

The Energy Centre, KNUST



GIS-BASED ENERGY ACCESS PROJECT

ASSESSMENT OF GHANA'S ENERGY NEEDS, IDENTIFICATION OF GAPS AND COMPARISON WITH ECOWAS AND MDG TARGETS

First Order Draft

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1.0 INTRODUCTION

1.1 Background

The phenomenal contribution of energy to the socio-economic development of a country is decidedly evident in its usefulness for the production of goods and services for both industrial and domestic purposes. The growth of an economy and the guaranteed reliability, availability and adequacy of energy are inextricably entwined (Modi *et al.*, 2006; Ghana Energy Commission, 2005). To usher a country into a vibrant economic status, increased access to modern energy (electricity, Liquefied Petroleum Gas etc) decidedly constitutes an important driver. However, ensuring increased energy access remains a major challenge to most governments in developing countries especially in Sub-Saharan Africa.

There exists a wide array of traditional and modern energy forms in Ghana with varying effects on the country's socio-economic development. There is a rising energy demand in Ghana as a result of increasing population and economic activities. The paper therefore seeks to address the overall energy needs of the country by illuminating energy access rates, the driving forces and the existing gaps. The paper further assesses the country's energy needs and targets by comparing them with the MDGs and ECOWAS targets which are broad regional and global plans aimed at guiding developing countries for a swift economic take-off.

1.2 Energy access situation in Sub-Saharan Africa

Energy access has been defined as the 'ability to use energy namely electricity, LPG, charcoal or some other form of energy (Brew-Hammond, 2009). The term has also been defined as "a household's ability to obtain a modern energy service, should it decide to do so" (Ranjit and O'Sullivan, 2002). Brew-Hammond (2009) posits that the term "modern" is often introduced in the access discourse to make a distinction between traditional energy forms (firewood or agricultural residues) and commercial energy forms (electricity or LPG). Following Ranjit and O'Sullivan's (2002) definition, Brew-Hammond (2009) thus sees access as a function of availability and affordability, where energy is considered to be available if the household is within the economic connection and supply range of the energy network or supplier, and energy

is affordable when the household is able to pay the up-front connection cost (or first cost) and energy usage costs". In Ghana, beside household surveys that capture energy access at the household level, the conventional national definition of energy access usually refer to communities' access to electricity, LPG, etc., irrespective of the number of households with access. In this paper, access definition is restricted to community access instead of the household, although reference will be made to the latter where appropriate. Moreover, due to the dire consequences of traditional energy forms on health, environment and income generation (UNDESA, 2005), the paper argues that a shift to modern energy forms (electricity and LPG) and the ability to pay will be used as the standard to measure increased energy access.

Biomass is the predominant energy form in Sub-Saharan Africa especially at the household level (UNDESA, 2005; Hagan, 2006). It is estimated that in 2001, the share of biomass consumption was 81.18% in sub-Saharan Africa, 16.46% in South Africa and 4.06% in North Africa (IEA, 2003) and even accounts for 95% in some countries (UNDESA, 2005). Between 1995 and 2001, per capita consumption of modern energy in sub-Saharan Africa remained small and stagnant, falling slightly from an average of 138 kg of oil equivalent (kgoe) to 126 kgoe (ibid.). Whereas a few countries, such as Gabon, Cape Verde and Senegal have more than 40% of their population with access to modern cooking fuels such as LPG, others like Liberia, Guinea, Niger and Sierra Leone have less than 2% of the population with access to modern cooking fuels (UNDP-WHO, 2009).

Even in the case of electricity, with the exception of South Africa, Botswana and Mauritius, per capita consumption of electricity dropped from 122.8 kWh in 1990 to 112.8 kWh in 2000 which has been described as one of the lowest rates of electricity use in the world (World Bank, 2001; World Bank, 2003a). The low electricity access rate in the region arising mainly due to low electricity generation capacity and financing constraints raises numerous questions on the perceived negative effects on Small and Medium Scale Enterprises as well as effective healthcare and education especially in the rural areas and national development as Modi et al (2006) opine.

1.3 ECOWAS Targets and MDGs on Energy Access

The ECOWAS White Paper on Access to Energy Services for Rural and Peri-Urban Populations is a regional strategy that seeks to support economic growth through the provision of energy services for citizens of the region. It is partly funded by United Nations Development Programme (UNDP) and the European Union Energy Initiative Partnership Dialogue Facility (EUEI-PDF). The plan which was set up in 2005 was a follow-up of regional targets and objectives set by the New Partnership for Africa's Development (NEPAD) including increasing access to reliable and affordable commercial energy supply by Africa's population in 20 years with emphasis on productive activities for economic growth and reversing environmental degradation associated with traditional fuels. In the White Paper, ECOWAS has proposed specific targets for increasing access to modern energy services (Table 1) in member countries.

Table 1: Specific Energy Access Targets by ECOWAS for 2015

Energy Service	Target
Modern energy for cooking	100%
Modern energy services/ electricity for basic needs in urban and peri-urban areas	100 %
Electricity for rural households	36%
Electricity for schools, clinics and community centers	60%
Mechanical power for productive uses in rural areas	60%

The Millennium Development Goals are the world's time-bound and quantified targets for addressing extreme poverty, in its many dimensions including income, poverty, hunger, disease, lack of adequate shelter while promoting gender equality, education, and environmental sustainability (UN Millennium Project, 2005). A common mental projection made given the

aforementioned sets of conditions is: 'how will the world look in 2015?' (ibid). Despite the eight major issues that MDGs seek to address, energy poverty which is prominent in deprived rural and urban households in developing countries is missing (WHO, 2006). But it is evident that health promotion, agricultural and educational improvement as well as environmental sustainability cannot be achieved without energy. The United Nation's Millennium Project therefore recognises the role of energy services especially modern cooking fuels as a prerequisite for development and thus seeks to energize MDGs (ibid.). For countries to achieve MDGs, the following energy targets are recommended: (i) to reduce the number of people without effective access to modern cooking fuels by 50% by 2015 and (ii) and make improved cooking stoves widely available.

The use of modern cooking fuels has numerous health benefits compared to traditional biomass used in homes. It is estimated that, burning solid fuels produces extremely high levels of in-door air pollution. The level of in-door pollution in homes in Africa, Asia and Latin America is estimated as ranging between 300 to 3000 micrograms per cubic metre ($\mu\text{g}/\text{m}^3$) (WHO, 2006). Such in-door smoke have been linked to asthma, cataracts, tuberculosis, adverse pregnancy outcomes particularly low birth weight, ischaemic heart disease, interstitial lung disease, and nasopharyngeal and laryngeal cancers (ibid.). The more time people spend in these highly polluted environments, the more dramatic the health consequences which are usually borne by women and children. Felling of trees for charcoal production or wood fuel collection contributes to deforestation in developing countries in addition to pollutants (smoke) generated with its associated dire health effects such as respiratory diseases. Addressing gender equality issues as espoused among the goals of the MDGs requires a better evaluation of energy access by men and women and the consequent effects on health.

Indeed, due to the pivotal role of energy to social and economic activities in a country, limited energy access has undeniable repercussions on achieving the MDGs. The essence of having broad regional plans is to provide a comprehensive framework to guide energy provision in member countries. Nevertheless, it is also important that Ghana's energy plans and targets be evaluated within the context of such global standards to determine existing gaps and how such gaps could be addressed to unlock the country's development potential.

1.4 Ghana's Strategic Energy Plans and Targets

1.4.1 National Electrification Scheme

The national electrification drive in Ghana started in 1985 with the preparation of a project by the Volta River Authority to extend the 161 kV National Grid to the northern part of Ghana to connect all the administrative regions of Ghana under Northern Electrification and System Reinforcement Project (NESRP) (Amissah-Arthur, 2004). The Volta River Authority completed the definition of the project and obtained financial support for the first phase from the African Development Bank in 1987. Within three years of the project implementation, electricity supply to all the remaining regional capitals came from the national grid except the Upper West regional capital (Wa). The NESRP led to the initiative for the National Electrification Scheme (NES) which was a plan aimed at providing within a 30-year time frame, electricity access to all settlements with population exceeding 500. The NES was pursued through various discrete projects prominent among which were the Northern Electrification Project and the Self-Help Electrification Project (SHEP).

