in the Commission; transparent guidelines for tariff-setting; publication of tariff decisions; and mechanisms for public hearings and representation before the PURC (Edjekumhene and Dubash, 2002).

In the case of petroleum products, the only mechanism put in place to mitigate the impacts of price increase on the poor segment of Ghana's population is the adoption of a petroleum pricing structure that includes significant cross-subsidization in favor of products consumed primarily by low-income households, i. e., kerosene and LPG.

Conclusions

There are various reforms that characterize the energy sector, and this chapter looked at these reforms being undertaken within the sector in Ghana. With regards to the electricity sector reform, GoG in 1995 initiated a process to comprehensively reform the power sector. Though this was a World Bank conditionality for a credit facility, GoG saw the reforms as the most pragmatic response to problems confronting the energy sector. The PSRC was established to work out the modalities, milestones, and timetables for the reform process. It finished its work in 1997 and submitted a report.

Although the PSRC recommended the establishment of one regulatory body in its report, the Parliament, under the direction of the cabinet, passed two laws: the Public Utilities Regulatory Commission Act (Act 538) and the Energy Commission Act (Act 541) in October and November 1997. These Acts provide the legal framework for reforms in the electricity sector while establishing a new framework for regulation of the sector.

Structural reforms proposed under the reforms process include the introduction of IPPs into the sector in an effort to increase the availability of power generation to other generators beside VRAs.

The responsibility for the transmission of power would lie on a publicly owned national grid company, to be called Electricity Transmission Utility (ETU), so that VRA would not be tasked to transmit electricity to potential customers.

Under the distribution of power, a plan has been proposed to divide the market into 'regulated' market for consumers under 5 MW and 'deregulated' for consumers above 5 MW. It has been proposed that ECG and NED would be merged and then split into two main distribution regions for each to be responsible for five distinct concession areas. This would enable consumers to choose which supplier to buy energy from.

The main objective of the pricing reform was to ensure transparency for all stakeholders, cost recovery for power utilities, and protection of customer interests. The PURC, since its inception in November 1997, has in consultation with stakeholders, adjusted tariff five times between February 1998 to October 2003.

With regard to subsidies, there is a gradual removal of both direct subsidies to utilities and cross-subsidies among electricity consumers, to allow for the move towards cost-reflective and economic tariff. A lifeline tariff mechanism has, however, been instituted by PURC to mitigate the impact of price increases on poor households and low income areas, with the explanation that electricity is an essential service rather than a luxury.

The status of the electricity sector reforms shows that proposals have progressed at a rather slow pace. Unfortunately, the whole process was stalled during the period just before and after the change of Government in January 2001. Thus, apart from the enactment of the EC Act (Act 541) and the PURC Act (Act 538) and the rationalization of electricity tariffs, none of the proposed reforms has gone beyond the conceptual stage. In spite of these challenges, in November, 2002, the cabinet commissioned a Review of the Power Sector Reform Program, which was completed in March 2003 and its recommendations approved by the cabinet. For the petroleum sector, only two reform initiatives have been proposed so far — the deregulation of distribution and the liberalization of petroleum pricing. A step towards deregulation was fulfilled with the inauguration of NPPC in November 2003.

It was also noted that reforms in the woodfuel sector were expected to focus on initiating and supporting appropriate regulatory mechanisms that will ensure the sustainability of the sector, as the production and supply of woodfuel were already private sector-driven.

Finally, with regards to 'public benefits' from these various reforms, it has been argued that unless there are explicit requirements outlined in the various reform programs, the provision of these 'benefits' would be compromised as the role of the public sector reduces and that of the private sector surges.

5. Impact of Energy Sector Reform on Poor Households

Introduction

An assessment of the impact of energy sector reforms on poor households falls under the purview of evaluation research, which is almost always confronted with the key challenge of identifying causality. According to Davies *et al,* 2003, the detection of causal relationships is difficult due to several factors, including the influence of other causes on outcomes, the fact that outcomes may be conditional on specific factors in the environment, the feedback loops that may exist between effects and causes, and the time delay between the implementation of reforms and the emergence of impacts. The issue of time delays is of particular significance since, in many cases, reforms are at a preliminary stage of implementation. Hence, impacts may not have had a chance to manifest themselves and one would have to conjecture what the likely impacts and outcomes will be (Davies *et al,* 2003). In spite of all the inherent difficulties, reforms in the energy sector are expected to impact, either directly or indirectly, on poor households in any of the following ways: the price of energy services; access to energy services; quality of supply and service provision; improvement in social services such as health and education; stimulation of economic development; and public sector finances (Davies *et al,* 2003).[19]

Given the inchoative nature of Ghana's energy sector reform, the only tangible impact of the process, thus far, on poor households is its effects on tariffs; all the other likely impacts are a bit too early to manifest. As mentioned in Chapter 4, pricing reform (price liberalization) is one of the few reform measures that has been implemented and this has led to significant increases in the prices of electricity and petroleum.

Impact of Electricity Tariff Reform

Electricity tariffs, for example, have been increasing consistently since reforms were introduced. The first major tariff increment of over 400 percent for all categories of consumers was announced by the PURC in February and August 1998. The next upward adjustment of electricity tariffs averaging 103 percent (as against an average increase of 310 percent requested by the utilities) for all categories of consumers

[19] *It should be pointed out that the list of likely impacts of reform referred specifically for the power sector but have been cited here because similar, if not same, impacts could result in the other sub-sectors.*

was approved and announced by the PURC in May 2001. The most recent increment in electricity tariffs resulted in a combined increase of 72 percent in August 2002 and March 2003. The latest tariff increases, just like the earlier ones, were meant to move electricity tariffs closer to their economic levels by the end of 2003 so as to pave the way for the charging of full economic cost (full cost recovery) by 2004. The PURC also gazetted a quarterly automatic tariff adjustment mechanism in order to allow tariffs to be revised in smaller, less disruptive increments to reflect shifts in oil prices and the exchange rate. The first adjustment with the formula came to effect in October 2003. Figure 4.3 shows the increasing trends in electricity tariffs since the inception of reforms.

Needless to report that these tariff increases were occasioned by massive furore led by stakeholders like the Civil Servants Association (CSA), Trades Union Congress (TUC), Association of Ghana Industries (AGI), Ghana National Association of Consumer (GNAC) and political parties in opposition. While not objecting to the increments per se, these stakeholder groups contend that the wherewithal to meet these extra expenses are non-existent largely because the increments are not accompanied by corresponding or proportionate increase in wages and salaries. The opposition from the AGI stems from the fact that the tariff adjustments have resulted in increasing cost of production for its member, many of whom are running electricity-intensive industries. For instance, the Ashanti Goldfields Corporation, one of the leading producer of gold in the world, reported a $20 increase in the cost of producing an ounce of gold following the 1998 tariff increment and threatened to close down some of its mines if tariffs were not reduced (Edjekumhene, 2000).

The impact of increases in electricity tariffs is expected to be significant on urban households, over 70 percent of whom depend on electricity to meet their lighting needs and 32 percent relying on wage income from employment. Tariff increments can also impact adversely on household income depending on how it impacts on households, non-farm enterprises (including small-scale manufacturing), which contributes approximately 40 percent of the income of urban households. The impact on poor households (and businesses) could be even worse given the fact that quality of supply has not matched the increases in tariffs, thus households have to pay more for the same or worse quality of service. However, there is little or no evidence of fuel-switching as a result of the surging prices of electricity. The only noticeable change in household use of electricity is the adoption of energy efficiency and conservation measures, thanks to the educational campaign initiated by the Energy Foundation. Due to the Energy Foundation's campaigns, most households have shifted from the use of incandescent bulbs to Compact Fluorescent Lamps (CFL) and adopted several other energy saving measures such as bulk ironing and constant defrosting of their refrigerators. Households have also been monitoring their electric energy consumption through regular reading of their meters.

As mentioned briefly in Chapter 4, the main mechanism introduced to protect poor consumers in the face of soaring electricity tariffs is a lifeline tariff for all residential consumers who consume less than or up to 50 kWh per month and subsidized tariff for end-users whose consumption is up to 300 kWh per month. Five years after the introduction of lifeline tariffs, no study has been conducted to assess their effectiveness as a mechanism for cushioning poor households from the likely effects associated with an upsurge in electricity tariffs after reforms. However, there are concerns that a significant proportion of potential lifeline

consumers are not benefiting from the lifeline mechanism and may be facing the full impact of tariff increments. These are households living in compound houses. According to GLSS 4, approximately 69 percent of urban dwellings in Ghana were compound houses with many families sharing a space (GSS, 2000). Many of these houses use a single shared electricity meter, which means that some families may consume less than the lifeline level — 50 kWh — and yet be charged at a higher unit rate because their consumption is aggregated with other families sharing the same meter. According the ECG, about 66,000 residential customers (about 11 percent of the total) were located in compound houses with shared meters (ECG, 2001). When this happens households who would have qualified as lifeline consumers if they had had their own meters will end up paying more for electricity since the total consumption of some compound house could exceed 300 kWh every month, thus not benefiting from any subsidy at all. This situation is further aggravated in households located in compound houses having unscrupulous landlords who hide electricity bills from tenants and apportion cost based on their own formula and non-existent bills.