The SHEP was a nation-wide scheme that was introduced as a policy framework under which communities could advance their electrification projects ahead of the dates indicated in the NES by meeting agreed criteria for community contributions to the project implementation. In other words, the intent of the SHEP was to expedite rural electrification which was part of a broader National Electrification Scheme. Apart from the government's obligation to provide the conductors, transformers, pole-top and other materials and assume responsibility for the construction works required for the connection, the following three pre-requisites must be satisfied, for communities to qualify under the SHEP. The beneficiary communities should:

- i) Be within 20km radius of an existing 33kV or 11kV electricity grid network.
- ii) Be willing to provide their own Low Voltage (LV) poles to connect to the existing network.
- iii) Have one-third of households (houses) already wired.

Interestingly, as communities qualified under the SHEP, adjacent non-electrified communities intuitively met one or two of the pre-requisites and thus increased the possibility of electrification. For instance, if communities are located at about 30km from an existing electricity network (not qualified under SHEP), once adjacent communities within 20km were electrified, the communities which were previously not qualified may meet the existing grid network criterion because it will be 10km farther away from the grid. Similar factors could influence the last two criteria for electrification for the benefit of adjacent non-electrified communities.

1.4.2 Plans and Targets of SNEP and EPRAP

There has been strategic plans and targets by successive governments to increase access to energy services for Ghanaians. The two main existing documents are the Energy for Poverty Reduction Action Plan (EPRAP) prepared by Kumasi Institute of Technology and Environment (KITE) (Ministry of Energy, 2006) and the Strategic National Energy Plan (SNEP) by the Energy Commission (2006). The SNEP has strategic targets for both the demand sector and the supply sector whereas EPRAP has targets for the demand sector. In the supply sector, the SNEP targets are further disaggregated into residential sector, commercial and service sector, agricultural and fisheries sector, transport sector and industrial sector.

In the residential sector, the plan is:

- To achieve 100% access to electrification by 2020 and in the process achieves 15% penetration of rural electrification by decentralized renewable energy complementation by 2015 expanding to 30% by 2020.
- To reduce the average woodfuel energy intensity per urban household by 30% by 2015 and by 50% by 2020.

The plan for the commercial and service sector is:

- To achieve 1% penetration of solar energy in hotels, restaurants and institutional kitchens using solar water heaters by 2015 and 5% penetration by 2020.

- To increase LPG penetration to 20% by 2015 and 30% by 2020.
- To achieve 1% penetration for biogas for cooking in hotels, restaurants, and institutional kitchens by 2015 and 2% by 2020.

In the agricultural and fisheries sector, the SNEP aims to:

- Achieve 2% penetration of biodiesel by 2015 and 10% by 2020.
- Achieve 20% penetration of solar energy by 2020.
- Increase electricity penetration to 2% by 2015 and 5% by 2020.

The projections are aimed at propelling Ghana’s desire to achieve a US\$ 1000 per capita by 2015 and subsequently maintain a middle-income status up to 2020 which are tailored to the targets set by government for improvement in other sectors. To achieve the said aim, the estimated optimum energy and fuel needed to drive the economy are presented in Table 2. The demand for electricity is expected to impose huge demands on existing electricity infrastructure unless additional generation sources are provided to meet the excess demand and to avoid any future energy crisis suffered by the country like before. The onus is on government to facilitate the infusion of Renewable Energy Technologies (RETs) into the country’s electricity generation mix in order to meet the projected demands. It also calls for action-oriented energy efficiency campaign to save energy as achieved by the government’s energy efficiency initiative which led to the distribution of free 10 million CFL bulbs. The distribution of the bulbs is expected to enable the country save about 200MW of energy under the second phase of the Climate Change Mitigation and Adaptation project.

Table2: Estimated energy needed to drive economy (transport fuels excluded)

	Unit	2008 (Short term)	2015 (medium term)	2020 (long term)
Woodfuels	Tonnes	25-31 million	29-35 million	40-50 million

LPG	Tonnes	131,800	160,600	295,000
Electricity*	Gigawatt-hour	11,300 - 13,500	13,800 - 16,300	20,100 - 22,300

* This excludes transmission and distribution losses. Source: SNEP (2006).

While sector specific current energy access data is not readily available, the progress made in the supply sector leaves much to be desired and presupposes that, sector-specific targets are also not being met. For example in the electricity sub-sector, there has not been any appreciable increases in the supply sector between 2006 and 2010 and this could have an effect on the demand sector as well, because there will be inadequate supply to meet demand. Even though a few power plants are in the construction phase, electricity generation in Ghana has not seen much appreciable increases since 2006, meanwhile the country is only 4 years away from the 2015 timeline. Nonetheless, significant investments are made in thermal plants and system upgrading with the completion of VRA's 126 MW Thermal 1 Project and several independent power projects at various stages of advancement, all at Tema (see Figure 1). The development of the 400 Megawatt Bui hydro power station is expected to increase electricity generation sources to warrant a proper comparison as to whether or not the country is on track towards meeting its electricity demand targets.

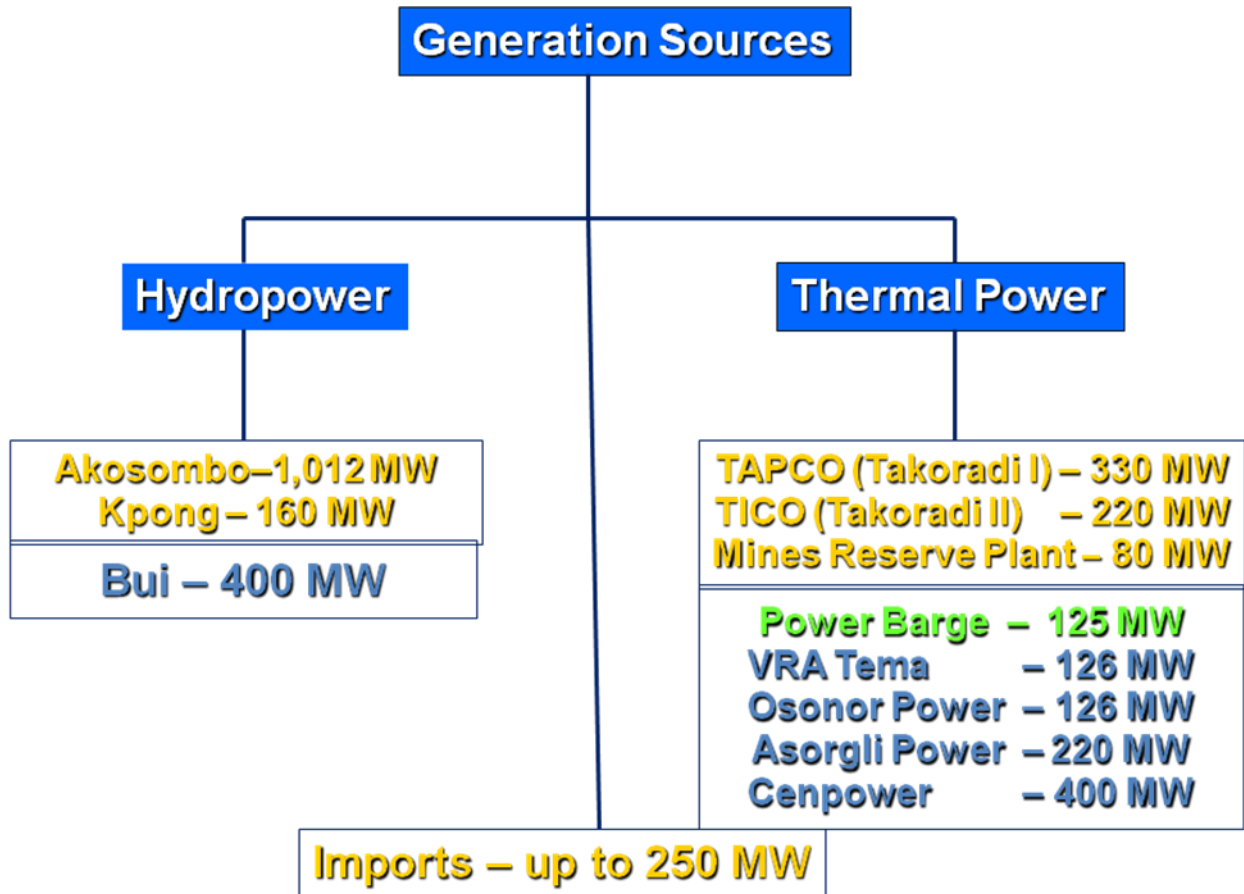


Figure 1: Electricity Supply Infrastructure for Ghana (Akuffo, 2009).