Impact of Petroleum Product Pricing Reform

Similarly, prices of petroleum products have been going up following steps taken towards liberalizing petroleum prices. The first major increase in the price of petroleum products averaging 60 percent was announced by the Government in February 2001. Then, in January 2003, prices of petroleum products were again increased by an average of 90 percent, bringing them fully in line with world market levels. The price of gasoline, for example, was hiked from 10,500 cedis (US$1.27) per gallon to 20,000 cedis, that of kerosene and gas oil or diesel went up from 8,800 cedis (US$1.07) to 17,500 cedis (US$2.12). GoG, in a press conference to announce the increases, said the tariffs had to go up to help stem the ever-increasing debt of TOR, which stood at 4 trillion cedis (US$485.6 million) in January 2003,[20] as well as to curb smuggling between Ghana and neighboring countries — particularly the Ivory Coast and Burkina Faso — where prices are much higher.

The full impact of these price increases on poor households has not been assessed but could be very significant considering the fact that petroleum products are used extensively in almost all major sectors of the economy including transport, manufacturing, agriculture, and various productive activities. Increases in the price of petroleum products work their way through the economy from higher transport costs and production costs that are then passed on, to varying degrees, depending on the structure of the market, to consumers through higher prices for goods and services. As a matter of fact, the 12-month or year-on-year inflation measured by the Consumer Price Index (CPI) shot up from 16.3 percent in January 2003 to 30 percent at the end of April 2003 (GSS, 2003) and this increase was attributed largely to increases in the price of petroleum products and a corresponding increase in the prices of goods and services (Osafo Marfo, 2003; GNA, 2003). According to the GSS, prices of food items, which account for half the weighted basket of items used to compute the CPI, rose by 27.3 percent over the 12-month period while non-food items rose even faster, by 31.5 percent. Considering the fact that about 46 percent of total cash expenditure

[20] *TOR debt exceeds the total primary capital of the banking system in Ghana and more than 90 percent of this debt is owed to one bank – the Ghana Commercial Bank.*

by households is incurred on food and beverages, the effects of these increases in food prices on household budgets and standard of living could be significant.

The discussion in the preceding paragraph covered the likely indirect impacts associated with increases in the prices of petroleum products. However, there could be other direct impacts of price increments on poor households. For instance, an increase in the price of kerosene is expected to have a negative impact on poor households in Ghana, 60 percent of whom use the fuel as the main source of lighting. The effect could even be more significant in rural areas where up to 82 percent of households use kerosene as the main fuel for lighting. Similarly, the price hike in transport fares that has characterized many a petroleum products price increments can make further demands on household budgets thereby reducing the spendable incomes available for other goods and services. According to the GLSS 4, about 4 percent of the total household expenditure is incurred each year on purchased fares (transportation) (GSS, 2000). This percentage has definitely increased given the fact that transport fares were increased by 15 percent and 30 percent on an average, following the February 2001 and January 2003 petroleum price increases.

As mentioned already, the only mechanism put in place to mitigate the impacts of petroleum price increase on the poor segment of Ghana's population is the adoption of a petroleum pricing structure that includes significant cross-subsidization in favor of products consumed primarily by low-income households such as kerosene. However, it is not clear how the cross-subsidization mechanism has helped to mitigate these impacts of the price hike because the price of kerosene almost doubled when the recent price increase was announced. One wonders what would have happened without the cross-subsidization. The Government has also been increasing salaries of workers as well as raising the national daily minimum wage to enable workers to cope with the increase in the price of petroleum products. It is obvious that even if salary increases provide sufficient cushioning to poor households against petroleum price increments, its distributional impacts will be minimal since only the relatively small segment of the population in wage employment will benefit. Wage employment constitutes only 23 percent of the total household income (GSS, 2000).

Other Impacts

So far this report seems to suggest that the impact of energy sector reform on the poor has largely been negative due mainly to increases in tariffs and prices of petroleum products, which unfortunately have not been accompanied by enhanced quality of services. However, price increments may not be a bad thing after all and could have positive impacts on poor households. This is because subsidies paid to public utilities can be very significant and can absorb a large share of the Government budget. Thus, poorly performing utilities represent a significant drain on public-sector finances, diverting resources away from other priorities of governments such as provision of healthcare and educational facilities. Meanwhile, because most subsidies are not well targeted, they are enjoyed by both the rich and the poor, and are thus inequitable. A move towards full cost recovery, which is what the series of price increases are seeking to achieve, will improve the financial health of the utilities thereby reducing the subsidy burden on the budget.

The resources generated through removal of subsidies could be invested in direct poverty reduction measures, although there is no guarantee that such savings would be channeled into poverty alleviation, given the fungibility of Government funds. To the extent that savings accruing from the non-payment of subsidies will make more funds available to Government the poor households in Ghana are expected to benefit because of GoG's commitment to increase poverty spending with the aggregate poverty-related expenditure budgeted at 4.6 percent in 2003 (Osafo-Marfo and Acquah, 2003). Again, according to Osafo-Marfo and Acquah, the March 2003 adjustments in utility prices is expected to reduce subsidies to utilities to 50 billion cedis, which will be directed to "finance lower-than-market rates for low-income consumers of electricity and (water)".

Conclusions

The impact of energy sector reforms on poor households was analyzed based on electricity tariff reform, pricing of petroleum products and other general impacts. With electricity tariff reform, urban households are likely to receive the highest impact, since over 70 percent depend on it to meet their lighting needs and only 32 percent rely on wage income for employment. If tariff increases affect non-farm enterprises, household income could be adversely affected as it contributes about 40 percent of the income in urban households.

Higher transportation and production costs are the main impact of petroleum product pricing reforms. These costs are then passed on to consumers through higher prices for goods and services. An increase in the price of kerosene would impact negatively on poor households as 60 percent depend on it for lighting.

Other impacts envisaged from these reforms includes a move towards full cost recovery in electricity and petroleum production and supply; as this will improve the financial health of the utilities, reducing the subsidy burden on the Government's budget. These resources could be channeled into poverty alleviation activities, which are intended to benefit poor households.

6. Socio-economic Characteristics of the Household Sector

The 2000 Population and Housing Census defines the household as "a person (or group of persons) who lives together in the same house or compound, shares the same house-keeping arrangements and is catered for as one unit". According to the Census, there are a total of 3,701,241 households in Ghana, with each household unit having an average size of 5.1 persons compared to 4.9 recorded in the 1984 Census. Eighteen percent of persons living in households are heads of the households: 69 percent of them male and 31 percent female. Children constitute the largest share of the average Ghanaian households (37.3 percent) followed by members of the immediate family (other relatives – 21 percent), spouses (9.4 percent) and grandchildren (7 percent). The significant proportion of other relatives and grandchildren in the composition of households highlights the fact that the Ghanaian households are still traditional in structure (GSS, 2002).

Educational Attainment

Table 6.1 highlights the educational attainment of people aged 15 years and above in Ghana during GLSS 3 and GLSS 4.

Table 6.1: Educational Attainment of Adults by Sex, 1991/92 and 1998/99

	1991/92			1998/99		
Highest Level Attained	*Males*	*Females*	*All*	*Males*	*Females*	*All*
Never been to school	29.1	49.8	40.3	21.1	41	31.8
Less than MSLC/BECE	29.2	26.6	27.8	24.6	25.6	25.1
MSLC/BECE	32.6	20.3	26	38.6	27.8	32.8
Secondary or Higher	9.1	3.3	6	15.8	5.7	10.4

Source: Ghana Statistical Service, 1995 and 2000.

Table 6.1 shows that in 1998-1999 about 32 percent of all adults (aged 15 and above) had never been to school, a further 25 percent went to school but did not obtain any qualifications, about 33 percent had the Middle School Leaving Certificate (MSLC)/ Basic Education Certificate Examination (BECE) certificate as the

highest qualification, while the remaining 10 percent had secondary or higher-level qualification. These figures represent improvement over the 1991-1992 figures when 40 percent of all adults had not been to school; 28 percent went to school but did not obtain any qualifications; 26 percent had MSLC/BECE; and 6 percent had secondary and higher-level qualification. Table 6.1 also brings to the fore the gender disparity in the educational level of adult males and females in Ghana. For instance, more than twice as many females as males have never been to school while half as many females as males have secondary or higher qualification. Again there are more females than males who have been to school but failed to obtain any certificate (GSS, 1995 and 2000).

Household Income: Levels and Sources

According to the Ghana Statistical Services, the average annual household income, relative to March 1999 prices, is estimated to be 2,267,000 cedis, which is equivalent to a per capita income of 527,000 cedis. These figures translate to US$947 and US$220, respectively, using an exchange rate of 2,394, the prevailing rate in March 1999. Table 6.2 indicates the mean annual household and per capita income, by quintile (GSS, 2000).

Table 6.2: Mean Annual Household and Per Capita Income by Expenditure Quintile

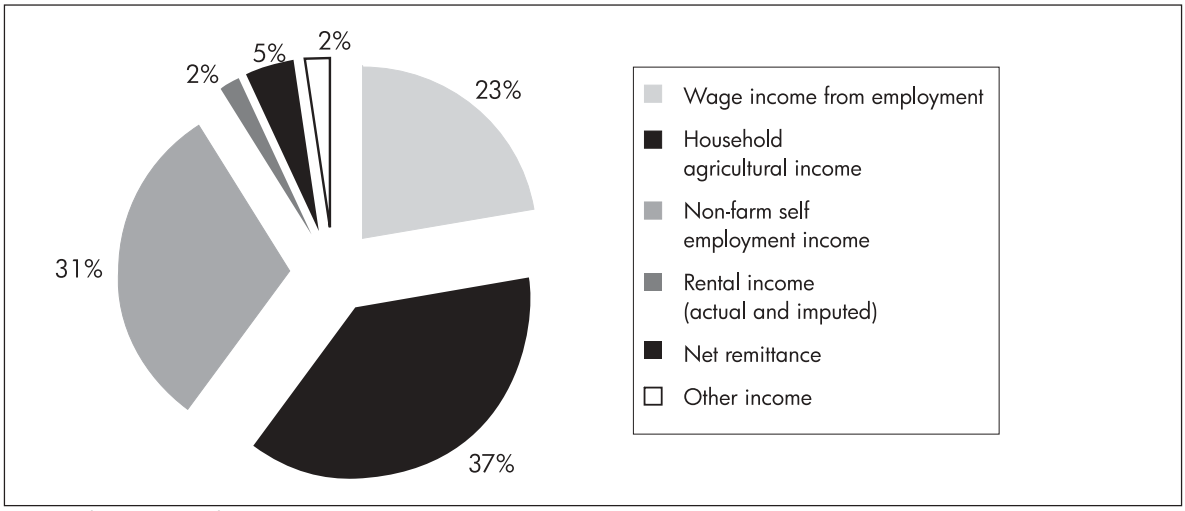
Quintile	*Mean Annual Hhold Income (cedis)*	*Mean Annual per Capita Income (cedis)*	*Percentage Share*			*Mean Hhold Size*	*Sample Size*	
			Hholds %	*Persons* %	*Income* %		*Hholds*	*Persons*
Lowest	979,000	166,000	14.7	20.0	6.4	5.9	919	5,170
Second	1,770,000	328,000	15.9	19.9	12.4	5.4	1,004	5,152
Third	2,009,000	419,000	18.0	20.0	16.0	4.8	1,139	5,184
Fourth	2,673,000	652,000	21.1	20.0	24.9	4.1	1,261	5,177
Highest	3,025,000	1,080,000	30.3	20.0	43.7	2.8	1,261	5,171
All	**2,267,000**	**527,000**	**100.0**	**100.0**	**100.0**	**4.3**	**1,675**	**25,855**

Source: Ghana Statistical Service, 2000.

As can be seen from Table 6.2, there is substantial variations in income across the expenditure quintiles. Households in the lowest quintile have an average per capita income of 166,000 cedis, whereas those in the highest quintile have an average per capita income of 1,080,000 cedis. This inequality is also seen from the percentage share of persons and income in the different quintiles with 20 percent in the lowest quintile generating only a little more than 6 percent of total income and the highest quintile generating over 40 percent of total income (GSS, 2000).

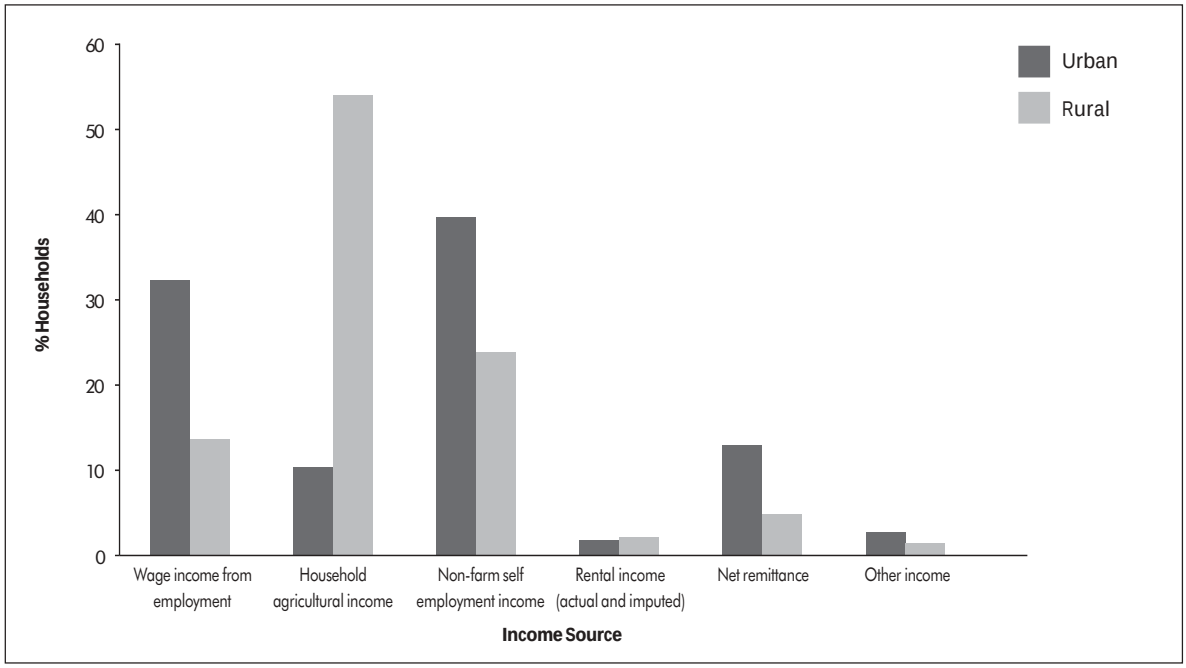
Agriculture (37 percent) is the major source of household income, followed by non-farm self-employment (31 percent), wage employment (23 percent), net remittances (5 percent), rental income (2 percent) and other income (2 percent). Figure 6.1 depicts the components of household income in Ghana. The composition of household incomes varies across the country. In urban areas, non-farm self-employment income (40 percent) is the major source of income, with wage income as the second most important source (32 percent). In rural areas, more than half of total household income is derived from agriculture (54 percent), with non-farm self-employment income ranking second and contributing 24 percent of household income (GSS, 2000). Figure 6.2 shows the variations in the components of household income for rural and urban Ghana.

Figure 6.1: Components of Household Income (%)



Source: Ghana Statistical Service, 2000.

Figure 6.2: Distribution of Household Income by Component and Locality



Source: Ghana Statistical Service, 2000.

Household Expenditure

GLSS 4 estimated average annual household expenditure and average annual per capita expenditure to be 4,244,000 cedis and 987,000 cedis, respectively, relative to 1999 prices. The figures are equivalent to US$1,773 and US$412, respectively, using the March 1999 exchange rate of 2,394 cedis to the US dollar. Table 6.3 captures mean annual household expenditure and per capita expenditure for different expenditure quintiles.

Table 6.3: Mean Annual Household and Per Capita Expenditure by Quintile Group

Quintile Group	*Mean Annual Hhold Expenditure (cedis)*	*Mean Annual per Capita Expenditure (cedis)*	*Percentage Share*			*Mean Hholds Size*	*Sample Size*	
			Hholds %	*Persons %*	*Exp %*		*Hholds*	*Persons*
Lowest	1,658,000	281,000	14.7	20.0	5.7	5.9	919	5,170
Second	2,747,000	509,000	15.9	20.0	10.3	5.4	1,004	5,152
Third	3,538,000	737,000	18.0	20.1	15.0	4.8	1,139	5,184
Fourth	4,655,000	1,135,000	21.1	20.0	23.2	4.1	1,261	5,177
Highest	6,422,000	2,293,000	30.3	20.0	46.0	2.8	1,261	5,171
All	**4,244,000**	**987,000**	**100.0**	**100.0**	**100.0**	**4.3**	**1,675**	**25,855**

Source: Ghana Statistical Services, 2000.