Around the same time that SNEP was prepared, EPRAP was also prepared by the Ministry of Energy. The goal of EPRAP was to provide a 'roadmap' for the targeted delivery of energy services to support the realization of national development/poverty reduction goals and strategies outlined for the implementation of seven key areas under the GPRS II. The seven sectors are Agriculture, Small and Medium Enterprises, Health, Education, Water and Sanitation, Communication and Technology, and Household. The broad objectives of the Plan of Action proposed in EPRAP are as follows:

1. Facilitate the provision of reliable electricity to support and enhance the delivery of essential social services such as education, health care and potable water as well as the deployment of ICTs in rural areas

2. Facilitate the provision and use of modern energy services (in the form of mechanical and/or electrical power) at the community level for all rural communities for productive applications.
3. Facilitate the provision and use of affordable modern cooking fuels and devices to at least 50% of households currently using traditional biomass for cooking

Under a business as usual scenario, the energy demand targets in Table 3 have been proposed in EPRAP. Business-as-usual is the energy demand projection if the country continues to grow at the rate at which it was growing as at 2006. GPRS High Growth is guided by the overall objective of raising the per capita income of Ghanaians from the 2004 level of US\$ 434 to US\$ 1000 by 2015. To achieve this growth, the economy is expected to grow at an average annual rate of about 6% in cedi terms driven by the agricultural sector. In effect, it can be stated in broad terms that under the GPRS High Growth, both EPRAP and SNEP took the same conditions into consideration in projecting energy demand up to 2020. Since the targets for EPRAP are sector-specific areas and not broadly as demand for every activity taking place in the country, it is difficult to compare the targets from the two plans. But as an example, considering the three sectors for which EPRAP had projections (that is Agriculture and Fisheries Sector, Industrial Sector and Residential Sector), electricity demand under GPRS High Growth for 2020 add up to over 25,000 Gigawatt-Hours as against 22,300 for all sectors under SNEP. To meet these demands, EPRAP recommended a number of priority projects including the following:

- Grid Extension to Fish Landing and Freezing Facilities
- Establishment of Woodlots and Transfer of Improved Technology for Charcoal Production
- Promotion of Access to LPG in Rural and Poor Peri-Urban/Urban Communities
- Promotion of improved cook stoves in households
- Wind pumps for irrigation, Multi-functional Platforms for Agro-processing, etc

In spite of the costs involved in preparing both the SNEP and EPRAP, they were not formally adopted by the government. There exists currently a National Energy Policy Document before Cabinet which is expected to address the challenges in the energy sector.

More recently in 2007, Government rolled out the Ghana Energy Access and Development Project (GEDAP). GEDAP is a multi-donor funded project involving the World Bank, International Development Agency (IDA), Global Environment Facility (GEF), African Development Bank (AfDB), Global Partnership on Output-based Aid (GPOBA), Africa Catalytic Growth Fund (ACGF) and the Swiss Agency for Development and Cooperation (SECO). The Development objective of GEDAP is to improve the operational efficiency of the power distribution system and increase the population’s access to electricity and help transition Ghana to a low-carbon economy through the reduction of greenhouse gas emissions. Government’s objective under GEDAP is to increase electricity access from 54% to 75% by 2015 with the ultimate aim of universal access. The investment needed to reach the target electrification rate of 75 percent by 2015 was estimated at US\$500 million.

Table 3: Energy Demand Projections for Various Sectors in EPRAP

SECTOR	FUEL	ECONOMIC SCENARIO	DEMAND		
			2008	2012	2020
RESIDENTIAL	ELECTRICITY (Gigawatt-hours)	Business-as-usual	3,600	4,600	7,200
		GPRS High Growth	7,000	8,000	13,000
	LPG (tonnes)	Business-as-usual	40,000	60,000	100,000
		GPRS High Growth	>12,000	>126,00	300,000
	WOOD (million tonnes)	Business-as-usual	13-16	14-18	18-24
		GPRS High Growth	21-28	22-30	31-42

INDUSTRIAL	ELECTRICITY (Gigawatt-hours)	Business-as-usual	2,200-4,800	2,500-5,400	3,200-5,900
		GPRS High Growth	7,100-9,000	8,000-10,000	10,200-12,000
	Liquefied Petroleum Gas (tonnes)	Business-as-usual	2,300	2,600	3,400
		GPRS High Growth	47,500	58,000	86,000
	WOOD (million tonnes)	Business-as-usual	4.0-4.2	4.9-5.2	7.5-7.8
		GPRS High Growth	12.0-12.5	14.8-15.5	22.4-23.4
AGRICULTURE AND FISHERIES	ELECTRICITY (Gigawatt-hours)	Business-as-usual	12	22	61
		GPRS High Growth	37	65	184
	WOOD (tonnes)	Business-as-usual	13,600	17,100	27,300
		GPRS High Growth	40,700	51,300	81,800

Source: Ministry of Energy, 2006

1.4.3 Current Energy Plans and Targets

Ghana's current energy access targets are: (1) achievement of the universal electrification by 2010 and (2) 50% access to LPG by 2015. The current energy plans are inspired by the earlier

national energy programmes, plans and policies. For instance, the desire for achieving universal electrification by 2020 is a revival of the targets set by NES. The NES was given a boost by the recent US\$ 520 million grant secured by the government to expedite electricity extension to 2,200 communities across the country. Electricity access to rural areas and the northern parts of the country is expected to be given the highest priority and facilitate the opening of cottage industries and eventually create incomes for the poor. In a presentation on Ghana Energy Access Review at The Energy Center at Kwame Nkrumah University of Science and Technology, Kumasi in June 2009, the Minister of Energy, Dr Oteng-Adjei promised to charge the energy regulatory bodies towards implementing some of the plans and strategies that government has drawn. These include:

- Energy Commission (EC) to oversee implementation of the Energy for Poverty Reduction Action Plan (EPRAP), involving the REA as necessary, to ensure that electricity and other forms of modern energy are provided for productive uses with income generation especially the rural population to benefit from the country's middle income status.
- The National Petroleum Authority (NPA) to re-launch the national LPG programme with a medium-term view to ensuring access for at least 50% of the country's population by 2015.
- Energy Commission to re-launch a sustainable wood fuels programme building on earlier programmes that introduced improved stoves like Ahibenso to ensure affordability to LPG in the long-term and efficient wood fuel stove as well as sustainably produced wood fuels by 2020.

2.0 LINKING ENERGY TO SOCIAL AND PRODUCTIVE SECTORS IN GHANA

2.1 Linking Energy to Productive Uses

Increased energy access is a pre-requisite for improved social and productive activities in the country. In the context of providing modern energy services, the Global Environment Facility (GEF) and the Food and Agricultural Organization (FAO) define productive use of energy as the application of energy to create goods and/or services either directly or indirectly for the production of income or value (White, 2002). The productive uses of energy are seen as a promising way to create jobs and generate incomes directly for the unemployed and indirectly through value addition to agricultural produce for small and medium scale enterprises' development. Increased energy access can provide new opportunities for Micro, Small and Medium Enterprises (MSMEs) to develop, diversify and improve quality for employment generation and income creation (AIT, 2005). Benefits include improved productivity, increased value of the products (due to refrigeration), reduced energy costs due to higher efficiency of electricity and improvement in ability and willingness to pay for electricity, thus ensuring sustainability of electricity services.

Hammer mills for instance (either home-based or outside enterprises) provide useful commercial services for grinding and processing of food crops such as cassava, corn, groundnut and others. The hammer mill provides positive spin-off effects especially in rural areas through employment creation and food processing. The dire consequences of lack of electricity for enterprises are evident in the uncomfortable routine of rural folks walking for longer distances to nearby towns with electricity in order to access the services of hammer mills. Because the above named food crops are the staple food of rural residents, access to cheaper electricity tariffs in rural areas where a chunk of the country's population resides is a laudable contribution to food supplies. Improved electricity access also allows other service enterprises such as provision stores, or supermarkets, licensed chemical sellers etc. to operate for longer hours to serve households and hence enhance the socio-economic well-being of nearby communities. Access to electricity in rural areas could revitalize rural economies and thus reduce the alarming spate of rural-urban migration.

2.2 Linking Energy to Education, Health, Gender and the Environment

Educational and health standards as well as environmental conditions have become important global indicators of development or Human Development Index (HDI). Studies in India corroborate the direct relationship between electricity and education (Barnes *et al.*, 2002). A striking benefit of electricity is the high amount of quality light compared to that provided by kerosene lamps. The high quality light in the evening creates an enabling environment where reading becomes possible for adults and children especially in rural areas where the situation persists. The failures of teachers to take up posts in rural schools and frequent absenteeism from such postings are problems in many countries. The availability of electricity will thus make rural communities more attractive to teachers and hence raise academic performance in rural areas. A teacher's living conditions, including household's access to electricity affect the incidence of absenteeism and teachers working morale. During fieldwork for the study, the chair of the school committee in a community with no electricity where only one of the four teachers allocated to the school had taken up his post-complained: "What teacher will come here and live in a place with no electricity?" (IEG, 2004).