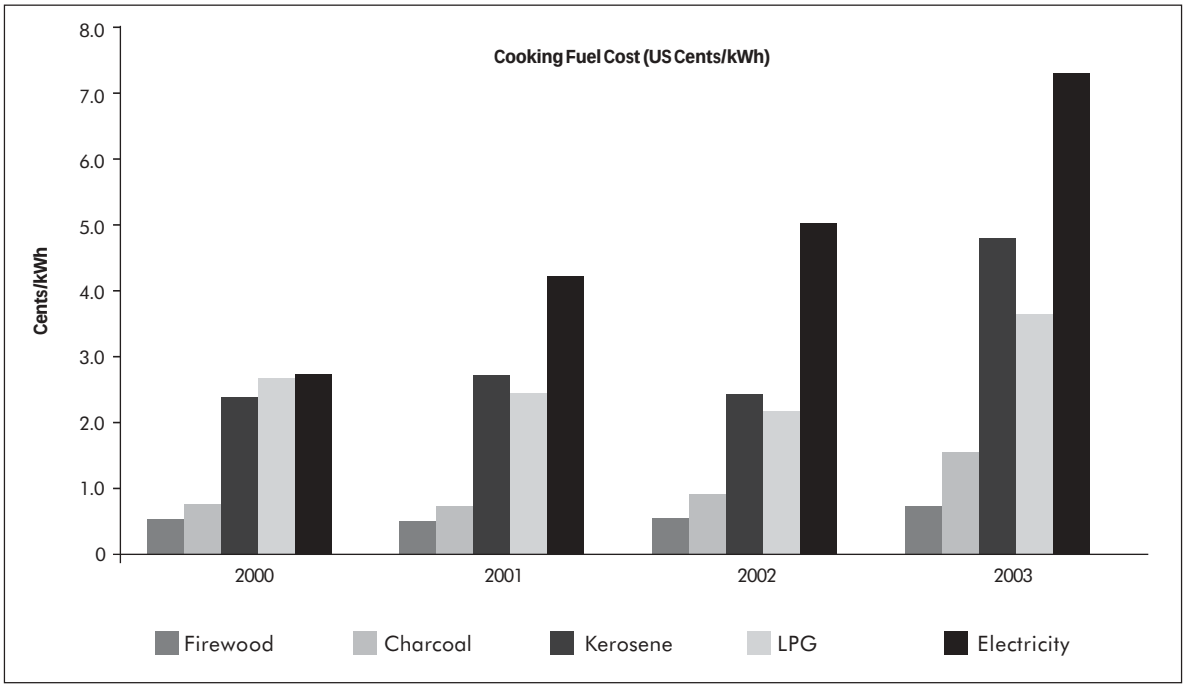
Just as was observed in the case of household income, household expenditure patterns reveal similar significant variations across different quintiles. Table 6.3 shows that the average annual household expenditure in the fifth quintile (6,422,000 cedis) is more than thrice that in the first quintile (1,658,000 cedis). The disparity among quintiles becomes even more pronounced when one considers the fact that households in the highest quintile had fewer number of persons (three) in a household as against six persons per household in the lower quintile. This means that average annual per capita expenditure for those in the fifth quintile (2,293,000 cedis) is more than eight times that of the average in the first quintile (281,000 cedis). This observation further implies that while the top 20 percent of households account for 46 percent of total annual expenditure, their counterparts at the other end of the spectrum account for only 5.7 percent of household expenditure (GSS, 2000).

As much as 55 percent of mean annual household expenditure is expended on food (45 percent in cash and 10 percent of consumption of own-produced food), 42 percent on non-food expenditure (36 percent in cash and 6 percent for imputed value of non-food items used in household), and 2 percent on housing cost. At the national level, total cash expenditure amounted to 14,100 billion cedis, 46 percent of which

went to food and beverages. Alcohol and tobacco, and clothing and footwear, each accounted for about 10 percent of total cash expenditures. The next most important expenditure groups, in terms of amount spent, were recreation and education (7.6 percent), housing and utility (6.4 percent), household goods, operations and services (6 percent), and transport and communications (5.6 percent). Household expenditures on energy fall under the housing and utility (electricity) and household goods, operations and services (fuel and power) categories. Relative to 1999 prices, it is estimated that, on the average, Ghanaian households spend 47,196 cedis (US$20) per annum on electricity, representing 1.4 percent of total annual cash expenditure. Total annual cash expenditure on electricity was also estimated at 192 billion cedis (US$80 million). With regard to fuel and power, an average amount of 95,543 cedis (US$40), representing 2.8 percent of total households expenditure, was estimated to be spent annually by households. Total cash expenditure by households on fuel and power was estimated at 389 billion cedis (US$162 million) (GSS, 2000).

It should be noted, however, that total household cash expenditure on fuel and power could have been much higher but for the fact that a significant amount of firewood consumed in Ghana, particularly in rural areas, is non-marketed. A survey by Hagan and Addo, 1994, shows that 67.8 percent of rural households harvest their firewood free of charge (Olhoff, 2001). This also suggest that a considerable amount of time is spent collecting the fuels. Figure 6.3 compares the cost, in kilowatts hours, of the various cooking fuels used by households from June 2000 to June 2002. The detailed breakdown of the various costs is tabulated and attached in Appendix 1.

Figure 6.3: Comparative Cost of Cooking Fuel in Ghana



Source: Togobo, 2004.

As can be gleaned from Figure 6.3, electricity is the most expensive fuel source for cooking while firewood is the least expensive. This shows a negative correlation between the cost of fuels and the percentage of households (see Figure 7.1) that use that kind of fuel for cooking: the higher the cost of the fuel, the lower the percentage of households which will use it.

Conclusions

According to the 2000 Population and Housing Census, there are a total of 3,701,241 households in Ghana, with an average size of 5.1 persons compared to 4.9 recorded in the 1984 Census. Children constitute the highest percentage of households (37.3 percent) of an average household in Ghana, and a significant portion (27 percent) for other relatives.

Educational levels in Ghana are improving. According to GLSS 3 and GLSS 4, in 1998-1999 about 32 percent of all adults (aged 15 and above) had never been to school, this is an improvement of over 40 percent of all adults who has not been to school during the 1991-1992 survey.

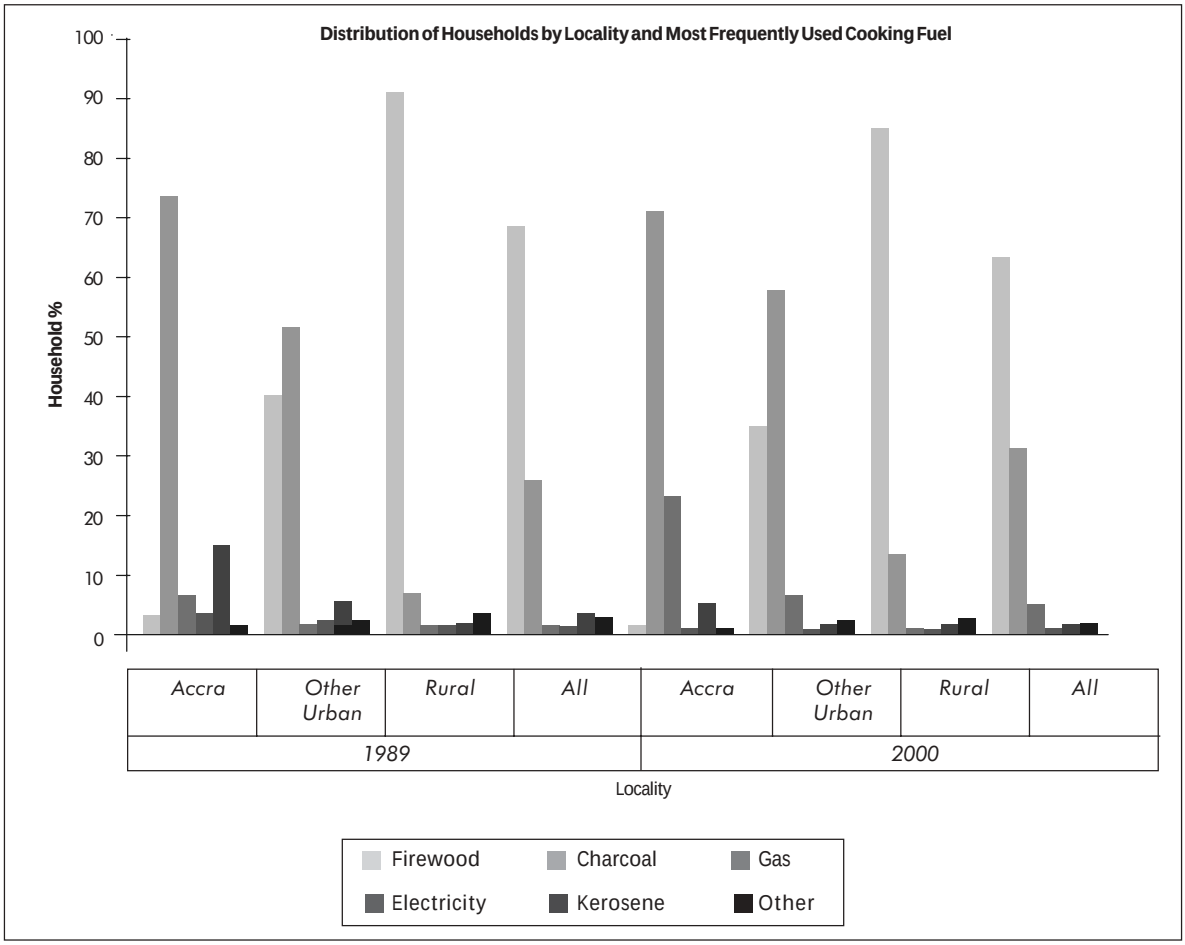
The GSS puts an average annual household income estimates, relative to March 1999 prices, at 2,267,000 cedis, which is equivalent to a per capita income of 527,000 cedis. With regards to sources of household income, agriculture contributes 37 percent, self-employment 31 percent, wage employment 23 percent, net remittances 5 percent, rental income 2 percent and other income 2 percent.

Expenditure-wise, GLSS4 estimates average household expenditure and average annual per capita expenditure to be 4,244,000 cedis and 987,000 cedis respectively, relative to 1999 prices. In typical households, 55 percent of mean annual household expenditure is spent on food, 42 percent on non-food expenditure and 2 percent on housing cost. According to a survey carried out in 1994, about 67.8 percent of rural households in Ghana harvest their firewood free of charge, thus lower the cash expenditure on fuel and power in rural areas but much time is spent on this activity.

7. Household Energy Consumption Patterns

As revealed by the overview of Ghana's energy sector, energy for cooking and water heating is the most pressing energy need in households in Ghana which is met largely from biomass sources. Figure 7.1 shows the distribution of households by locality and most frequently used type of cooking fuel for 1989 and 2000.

Figure 7.1: Household Energy Consumption Patterns



Source: Ghana Statistical Services, 1996 and 2000.

As can see from Figure 7.1, about 63 percent and 31 percent of households rely on firewood, and charcoal, respectively as the main cooking fuel (GSS, 2000), compared to 68 percent and 25 percent in 1989 (GSS, 1996). These percentages indicate a slight increase in households' dependence on woodfuels for cooking – from 93 percent in 1989 to 94 percent in 2000 – and a changing trend in the consumption of firewood and charcoal. Household consumption of firewood declined from 68 percent in 1989 to about 63 percent in 2000 while consumption of charcoal increased from 25 percent to 31 percent over the same period. Firewood consumption decreased even in the rural areas from 90 percent in 1989 to 84 percent in 2000. The decline in firewood consumption can be attributed mainly to declining stock of the resource and partly to fuel-switching. Ghana is losing its forest cover at an estimated annual rate of 65,000 hectares and this has led to the dwindling of Ghana's forest cover from 8.3 million hectares at the beginning of last century to 2 million hectares in 2000, out of which 1.6 million hectares is designated as forest reserves. It is only the remaining 0.4 million hectares that is given to free but controlled access (Brew-Hammond and Edjekumhene, 2000). Since firewood is harvested directly from the forest and there are no dedicated plantations or woodlots to be exploited on a sustainable basis, the availability of the resource has tended to dwindle with the disappearing forest cover.

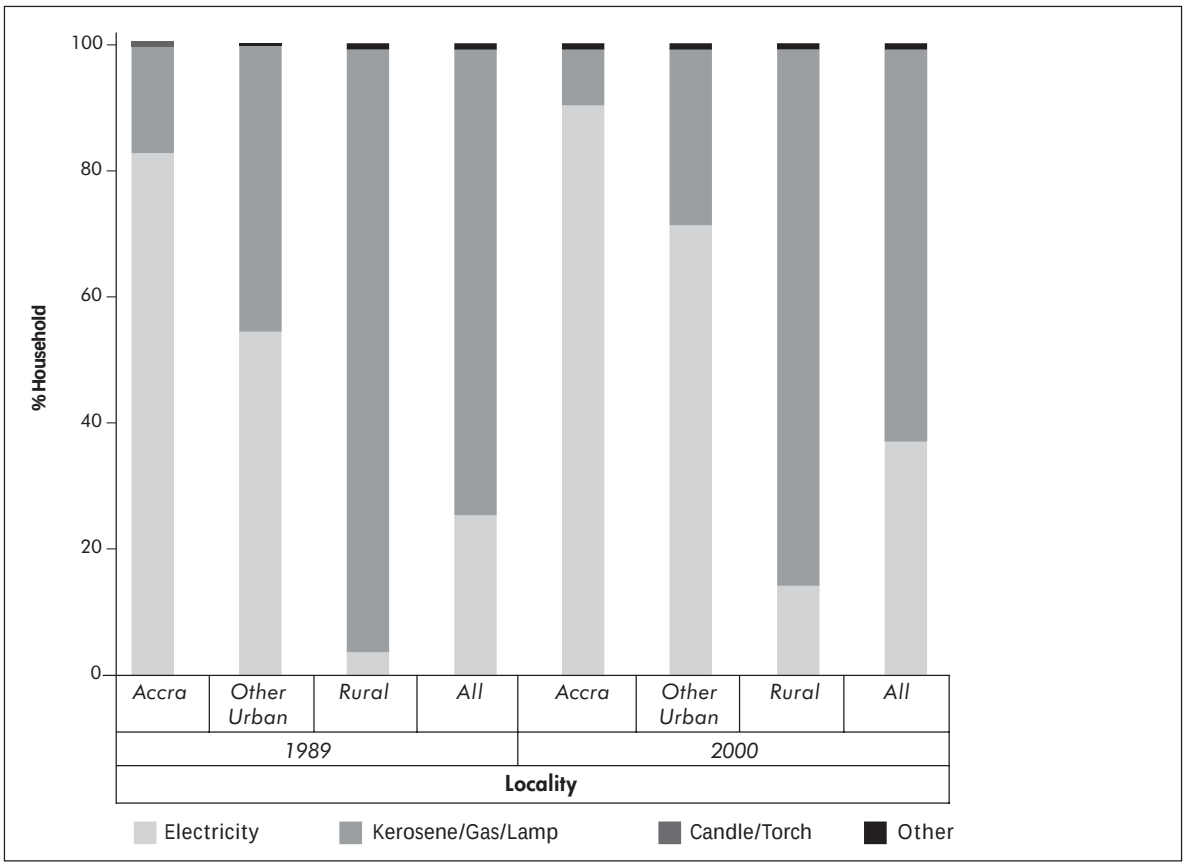
Meanwhile, consumption of charcoal increased in all localities, with the exception of Accra, the national capital, over the same period. This increase in charcoal utilization is likely to be attributed to increased urbanization, on one hand, and inter-fuel substitution, on the other. Since charcoal is the main cooking fuel in urban Ghana, there is likely to be a positive correlation between urbanization and consumption of the fuel. The decline in charcoal consumption in Accra, the outlier, could be attributed to an increase in the consumption of LPG in Accra, which went up from 6 percent in 1989 to 23 percent in 1999. In fact, this significant increase in the consumption of LPG could account for the decline in the consumption of all other forms of cooking fuels in Accra, especially kerosene which used to be the second most important cooking fuel after charcoal during GLSS 2. The increase in LPG consumption is attributed to the massive promotion campaign embarked upon by the MoE in the 1990. It should be noted that with the exception of LPG, the percentage of households using all the other forms of cooking fuels declined over the period 1989 and 2000.

Following cooking, lighting is the next major energy service in households. Figure 7.2 shows the distribution of households by locality and source of lighting for the period 1989 to 2000. As revealed by Figure 7.2, kerosene is the main source of lighting for households with 60 percent of households in Ghana depending on it to meet their lighting needs in 1999 compared to 72 percent in 1989. Grid connected electricity is the second most important source of lighting for households with 39 percent of Ghanaian households having access to electricity in 1999 compared to 27 percent in 1989.[21] Figure 7.2 also shows that about 90 percent of households in Accra, and 72 percent in other urban areas, use electricity for lighting. Many rural households (82 percent) use kerosene for lighting, compared to 93 percent in 1989 (GSS, 2000). The changing trend in the source of energy for lighting (a shift from the use of kerosene to electricity) can be attributed to the NES, which was introduced in 1989 with the aim of ensuring that electricity supply

[21] *The 2000 Population and Housing Census reports a high percentage for electricity, approximately 44 percent while the share of kerosene is given as 55 percent.*

covers all parts of the country (universal access) over a 30-year period from 1990-2020. If universal access to electricity is achieved in 2020, electricity will become the main source of energy for lighting for all households in Ghana. While grid electrification is the main focus of the NES, renewable energy, especially solar energy, is gradually becoming a key part of the NES following the decision of the GoG to provide remote rural communities with solar PV systems. According to the 2000 Population Census, 0.1 percent households rely on solar energy to meet their lighting needs (GSS, 2002).

Figure 7.2: Distribution of Households by Locality and Source of Lighting



Source: Ghana Statistical Service, 1989 and 2000.

It should be pointed out, however, that electricity is not only used for lighting purposes by households but it is also used to power electrical appliances such as ventilation fans, refrigerators, television sets, radios and electric pressing irons. It is estimated that 23.6 percent of all households have electric fans, 16.6 percent own refrigerators, 53.8 percent own radios – which is the major source of information, 4.1 percent own videos, 22.4 percent own television sets and 23.8 percent own pressing irons. Non-electrified households rely on the charcoal box iron and the solid metal iron for the pressing of clothes and dry cell or car battery to power their radio sets (Energy Commission, 2002).