The environmental and health implications associated with low levels of access to modern energy systems for cooking pose a threat to most developing countries including Ghana. The use of traditional biomass especially fuel wood, crop residues, cow dung is associated with many respiratory diseases which constitutes health burden compared to modern cooking fuels like LPG. In Ghana for instance, total wood fuel (charcoal and firewood) consumption increased from between 12.1- 14.6 million tonnes in 2000 to 14.6-17.3 million tonnes in 2005 especially at the household level (Ghana National Energy Statistics, 2000-2005). This implies that, the country will continue to battle with health risks associated with wood fuel use. In the Northern region for instance, even Tamale that has the highest access to electricity, only a handful (2.7%) use electricity for cooking (Ghana Statistical Service, 2005). Kerosene remains a dominant source of lighting in the Northern region not excluding even Tamale (40%) (*ibid.*). Majority of the populace use wood fuel (firewood and charcoal) for cooking. The situation is worst in the Upper East and the Upper West regions.

The use of kerosene cooking stoves also exposes users to dangerous substances such as carbon monoxide from the smokes generated and the consequent respiratory diseases with the poor women and children bearing the brunt of the problem. The situation is compounded in places where cooking is done in closed or semi-closed spaces such as kitchen, veranda or rooms. It is asserted that, the frequent illnesses in women and children are attributed not only to poor sanitation but also biomass use with the concomitant in-door air pollution (Inyang, 2005; Muchiri and Gitonga, 2000).

In addition, as MDGs are intended to address gender inequality, the energy forms used by both men and women need a closer reading. Gender division of labour in Ghana (Africa) limit women to household chores such as cooking. As women spend a greater part of their time collecting and using traditional energy forms such as wood fuel and charcoal, they are usually exposed to numerous health risks compared to men. Pregnant women, carrying heavy load of cooking fuels which may affect pregnancy and expose the developing embryo to pollutants from cooking fires may lead to still birth (Kanagawa and Nakata, 2007). Electricity for lighting has social benefits as women can perform household chores at night and children are able to read more and may therefore improve on their educational standards. Children are not immune to health risks posed by biomass use because they often sit around in the kitchen and inhale the smoke – as they often have to wait for many hours for the food to get ready. More so, the long hours women spend on accessing firewood diverts attention from income generating activities which also re-enforces the pre-existing forms of women's economic marginalization (Ghana Statistical Service, 2005).

2.3 Productive Use Initiatives

Productive uses of energy have been initiated by Energy Commission and Ministry of Energy because 'productive uses' was a major issue the National Electrification Scheme (NES) sought to address. In line with productive uses of electricity components under the NES, the Ministry of Energy formulated productive uses of electricity programme to assist entrepreneurs in electrified rural areas to establish businesses in order to generate income, increase economic productivity and reduce poverty in the rural areas (Abavana, 2004). The programme also involved capacity building in the newly electrified areas through training and access to credit to support the establishment of small and medium scale rural enterprises. Since the launch of the programme,

very little has been done towards productive uses of electricity as domestic users still remain the major users of electricity in electrified areas in Ghana (Ministry of Energy, 2006). According to a World Bank (2004) study, it is difficult for small commercial consumers to pay their electricity bill since they are being charged the higher commercial rates.

The 2004 review of the NES revealed that poor communities were unable to pay their electricity bills and the non-existence of productive uses by poor households featured prominently (Amissah-Arthur, 2004). After two decades of implementation of the NES, electricity has been found to be mainly used for consumptive purposes and rarely used in productive applications. The Energy for Poverty reduction Action Plan (Ministry of Energy, 2006) recommended the following actions for productive uses of energy in Ghana:

- Critical evaluation of the Ministry of Energy's Productive Uses of Energy (PUE) programme should be carried out with the view to determining shortcomings and charting the way forward.
- In the medium to long term, the Ministry of Energy should outsource the PUE programme to private sector actors and/or NGOs with requisite skills and expertise in enterprise/business development services and micro-financing.
- Government, working through the relevant agencies, should formulate the policy and device mechanisms that will help remove all policy, pricing and regulatory bottlenecks that stifle the development and establishment of micro and small enterprises in rural and urban communities.
- Promote the use of the Multi-functional Platform in off-grid locations.

2.4 Existing gaps in Ghana's energy access

The Millennium Development Goals emphasize not only poverty reduction in terms of income but also highlight the importance of improved health, universal primary education, women's empowerment and gender equality. Thus, an enhanced understanding of what is a productive use of energy must take into account not only the direct impact of energy on raising incomes but also

the indirect impacts of energy on education, health and gender. In other words, without the provision of regular, efficient and cheaper energy services, achieving MDGs will be a difficult task. The Millennium Project is explicit in its assertion that modern energy services help drive economic growth by improving productivity and enabling local income generation through improved agricultural development and non-farm employment. It further opines that, if made available to all income groups, modern energy services become an invaluable means of improving social quality. Modern energy services are thus decidedly needed to alleviate poverty, reduce hunger, raise educational and health standards in developing countries.

However, there are lots of gaps in Ghana's energy discourse. A major gap in Ghana's energy access at the household level is that, lighting and television alone is said to account for 80% of rural electrification consumption and this forms a bulk of the benefits delivered by electrification (World Bank, 2008). Moreover, virtually 100% of households with electricity are geared towards lighting (Barnes, 2007).

The widespread use of electricity almost entirely for lighting (limited use for cooking) in households, and the high electricity tariffs for non-residential activities raise questions or uncertainties with regards to achieving MDGs especially in the deprived rural areas. The high costs of electricity tariffs for non-residential sectors discourages the use of electricity for productive activities (SMEs) which is intended to contribute to income generation and employment creation in lagging communities.

As at 2010, more than 50% of the population not having access to electricity in Ghana live in settlements smaller than 500. With the country's plan to electrify settlements above 500, it has been espoused by some energy experts that a large part of the country's population (~15%) may remain unelectrified by the year 2020. This presupposes that the universal electrification by 2020 policy which has been rekindled by the government is implausible if the status quo is maintained as only about 85% of the population will be electrified. Nonetheless, the aforementioned guiding principle of the NES is seldom followed in practice because many smaller communities with population smaller than 500 are electrified in the course of electricity grid extension programmes. This has been possible on the grounds of ethics as well as the need to satisfy such small communities lying in between bigger settlements ready for electrification in order to avoid

conflicts. Moreover, there are some communities with population smaller than 500 which are electrified under GEDAP and SHEP. Even though off-grid electrification options have been recommended for communities with smaller populations which are also farther from the grid, there is a popular lack of interest in this option in most communities in Ghana. This is because households in these communities are not able to use these off-grid solutions for income generation and employment creation for poverty alleviation. Most of these communities also agitate to be placed on the grid once they realize that neighbouring villages have been given access to the grid. These issues highlighted are research gaps in Ghana's energy access that needs to be addressed in the near future.

Addressing MDGs through access to modern cooking fuel (especially LPG) for cooking also remain a serious development challenge. The health advantages associated with modern cooking fuels are lower smoke exposures, improved ventilation of cooking areas with its consequent effect of reducing the disease burden resulting from smoke, lower child mortality rates, and improve maternal health (Modi *et al.*, 2005). Beside the limited use of electricity for cooking at the household level, low access to modern cooking fuels (such as LPG) presupposes the continuous use of traditional biomass. Indeed, another major gap that needs to be addressed on modern cooking fuels is the inconsistent data sources on the rates of access in the country. With regards to LPG, different access rate quotations are provided. Even though the number of LPG stations have increased from 98 in 2004 to 249 in 2010 (see Figure 2), data on population who use LPG as cooking fuel is not consistent. Whereas the Energy Commission is quoting 6% as current access rate, other notable organisations such as UNDP/WHO (2009) quote 12% as at 2008. Perhaps results from the recently conducted Housing and Population Census, when ready, would provide a figure that can be acceptable to all stakeholders. Nonetheless, even if the access rate of 12% is accepted, it is still far below the ECOWAS recommended rate of 50% access to modern cooking fuels and the MDG target of 50% set by United Nation's Millennium Project by 2015. There is also scant data on the improved cook stoves in the country. It is therefore difficult to measure how their availability is making up for the limited LPG use in the country.

From the above advantage, a low access rate of cleaner cooking fuels may therefore present a potential threat to achieving the MDGs. The situation is likely to be worsened in the Northern,

Upper East and Upper West regions of Ghana where LPG access is extremely low. For instance it is estimated that, an average of 51,444 people are served by one LPG station in the Greater Accra region which is almost eight times less than Northern region where a population of 411,426 are served by one LPG station (see Figure 3). Although the number of LPG station access across Ghana is inadequate, the situation in the three Northern regions (Upper East, Northern and Upper West) is very bleak as the LPG stations are concentrated in the regional capitals (Figure 4). The difficulty of access to LPG by smaller towns and remote settlements is evident in the large land areas/sizes of the regions coupled with the persistent transportation problems. This presupposes the high dependence on traditional biomass in the aforementioned regions. In effect, not until the use of electricity is extended to include cooking or productive activities and LPG access rates increased to an appreciable level, achieving the MDGs will be difficult.

The inconsistency with data and access rate calculations is not only limited to LPG. The same goes for electricity. Electricity access rates estimates of Ghana are notably coming from Ministry of Energy and Ghana Statistical Service bearing different time-stamps using different indicators. For instance, whereas Ministry of Energy makes the computation based on community access, households' access is the reference point for Ghana Statistical Service in both 'Population and Housing Census' and 'Living Standard Surveys' .