Conclusions

An overview of Ghana's energy sector reveals that energy for cooking and heating water is the most pressing energy need in households. A significant source of energy in Ghana is the use of firewood in both rural and urban areas. Although the use of firewood declined in the year 2000, the use of charcoal increased. While the decline is attributed to the declining stock of resources and partly to fuel-switching, the increase in charcoal use could be attributed to increased urbanization. The decrease in charcoal consumption in Accra is linked to an increase in LPG consumption due to its massive promotion by the MoE.

Lighting is the next major energy service after cooking. Kerosene is the main source of lighting in households in Ghana, accounting for 60 percent in 1999. This is followed by grid-connected electricity as the next important source of lighting. The NES, which was introduced in 1989, could be the source of the changing trend in the source of energy. If the target of universal access energy to be achieved in the year 2020, electricity will become the main source of energy for lighting.

8. Energy Supply Chain

Biomass

About 90 percent of woodfuels is obtained directly from the natural forest and the remaining 10 percent from wood waste, i.e. logging and sawmill residue and the planted forests. The production and supply of firewood and charcoal are very decentralized commercial activities that are undertaken all over the country. However, the transition and savannah zones of Ghana, mainly the Kintampo, Nkoranza, Wenchi, Afram Plains, and Damongo districts provide the bulk of dense wood resources for woodfuels. Woodfuel resources are depleting at a faster rate as a result of unsustainable practices in the production and consumption of the products that result in high levels of waste. According to the UN Food and Agriculture Organization (FAO), the rate of deforestation in Ghana is 3 percent per year. This rapidly depleting resource stock has led to the situation where charcoal producers have had to travel over long distances in search of appropriate wood for charcoal production (Energy Commission, 2003). Similarly, harvesters of firewood now spend more time collecting the wood from the forest.

Charcoal and fuelwood are normally transported from the production centers (mainly in the rural areas) to the major cities and other urban centers where they are sold by wayside retailers to final consumers. A fraction of the charcoal produced is, however, exported to West African and European markets. For example, a total of 32,328 TOE of charcoal was exported in 2000 (Togobo, 2002). The woodfuel industry is handled almost exclusively by private individuals with little regulation by the Government. The most recent regulatory measure introduced by the EC is the ban on the export of charcoal produced from unapproved sources, that is, sources other than sawmills residue or forest planted for that purpose. Thus, exporting charcoal produced from the direct wood sources, that is, wood harvested from the natural forest, is not allowed. Since July 2003, all exporters of charcoal are required to obtain a permit or license from the EC.

Petroleum Products

As indicated earlier on in this report, Ghana imports all of its crude oil requirements and finished products. The imported crude oil is refined by TOR, which has a capacity to refine 45,000 Barrel Stream Per Day (BSPD). TOR also undertakes bulk sale and export of petroleum products. Until May 2001, the bulk storage and primary distribution of gasoline, kerosene and diesel were the responsibilities of BOST. However, with

the reorganization of BOST in May 2001, these responsibilities were transferred to TOR. In the past, BOST had relied on four main modes for primary distribution of petroleum products. These are:

- Pipeline transport from Tema to Mami Water depot and Akosombo transit depot;
- Ocean transfer using small marine vessels from Tema to Takoradi;
- Lake barges on the Volta lake from Akosombo to Buipe; and
- Bulk Road Vehicles (BRVs) were used to transport products from Tema to Kumasi and Bolgatanga depots.

In order to cut down the cost of primary distribution, the Government has restricted the use of BRVs for bulk movement of petroleum products to depots since May 2001 (Energy Commission, 2002).

BOST is responsible for managing strategic stocks of gasoline, kerosene and gas oil in the country. It is also responsible for primary distribution of these products from the refinery to these depots and between the depots. Following the reorganization of BOST, its focus is now centered mainly on planning for laying and managing of strategic stocks in the country. The cost of maintaining these strategic stocks is accounted for in strategic stock levy in the price build-up of petroleum products. BOST is expected to keep a strategic stock of minimum three weeks of national demand of petroleum products as depicted in Table 8.1.

Table 8.1: BOST Strategic Reserves Stock

Depot	*Gasoline*	*Gas Oil*	*Kerosene*	*LPG*	*Total*
Kumasi	4,964	6,446	2,890	-	14,300
Bolgatanga	1,456	2,024	1,690	-	5,170
Total	6,420	8,470	4,580	-	19,470

Source: Energy Commission, 2002.

Secondary distribution and retail of petroleum products is carried out by OMCs and private retail outlets. As at October 2002, there were 18 licensed OMCs engaged in secondary distribution and sale of petroleum products. These OMCs obtain their supplies from TOR and BOST bulk storage depots for direct sale to industries and commercial institutions and retail sale to the public through about 1,200 retail outlets. Because of the importance of kerosene as the main fuel for lighting in rural areas, and cognizant of the supply bottlenecks identified through GLSS 4, the Government in 2001 initiated the Rural Kerosene Distribution Improvement Program (RKDIP).

The aim of this program is to ensure that kerosene is made available at all times and at officially approved prices through the provision of tanks and guarantees to tank vendors who are selected by the District Assemblies to resell kerosene. The project involves the establishment of over 2,400 kerosene reseller

outlets in rural areas all over the country by the year 2010 (MoE, 2001). So far, 500 tanks have been distributed to locations in the district. Under Phase II of the program, 1,100 surface tanks would be fabricated and distributed to all districts in 2004 (Nduom, 2003). In the case of LPG, there are 85 mini-filling plants in Ghana, 52 in and around Accra and 11 in Kumasi. Secondary distribution of petroleum products is done mainly by BRVs operated by both the OMCs and private owners (Tank Owners' Union). The cost of secondary distribution is accounted for in the price build-up for petroleum products as the UPPF margin.

Electricity

Until the introduction of reforms in the energy sector some five years ago, electricity generation was the preserve of the VRA, a publicly owned power utility. VRA is the sole owner of the two hydro plants at Akosombo (912 MW) and Kpong (160 MW). The Akosombo plant is undergoing retrofitting of its turbine generator sets, which is expected to bring on board an additional 108 MW of installed capacity when completed by the end of 2005. This will increase the total installed capacity at Akosombo to 1020 MW. VRA also owns half of the 550 MW Aboadze Thermal Power Plant – the 330 MW Takoradi Power Company (TAPCO). The other half, the Takoradi International Company (TICO), is jointly owned by CMS of Michigan and VRA. Currently, TICO has an installed capacity of 220 MW. However, this is expected to be increased by another 110 MW unit in 2004 when TICO is converted from the current single cycle plant to a combined cycle plant.

VRA again owns and operates the transmission network, comprising 36 substations and approximately 4,000 circuit km of 161 kV and 69 kV lines. This includes 129 km of double circuit 161 kV interconnection to Togo and Benin. There also exists a single circuit 220 km of 225 kV inter-tie with La Cote D'Ivoire's CIE network.

Distribution of electricity is undertaken by two distribution utilities – ECG[22] and NED, which is a subsidiary of VRA. The ECG was established in 1967 by a decree (NLC Decree No. 125) and charged with the bulk purchase of electricity from VRA for distribution throughout the country to all categories of consumers, with the exception of Volta Aluminum Company (VALCO), the Akosombo township, and the mines. In 1987, following the establishment of NED, ECG's distribution activities were restricted to the six southern regions, i.e., Ashanti, Greater Accra, Eastern, Western and Volta regions. ECG's customer base stood at approximately 900,000 as of 2001. As mentioned earlier, NED was established in 1987 as a subsidiary of VRA to take over from ECG the responsibility of procurement, distribution and sale of electricity in the northern sector of the country comprising Brong Ahafo, Northern, Upper East and Upper West regions. There are five bulk supply points located at Sunyani, Techiman, Tamale, Bolgatanga and Wa, which feed the NED distribution system. In 2000, NED had a customer base of approximately 120,000. The entire distribution system is made up of 8,000 km of sub transmission lines and 30,000 km of distribution networks. The system also has 22 bulk supply points and 1,800 MVA of installed transformer capacity (Energy Commission, 2002).

[22] The ECG was formerly called the Electricity Corporation of Ghana until 1997 when it was converted into a limited liability company under the provision of the Statutory Corporations (Conversion to Companies) Act, 1993 (Act 461).

The two distribution utilities are obliged to supply electricity to customers within their areas of operations. However, due to the poor financial state of the utilities, service extension to customers in new residential areas can be delayed for a long period of time and customers who want to fast-track the process will have to make contributions towards the extension of service. Customers are sometimes required to buy the main distribution poles, which by law would become the property of the utilities. Business consumers who want services to be provided are required to make a capital contribution in the form of advance payment before they will be served. This practice, however, has been abolished since October 2003 and both NED and ECG are now required to spread the capital contribution over a period of 12 to 24 months, to be negotiated depending on the amount involved and would be included in the customer's monthly bill (Nduom, 2003).