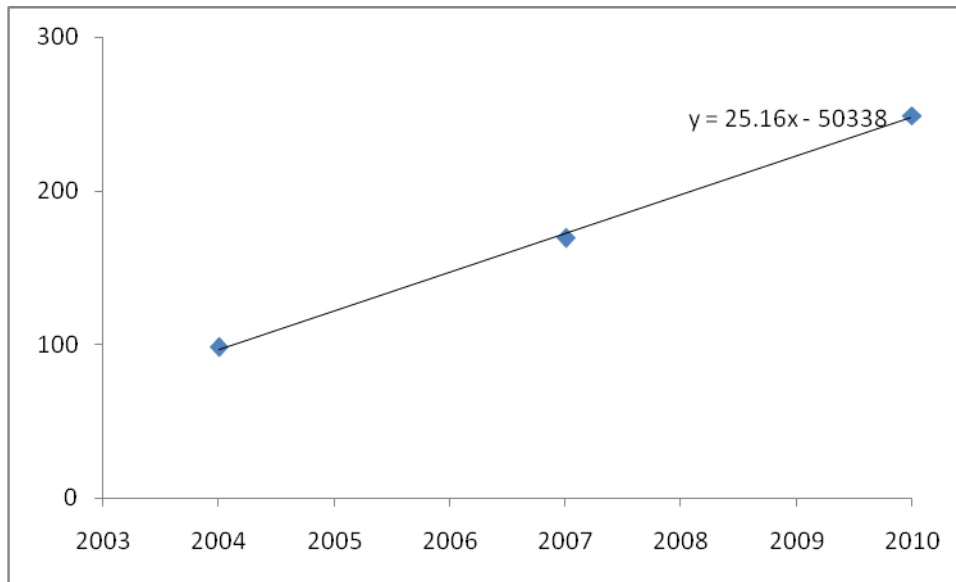


Figure 2: Evolution of LPG stations in Ghana

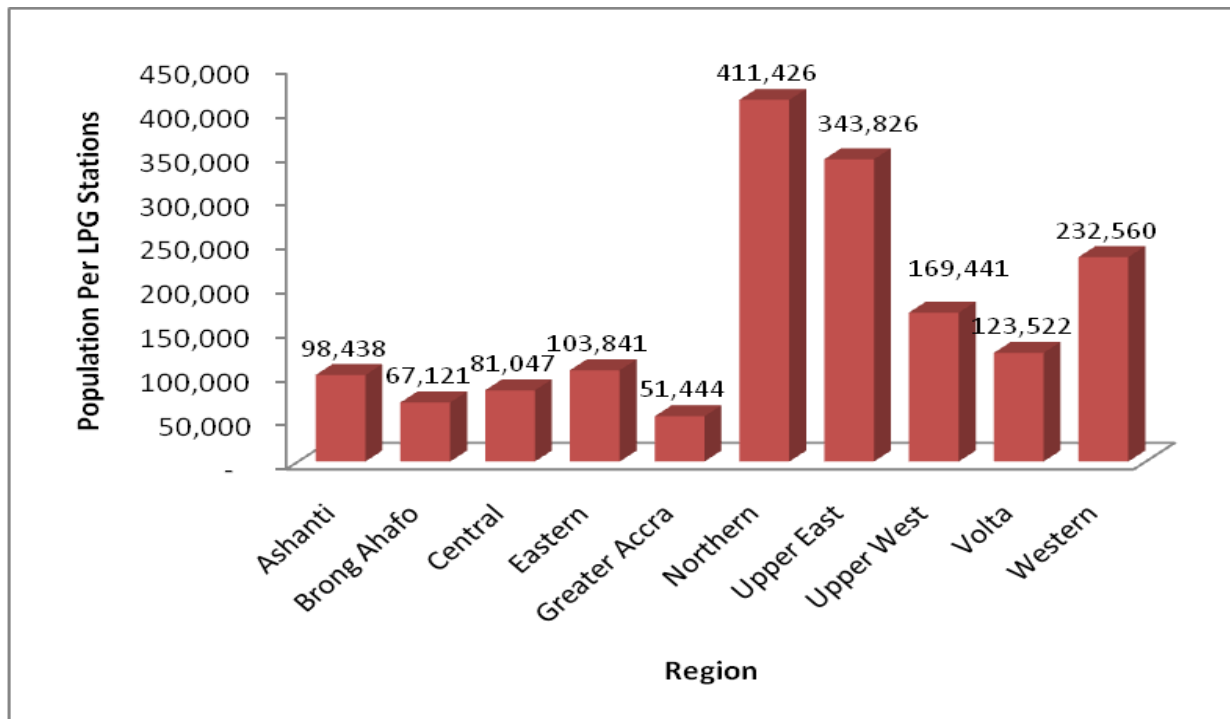


Figure 3: Population per LPG Stations in Ghana

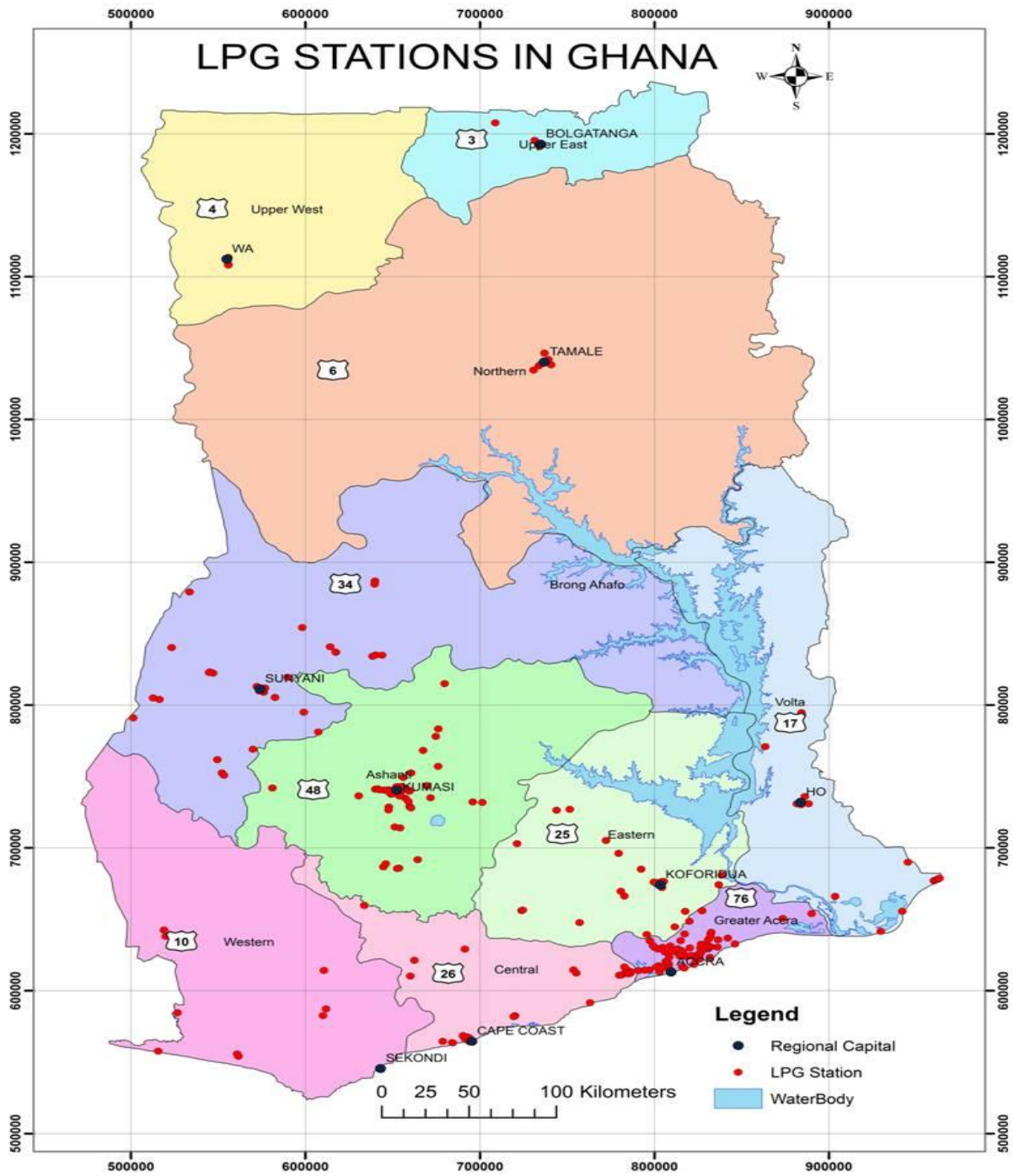


Figure 4: A Map of LPG stations in Ghana

3.0 KEY ISSUES AND OPTIONS

3.1 Ghana’s Energy situation in relation to ECOWAS and MDG targets

In terms of access to electricity, Ghana has made a big leap forward over the years between 1990 and 2010. Electricity access rates in Ghana increased from an average of 28% in 1990, 29.5% in 1990/92, 41.4% in 1998/99, 43.7% in 2000, 50.6% in 2003, 49.2% in 2005/6 (Akuffo, 2009) and eventually rose up to 66.7% in 2009 (Ministry of Energy, 2009). Current estimates provided by the Ministry of Energy place Ghana’s electricity access rate at 72% in the mid-2010¹ (Ministry of Energy, 2010) (see Figure 5). There has been also corresponding increases in electricity access at the regional levels with the Greater Accra region and Ashanti region recording the highest access rates of 96% and 81% respectively in 2009 (Ministry of Energy, 2009). Access rates in the two leading regions have increased to 96.8% (Greater Accra region) and 84.1% (Ashanti region) in mid-2010. Similar increases in access rates have been recorded in the Northern region from 43.60% in 2009 to 50.1% in mid-2010, Upper West (from 31.95% in 2009 to 39.9% in the mid 2010), Upper East (30.43% in 2009 to 43.6% in mid-2010) (ibid.). It is worth noting that, the rural-urban disparity in electricity access rates have also improved over the years (see Figure 6).

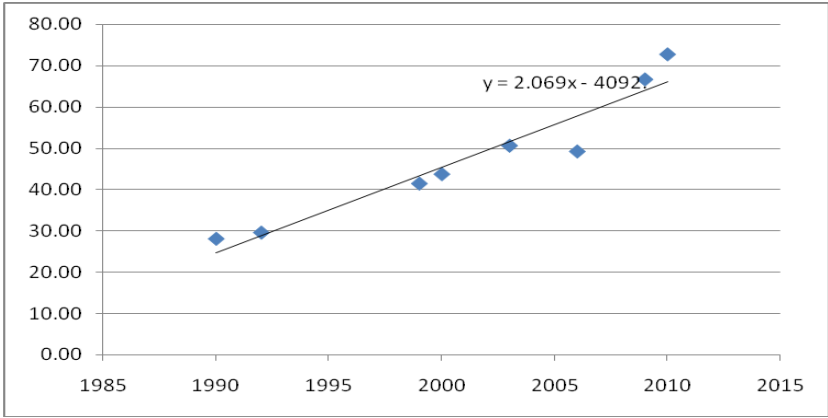


Figure 5: Pattern of electricity access rates between 1990 and 2010.

¹ Electricity access rates for 2009 and mid-2010 were calculated using populations in communities having access to electricity. In each of these communities, not all households may necessarily be connected to electricity.

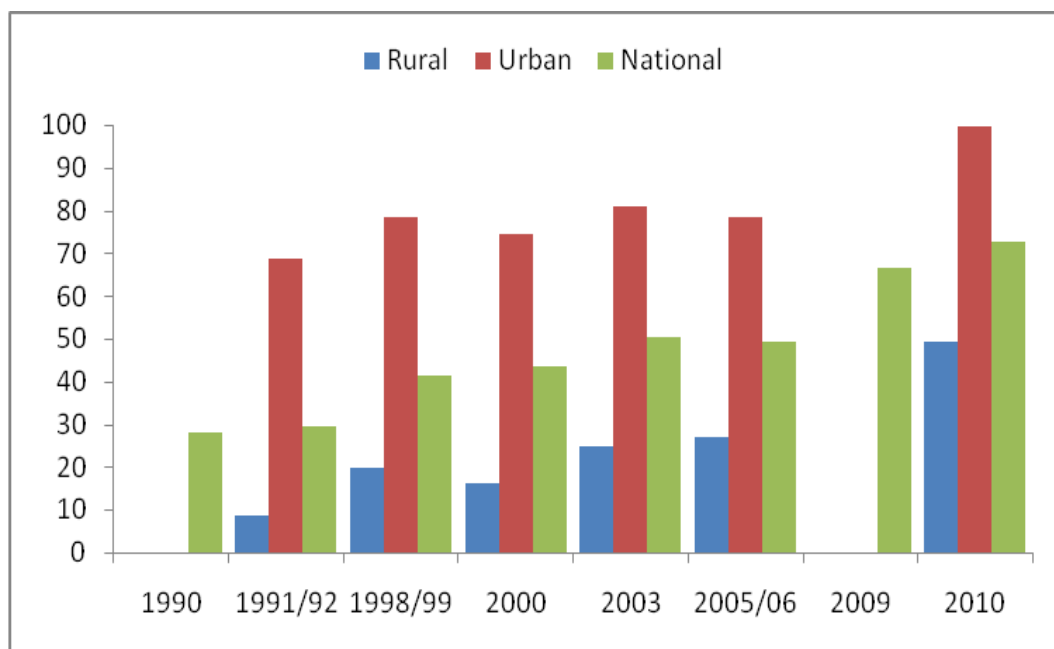


Figure 6: National, Urban and Rural Electricity Access Rates for Ghana

The increased access rates are accompanied by corresponding increases in energy consumption in the country at the household, industry and commercial levels. It is estimated that, household electricity consumption increased from 1,585 GWh (26% of national consumption) to 1,957 GWh (37%) in 2005 (Ghana National Energy Statistics, 2000-2005) and further increased to 2,095 GWh (38%) in 2007 (Ghana Energy statistics, 2007). Such phenomenal increases show promising efforts to address the eight objectives set by the MDGs. However, not until such electricity is used for delicate sectors of the economy such as industries, health, agriculture and education, the high electricity access rates would not yield the expected or corresponding gains to address the MDGs.

A comparative analysis of the country's electricity access with ECOWAS targets reveals that, Ghana has made significant strides. As of mid-2010, access to electricity by rural areas in Ghana had surpassed the ECOWAS rural electricity targets of 36% access and is close to achieving the 100% urban access by 2015 (see Figure 7). Moreover, Ghana is placed second to only Cape Verde in terms of electricity access and ranked higher than Nigeria, Cote d'Ivoire and Senegal given an estimated electricity access rate of 72% (see Figure 8). However, Ghana's impressive electricity access rates has not translated into increased access to modern fuels for cooking and

heating as in countries like Cape Verde and Senegal. Access rates available for 2008 (Figure 9) indicates that access to modern fuels in Ghana was only 12% as compared to Senegal’s 41% and Cape Verde’s 63%. Ghana’s current access rate to modern fuels means that it is not likely that the country will be able to achieve the ECOWAS target of 100% by 2015 and may in fact not be able to achieve her own target of 50% also by 2015. The implication is that, the use of woodfuel and their dire consequences will continue to make a large proportion of the population vulnerable to numerous health risks with the consequent effects of derailing the achievement of MDGs.

A major challenge in the assessment of the energy access rates is that different estimates are given from different sources (Energy Commission, Ministry of Energy, and other researchers) perhaps using different methodologies for the computation.