Most customers of ECG and NED are provided with either a single phase or three-phase credit meter, which is read at the end of the month and the bill provided to customers. Customers who are without meters pay flat rates determined by the utilities. In 1999, in a bid to reduce its non-technical losses and increase collection rates, ECG introduced a pilot project to install pre-paid meters in certain communities in the major cities. While this project is still ongoing, its progress has been very slow due to lack of funds to purchase the meters. NED has also introduced a new device known as a "load limiter", which is expected to enable NED to accurately determine power consumed by lifeline customers and billed on a flat rate basis. The idea behind the scheme is that as consumers move from the lifeline tariff bracket to higher usage of power, the rating of the load limiters would be progressively increased and flat rate tariffs adjusted.

Conclusion

This chapter focused on the energy supply chain. With regards to biomass, the natural forest accounts for about 90 percent of woodfuels. The remaining 10 percent comes from wood waste i.e., logging and sawmill residue, and planted forests. Firewood and charcoal production and supply are decentralized commercial activities. Usually, they are produced and transported from the rural areas to the urban centers for selling.

The next supply chain discussed was petroleum products, where it was noted that TOR refines all the crude oil imported into the country and also undertakes its bulk sale and export. It is also responsible for bulk storage and the distribution of gasoline, kerosene and diesel. Secondary distribution and retail of petroleum products is carried out by OMCs and private retail outlets, who obtain their supplies from TOR and BOST for direct sales to industries and commercial institutions and retailing to the public. The Government, in 2001, initiated the RKDIP due to kerosene's importance to rural dwellers, to ensure its availability at all times and at approved prices. For LPG, there are 85 mini-filling plants in Ghana.

Electricity generation was the sole responsibility of VRA until the introduction of reforms in the energy sector. Currently, it is the sole owner of Akosombo and Kpong Dams and also owns half of the 550 MW thermal

plant. Distribution of electricity is the preserve of two distribution utilities – ECG and NED, which is a subsidiary of VRA. ECG is responsible for distribution activities in six southern regions, while NED takes care of the remaining four regions to the north.

Although these two utilities are obliged to supply electricity to customers, due to the poor financial state of the utilities, service extension to customers in new residential areas can be very frustrating and customers who need it urgently would have to contribute towards the extension of service. Pre-paid meters were introduced in 1999 by ECG on a pilot basis in some major cities, but the progress has been very slow due to lack of funds to purchase the meters. NED has also introduced the "load limiter", which is expected to enable it to accurately determine power consumed by lifeline customers and billed on a flat rate basis.

9. Conclusions and Recommendations

Conclusions

The following conclusions can be drawn from this report:

Biomass (charcoal and firewood) is the most important energy source accounting for up to 69 percent of the total energy consumed in Ghana in the year 2000. Used mainly for cooking and water heating, charcoal and firewood combine to supply approximately 94 percent of total energy consumed in the household sector. The production and supply of woodfuels is carried out by the private sector with very little regulation by the Government.

Petroleum products are the second most important energy source in Ghana, contributing about 24 percent of Ghana's 2000 energy balance and 75 percent of commercial energy consumed in 2000. Gas oil, gasoline, kerosene and LPG are the main petroleum products consumed in Ghana, mainly in the transportation sector. Kerosene is the most frequently used fuel for lighting in Ghana with 55 percent of households depending on it for lighting. Kerosene serves as the fuel for lighting in 82 percent and 22 percent of rural and urban households, respectively. LPG is the third most important cooking fuel and the fuel experiencing the highest annual growth in demand (14 percent) in Ghana between 1990 and 2000. The growth in the utilization of LPG has led to the reduction in the consumption of charcoal in urban areas, especially in the national capital, Accra. Ghana imports all her crude oil, chiefly from Nigeria, and the crude oil is refined at TOR with a capacity of 45,000 BPSD. There are 18 OMCs and a total of 1,200 retail outlets that distribute and market the products across the country.

Electricity is the third most important energy source in Ghana accounting for 7 percent of total energy consumption in 2000. Approximately, 44 percent of Ghanaians have access to grid connected electricity but access is skewed in favor of urban dwellers: 77 percent of urban dwellers have access to electricity compared to only 11 percent for rural dwellers. Electricity is produced by VRA from two sources – hydro and thermal. The total installed electric capacity is 1,652 MW, which is supplemented by 200 MW power imported from La Cote d'Ivoire. VRA also owns and operate the transmission network in Ghana. Distribution of electricity is carried out by two public utilities – ECG and NED – with a total customer base of about 1,120,000.

The consumption of all forms of energy in Ghana has been growing consistently over the last decade and the trend is expected to continue with electricity and petroleum products projected to grow at higher rates (7 percent and 8 percent, respectively) than woodfuels (3 percent per annum). However, woodfuels are expected to retain a preponderant share of the total energy use in the short to medium term, regardless of substitution by oil or electricity.

Kerosene is the main fuel used by households to meet their lighting needs but this pattern is expected to change (and has been changing) due to the NES which is seeking to electrify the whole of the country by 2020. Similarly, the use of LPG is likely to displace the use of charcoal as the main cooking fuel in urban areas.

The percentage of average household expenditure on energy is relatively small – 1.4 percent on electricity and 2.8 percent on fuel and power (compared to other expenditure items like food and beverages (45 percent) and non-food items (36 percent)) However, these percentages are rising steeply following price increases associated with reforms in both the electricity and petroleum sub-sectors.

Energy sector reforms in Ghana are inchoate, hence the full impact and outcomes on the poor have not been empirically assessed. This notwithstanding, rising electricity tariffs and prices of petroleum products unaccompanied by a commensurate increase in wages and salaries and a significant improvement in the quality of service seem to suggest that poor households are worse off after reform. An assessment of the mechanisms introduced ostensibly to protect poor households from the adverse consequences of tariff reform reveals that the mechanisms are either inadequate or insufficient or both. On the other hand, however, reform can help release Government funds, which would otherwise have been paid as direct subsidy to the utilities, for direct poverty reduction expenditure or funding of targeted subsidies to the poor.

Recommendations

The projection that the dominance of woodfuels in Ghana's energy balance is expected to persist at least over the short to medium term raises serious social and environmental concerns, which call for the adoption of pragmatic mitigating measures. Social concerns have to do with the fact that rapid depletion of Ghana's forest – the main source of woodfuel resources – might result in scarcity of woodfuels, which is the main cooking fuel for over 90 percent of households, in the foreseeable future if current production and harvesting practices and processes are to continue in a "business-as-usual" manner. Besides, it is also going to be more costly to produce or collect the energy resource, especially in the case of firewood. The environmental concerns relate to the fact that the overreliance on woodfuels has contributed to the problems of deforestation in many part of the country as well as a worsening environmental and ecological damage to the natural forests and ecosystem.

To help avert this looming crisis (energy poverty), two measures are recommended: promotion of fuel substitution/switching and replenishment of the forest cover. Promoting LPG as an alternative fuel to woodfuels

is one way in which the Government seeks to facilitate sustainable exploitation of Ghana's woodfuel resources. An LPG promotion program launched in 1990 by the MoE was responsible for the astronomic rise in the use of LPG, especially in urban areas. Unfortunately, this program has stalled due to inadequate infrastructure. With TOR's production capacity increased to up 130,000 MT (far more than the current domestic demand for LPG) following the completion of the Residual Fluid Catalytic Cracker (RFCC) unit in October 2002 and a huge potential demand for LPG, it is recommended that the LPG promotion program should be resuscitated. The resuscitated program should focus not only on urban areas (as was the case in the original program) but rural areas as well where the majority of the woodfuels are consumed.

To replenish the fast depleting forest cover, several afforestation and reforestation initiatives are under way. However, most of these programs are targeted at economic timber species with long gestation periods. It is, therefore, recommended that dedicated woodlots of short-rotational energy crops should be developed alongside the major afforestation and reforestation programs.

Finally, it is recommended that the Government should seriously consider reducing or removing the number of taxes and levies imposed on the consumption of kerosene, which is the third most highly taxed (73 percent above the ex-refinery price) petroleum product. Although currently there is 6 percent cross-subsidy on the product, further reduction or removal of taxes will help reduce the impact of price increases on poor households.

References

Ahiataku-Togobo, W., 2002, "Analysis of Household Cooking Energy in Ghana", Powerpoint presentation at the LP Gas Promotion Workshop, Akosombo, April 15-17.

Brew-Hammond, A. and Edjekumhene, I. 2000, "Climate Change Activities in Ghana", In Biagini, B. (ed), *Confronting Climate Change: Economic Priorities and Climate Protection in Developing Nations*, National Environment Trust/Pelangi Report, Washington DC, USA.

Clark, A., 2001, "Expanded Provision of Public Benefits while Power Sectors in Developing Countries are Reformed", An Introductory Chapter to an International Energy Initiatives (IEI) book project.

Davies, M., Eberhard, A., and Clark, A., 2003, "Power Sector Reform in Africa: Assessing the Impact on Poor People and Influencing Policy Decisions", Research Framework and Methodology, prepared for the Graduate Business School, Cape Town.