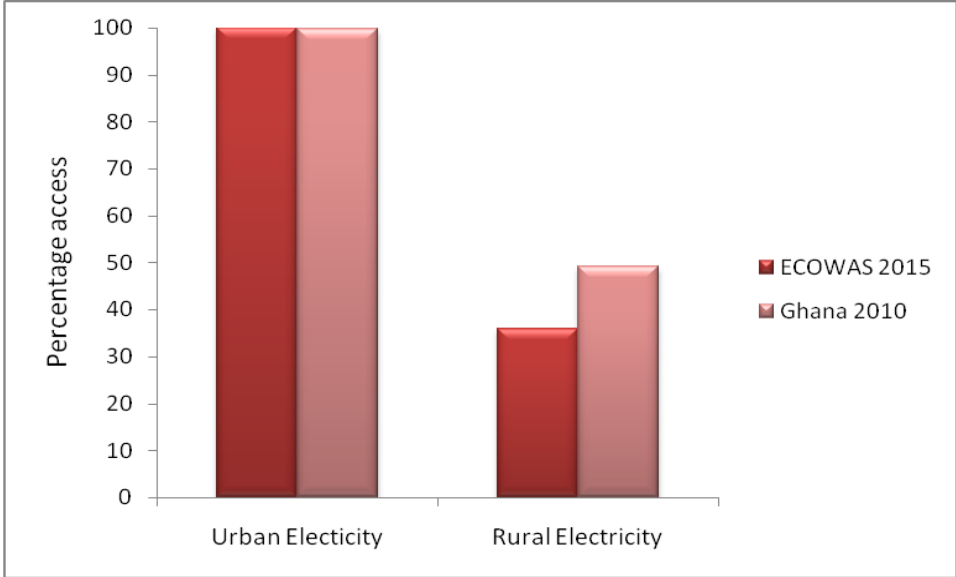


Figure 7: Comparing Ghana’s Electricity Targets with that of ECOWAS

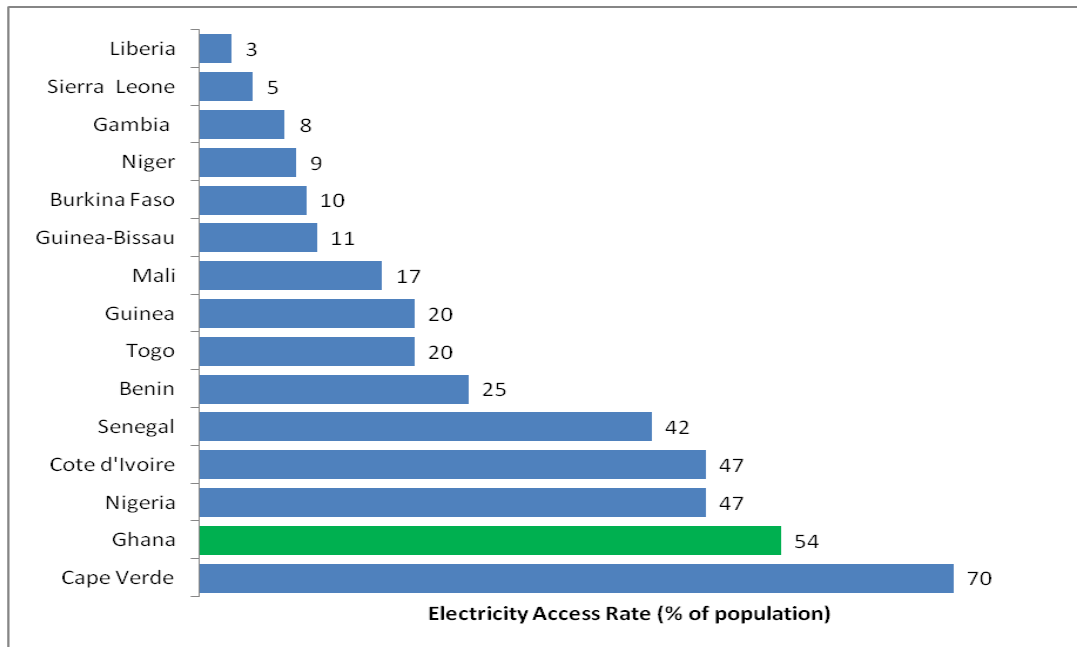


Figure 8: Electricity Access Rate in West African Countries, 2007

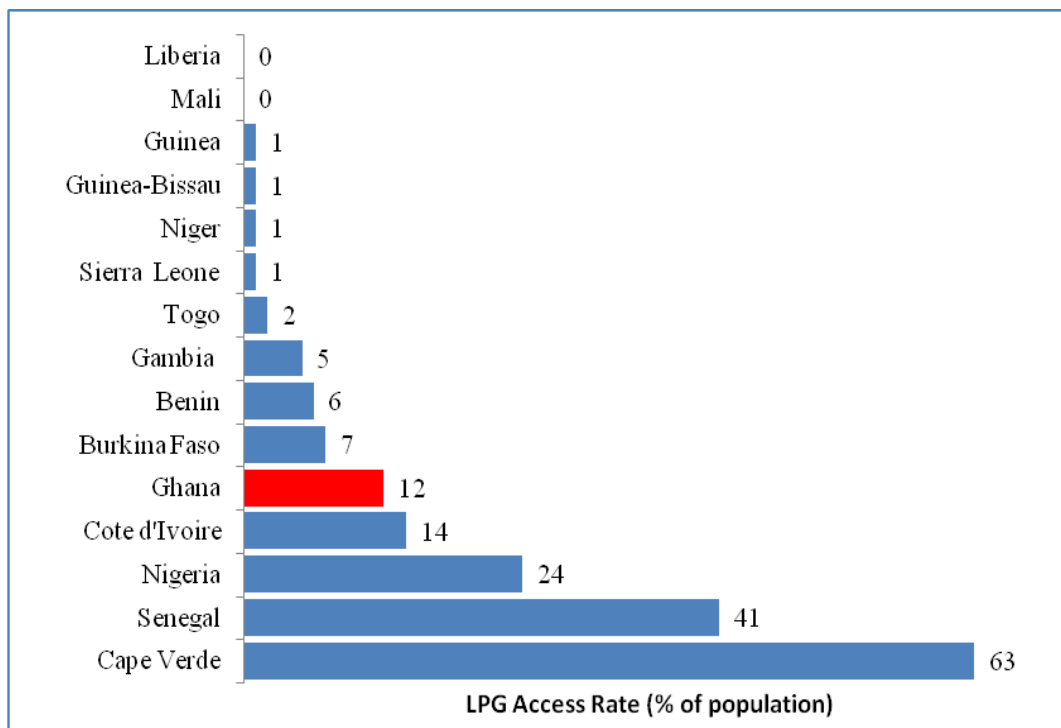


Figure 9: Modern Fuels Access Rate in West African Countries, 2008.

3.2 Drivers of the Ghana Energy Access

3.2.1 Long-term planning with clear targets

An important driver of Ghana's strides in electrification is a consequence of long-term planning with clear targets. The country has been one of the few African countries which have set up energy planning policies with clear targets sometimes with future projections close to 3 decades. For instance under the NES which was set up in the 1990, the country laid out its quest for universal electrification (100% access) by 2020, which the current government is still pursuing. The impressive impacts of the NES are evident in electrification of 2,350 communities within ten years after the launch, which is about 56% of the original 4,200 targeted communities. The Scheme which appeared over-ambitious at the outset has been a significant driver of electricity access especially through discrete programs such as the Self-Help Electrification Scheme (SHEP). Indeed, Ghana's electricity access rate has been spurred by the SHEP. Under the SHEP, clearly stated significant contributions/commitments are expected from both the government and communities willing to get connected to grid electricity. About 3,026 communities had been electrified by April 2005 under the various schemes. Electrification of new residential communities then becomes less difficult due to a reduced cost of grid expansion. This is as a result of the creation of an enabling electrification environment under the SHEP. Under the programme, residents of non-electrified communities mobilize resources usually in the form of payment of monies for the provision of Low Voltage (LV) poles and meters and at least 30% of households wire their households ready to receive power. Others make requests from their respective district assemblies for assistance usually in the form of providing LV poles and other electrification logistics. Given the burning desire to get their households connected to the grid with some form of assistance from the government, residents of non-electrified communities have found it relatively cheaper to mobilize funds to complement the government's effort for grid expansion compared to the period before the SHEP came into being.

3.2.2 Availability of external funding

Availability of external funding has been an important driver of Ghana's phenomenal energy access rate. Although a reasonable amount of financial resources have been made by the government of Ghana towards energy access in the country, availability of funding from European and Asian countries facilitated the implementation of Ghana's energy projects.