Edjekumhene, I. 2000, "Socio-Economic Impacts of Electricity Privatization in Ghana" 4th International Conference on Power Systems Operations and Planning – Conference Proceedings, Accra, August.

Edjekumhene, I. and Dubash, N., 2002, "Achieving Public Benefits by Default" in *Power Politics: Equity and Environment in Electricity Reform*, World Resources Institute, Washington DC.

Edjekumhene, I., Amadu B. and Brew-Hammond, A., 2003 *Power Sector Reform in Ghana: the Untold Story of a Divided Country versus and Divided Bank,* Kumasi Institute of Technology and Environment, Kumasi.

Energy Commission, 2002, "Key Issues in the Oil and Gas Sector", www.energycom.gov.gh.

Energy Commission, 2003, "Woodfuel Use in Ghana: Outlook for the Future", www.energycom.gov.gh.

Ghana News Agency, "National Petroleum Planning Committee Inaugurated" News report, November 4, 2003, www.ghanaweb.com.

Ghana News Agency, 2003 "ECG Halts Advance Payments", Statement made by Minister for Energy, Dr Paa Kwesi Nduom, at Meet-the-Press Series, October 16, www.ghanaweb.com.

Ghana News Agency, 2003, "Inflation for April: 30%", News Report, Tuesday May 13.

Ghana Statistical Service, 1996, *Ghana Living Standards Survey*, Report on the Second Round (GLSS 2), Ghana Statistical Service, Accra.

Ghana Statistical Service, 2000, *Ghana Living Standards Survey*, Report of the Fourth Round (GLSS 4), Ghana Statistical Service, Accra.

Ghana Statistical Service, 2002, *2000 Population and Housing Census*, Summary of Final Results, Ghana Statistical Services, Accra.

Ministry of Energy, 2001, "Energy for Poverty Alleviation and Economic Growth: Policy Framework, Programmes and Projects, Accra, Ghana.

Ministry of Energy, 2002, "National Renewable Energy Strategy", Draft Report presented at the Stakeholders' Workshop at Bayview Hotel, Accra, December.

Ministry of Mines and Energy, 1999, "Statement of Power Sector Development Policy", April, Accra.

Olhoff, A., 2001, "The Cost of Poverty: Private and Social Costs of Household Energy Use in Ghana", UNEP Collaborating Centre on Energy and Environment, Riso National Laboratory, Roskilde, Denmark.

Osafo-Marfo, Y., and Acquah P., 2003, "Memorandum of Economic and Financial Policies and Technical Memorandum of Understanding", Letter to Horst Kohler, Managing Director, International Monetary Fund, (March 31), www.ghanaweb.com.

Osafo-Marfo, Y., 2003, "Single-Digit Inflation is Unattainable – Minister", Keynote Address presented at Workshop on "2003 National Budget Statement and the Enhanced HIPC Initiative and Poverty Reduction – the Role of the Church in Demanding Public Accountability", Cape Coast, May 20, www.ghanaweb.com.

Patterson, W. 1999, *Transforming Electricity*, Earthscan, London.

Quaye-Foli, E. A., 2002, "Liquified Petroleum Gas (LPG) Promotion: the Ghana Experience", Presentation made at the UNDP/World Bank Energy and Poverty Workshop, Addis Ababa, October.

Annex 1

Comparative Cost of Cooking Fuels, June 2000-June 2002

Fuel	*Description*	*Cost-Aug 2000*		*Cost-Aug 2001*		*Cost-Aug 2002*	
		Cedis	*US$*	*Cedis*	*US$*	*Cedis*	*US$*
LPG	14.5 kg Bottle	27,550	5.01	32,500	4.58	32,500	4.06
KEROSENE	1L	1,324	0.24	1,956	0.28	1,956	0.24
FIREWOOD	1Bundle of 9 kg (Accra)	1,000	0.18	1,200	0.17	1,500	0.19
ELECTRICITY	Unit cost (150-300 kWh) tariff category	150	0.03	300	0.04	300	0.04
CHARCOAL	1 Bag of 46 kg (Accra)	16,000	2.91	20,000	2.82	26,000	3.25
	Exchange Rate		5,500		7,100		8,000

Fuel	*Calorific Value*	*Cost-Aug 2000*		*Cost-Aug 2001*		*Cost-Aug 2002*	
	kWh/kg	*Cedis*	*US$*	*Cedis*	*US$*	*Cedis*	*US$*
LPG	12.3	154	2.8	182	2.6	182	2.3
KEROSENE	11.72	141	2.6	209	2.9	209	2.6
FIREWOOD	3.94	28	0.5	34	0.5	42	0.5
ELECTRICITY	1	150	2.7	300	4.2	400	5.0
CHARCOAL	7.89	44	0.8	55	0.8	72	0.9
ELECTRICITY	2.5	220	4.0	570	8.0	980	12.3

Source: Ahiataku-Togobo, 2002.

Annex 2
Evolution of Tariffs in Ghana

Assumption Lifeline Consumption (kWh/Month)				23			
Historic electricity rates (Cedi):		*Feb 98*	*Sept 98*	*May 01*	*Aug 02*	*Mar 03*	*Oct 03*
Bulk Supply Tariff, BST	Cedi/kWh	42	95	194	359	412	462
Distribution Service Charge, DSC	Cedi/kWh	55	97	196	264	285	313
End User Tariff, EUT	Cedi/kWh	97	192	390	623	697	775
Residential kWh/Month		*Feb 98*	*Sept 98*	*May 01*	*Aug 02*	*Mar 03*	*Oct 03*
0 - 50	Cedi/month	87	174	339	391	565	565
51-150	Cedi/kWh	50	120	242	400	550	610
151-300	Cedi/kWh	50	150	304	400	550	610
301-600	Cedi/kWh	75	220	570	960	960	1,065
> 600	Cedi/kWh	180	350	570	960	960	1,065
Commercial		*Feb 98*	*Sept 98*	*May 01*	*Aug 02*	*Mar 03*	*Oct 03*
51-300 kWh/month	Cedi/kWh	80	220	436	750	800	888
300-600 kWh/month	Cedi/kWh	80	220	645	980	980	1,088
> 600 kWh/month	Cedi/kWh	180	320	645	980	980	1,088
Service charge	Cedi/month	3000	5000	10000	20000	20000	22198

Special Load Tariff - Low Voltage, SLT-LV		*Feb 98*	*Sept 98*	*May 01*	*Aug 02*	*Mar 03*	*Oct 03*
Max. demand	Cedi/kVA/month	4,000	10,000	34,000	130,000	135,000	149,834
Energy charge	Cedi/kWh	90	180	362	360	380	422
Service charge	Cedi/month	10,000	20,000	40,000	60,000	60,000	66,593

Special Load Tariff - Medium Voltage, SLT-MV		*Feb 98*	*Sept 98*	*May 01*	*Aug 02*	*Mar 03*	*Oct 03*
Max. demand	Cedi/kVA/month	4,000	10,000	30,000	82,000	92,000	102,109
Energy charge	Cedi/kWh	80	170	350	350	360	400
Service charge	Cedi/month	10,000	20,000	40,000	60,000	60,000	66,593

Special Load Tariff - High Voltage, SLT-HV		*Feb 98*	*Sept 98*	*May 01*	*Aug 02*	*Mar 03*	*Oct 03*
Max. demand	Cedi/kVA/month	4,000	10,000	28,000	74,000	84,000	93,230
Energy charge	Cedi/kWh	75	150	340	340	350	388
Service charge	Cedi/month	10,000	20,000	40,000	60,000	60,000	66,593
Consumer prices (Accra; 1995=100)		199	221	399	469	547	
Exchange rate	Cedi/USD	2,326	2,326	7,228	8,137	8,540	8,700

Essential events:	December 2000	National elections; President, Parliament and district assemblies
	July 2002:	PURC's Transitional Plan
	August 2002:	GoG introduced 5000 cedi/month subsidy to lifeline customers
	December 2004	National elections; President, Parliament and district assemblies

February 1998 tariffs inflated by CPI		*Feb 98*	*Sept 98*	*May 01*	*Aug 02*	*Mar 03*
0 - 50 kWh/month	Cedi/month	87	97	174	205	239
51-150 kWh/month	Cedi/kWh	50	56	100	118	137
151-300 kWh/month	Cedi/kWh	50	56	100	118	137
301-600 kWh/month	Cedi/kWh	75	83	150	177	206
> 600 kWh/month	Cedi/kWh	180	200	361	425	495

Real tariffs divided by inflated Feb. 98 tariffs	*Feb 98*	*Sept 98*	*May 01*	*Aug 02*	*Mar 03*
0 - 50 kWh/month	1.00	1.80	1.94	-22.47	-18.56
51-150 kWh/month	1.00	2.16	2.41	3.39	4.00
151-300 kWh/month	1.00	2.70	3.03	3.39	4.00
301-600 kWh/month	1.00	2.64	3.79	5.43	4.66
> 600 kWh/month	1.00	1.75	1.58	2.26	1.94

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