Without the funding, the country could not have made such a big leap forward in energy access. The Northern Electrification and System Reinforcement Project (NESRP) which is one of the forerunners of Ghana’s electrification programmes was funded by the African Development Bank in 1987. The same can be said about GEDAP. Currently a GIS-based Energy Access Project (GIS-EAP) in Ghana at The Energy Center of Kwame Nkrumah University of Science and Technology (KNUST), Kumasi is funded by the European Energy Initiative-Partnership Dialogue Facility (EUEI-PDF) based in Germany. The GIS-EAP has produced interesting results of cost-effective electrification options (grid, Solar PV and diesel mini-grid) for 30%, 60% and 100% penetration rates in Ghana in 2020 using the Network Planner model developed by the Earth Institute of Columbia University. To achieve 100% electrification rate in Ghana, the Network Planner estimates the cost of \$405,666,052. The 10 years time horizon (2010 as a base year) was used as basis for the electrification cost estimation due the country’s desire to achieve universal electrification by 2020. Table 4 shows the electrification cost estimates for the various ten regions given the afore-mentioned different penetration rates.

Table 4: Electrification cost estimates for Ghana at different penetration rates

Regions	Cost of electrification (US\$)		
	30% penetration Rate	60% penetration Rate	100% penetration Rate
Ashanti	11,518,530	25,993,681	36,208,825
Brong- Ahafo	11,739,213	23,585,884	33,660,745
Central	14,745,978	24,668,846	33,532,927
Eastern	9,853,101	24,584,873	32,049,291
Greater- Accra	718,903	1,239,306	2,021,299
Northern	26,644,850	53,854,385	85,568,248
Upper East	17,569,913	28,367,547	37,605,641

Upper West	12,604,470	30,966,358	40,619,900
Volta	20,120,191	30,721,383	43,637,225
Western	21,580,874	43,376,633	60,761,953
National	125,515,149	243,982,262	<u>405,666,052</u>

The cost of electrification differs widely across the ten regions due to remoteness (scattered settlement pattern and size (land area), the number of pre-existing unelectrified communities coupled with population size and the projected electricity demand over the ten years time horizon. The scattered pattern of settlement in Northern Ghana and the existence of many unelectrified communities amply suffice the relatively high electrification cost (\$85,568,248) compared to other regions especially Greater Accra region (\$2,021,299) with reverse characteristics. The availability of such electrification cost ranges provide a useful guide to the financing mechanisms or investments required either from private sectors or the government to achieve a certain level of penetration rate and eventually the set target of universal access by 2020.

3.2.3 Politics/ Popular Demand

Electrification access in Ghana has been observed over the years as influenced by electioneering years where efforts for rural electrification are a major vote-winner. Political commitment is thus very high because parliamentary candidates have been known to spend their own or campaign funds to extend grid distribution lines to their constituencies even in cases where there was no power flowing through the wires. Presidential candidates' of especially incumbent parties have similarly contributed to electrification. It was also revealed that electrification (grid electricity) has been a popular supplication electorates present to their respective political candidates during elections before giving them their mandates. As the country approaches another electioneering year, new sets of electrification programmes are being inaugurated by the incumbent government. A new electrification project has been inaugurated at Agyemankurom in the Dormaa Municipality of Brong Ahafo region of Ghana (Daily Graphic, May, 2011). The

inauguration was done by the regional minister as part of the government's commitment to its promise of 100% universal electrification by 2020. President John Evans Atta Mills also recently inaugurated another electrification project in Awuna in the Western region of Ghana in May, 2011 (TV3 News, May, 2011).

3.3 Potential Threats

3.3.1 Grid vs Solar!

The electricity utilities in Ghana, (i.e. the Electricity Company of Ghana, ECG and the Northern Electricity Department, NED) reveal that, residents of their operation areas have rejected off-grid electrification that were being implemented due to the high interest in grid electricity. Interestingly, the reason for such lack of interest is irreducible to not only financial reasons but more importantly the maintenance of batteries, regular cleaning of solar panels (to avoid reduced intensity of the solar radiation) including other logistics for Solar PV systems and the repairs of diesel generators coupled with the high fuel costs associated with diesel mini-grid electrification. Energy stakeholders meeting and Sensitization workshop organized by The Energy Center of KNUST reveal that, the lack of interest in the solar energy results from its inability to power electrical appliances such as TV sets, refrigerators, electric irons etc. This limitation, which featured prominently, urged them on for the popular preference for grid electrification. The use of refrigerators for small scale usually home-based economic activities such as sale of frozen fish, soft drinks, iced water, etc., which are impossible with the solar energy was the unanimous reason. Grid is thus the obvious choice for those residents whose livelihoods depend on the use of fridge.

Some participants expressed their wish to switch to any of the off-grid electrification options (solar or diesel generator) due to regular grid power outage/cuts at certain critical periods but the capital and recurrent costs presents a major obstacle and thus compelled them to stay on the grid, which is usually overly subsidised by the government. Most people who have had experience with the use of solar energy in their homes or adjacent towns explained that they saw nothing beyond lighting. Moreover, other communities turn down offers for off-grid electrification

options when they observe that adjacent communities are on grid electrification. These cases are reported to be the result of campaign promises made by politicians during electioneering years. Such a situation poses a threat to the smooth pace of Ghana's electrification drive as it derails efforts to electrify isolated and small communities where until a decade or two to come, grid may be economically or physically impossible.

3.3.2 LPG Shortages

In terms of modern energy sources for cooking, there has been high shortage of LPG for cooking especially in the peri-urban and urban areas of the country and the situation is gloomy in the rural areas. Already, a rampant shortage of LPG on the Ghanaian market, especially in the populous urban centers (Kumasi, Accra, etc.) where LPG is mostly used presents a major setback to achieving the 50% access to LPG by 2015 because there is only four years more to reach the target timeline. One of the principal reasons for the frequent shortages of LPG is perhaps the usage by some commercial and private car users who have adapted their engine systems to use LPG due primarily to the relatively cheaper cost compared to gasoline or diesel. Second, the high initial upfront cost of switching to LPG compared with traditional biomass also discourages its use by customers. For instance, it is asserted that, due to the relative larger number of people (90%) without access to LPG for cooking, they are compelled to use firewood and charcoal to improve their lots (UNDP Ghana, 2002; Ghana Statistical Service, 2005).

3.3.3 Financing

Financial constraints have been another significant impediment to modern energy sources especially for productive activities. The 2004 review of the NES revealed that poor communities were unable to pay their electricity bills and the non-existence of productive uses by poor households featured prominently (Amisshah-Arthur, 2004). It is thus not surprising that households in the least energy consuming bracket (0-50 kWh per month) have their costs heavily subsidized by the government. The situation is even gloomier when assessing electricity for productive activities compared to the developed world where a kilowatt-hour cost of electricity

for productive activities is less expensive compared with the cost for residential use, the reverse case exists in Ghana. This puts off prospective businesses that require the use of electricity. Rural enterprises which are expected to revive rural economies from raw materials production to the stage of value addition are beset with the high cost of electricity and thus leading to less remarkable successes in the productive use programme launched by the Ministry of Energy.

4.0 CONCLUSIONS AND RECOMMENDATIONS

Ghana has made significant strides in its plan to increase energy access to unlock the development potential. Excellent energy plans with clear targets, availability of external funding, political/popular demand, role of Ghana Energy Commission and Ministry of Energy towards the implementation of the various energy policies are identified as the drivers of the country's leap forward in energy access rate. With urban electricity access rate of about 99% and rural access of 49%, the country has made a sterling progress when compared with the ECOWAS target values of 100 for urban and 36% for rural households by 2015. This presupposes that, Ghana is well on the way to meeting the ECOWAS targets and MDGs especially in developed regions like Greater Accra and Ashanti regions. Although, Ghana's high electricity access rate (72%) places the country at an enviable position to achieving some MDGs, however, the electricity in most parts of the country is almost entirely used for 'lighting' but less for 'cooking'.

Moreover, due to the high electricity tariffs paid by commercial customers, electricity is less used for productive activities compared with domestic users. Because productive uses of electricity creates employment and generate incomes, limited use of electricity for that purpose will not yield corresponding spin-off effects on economic development. In other words, not until Ghana's high electricity access is extended to include productive use purposes, the phenomenal strides in electricity access will not be translated into achieving the MDGs.

LPG has a low access of approximately 12%. Due to the health advantages of modern cooking fuels including lower smoke exposures, improved ventilation of cooking areas with the consequent effect of reducing the disease burden resulting from smoke, lower child mortality rates, and improved maternal health, their low access rate present a potential threat to achieving MDGs. Ghana is on the path to meeting the electricity targets set by ECOWAS even before

2015. However, not until access to modern cooking fuels (LPG etc) is increased or electricity is increasingly used for cooking (to reduce tradition biomass use) and productive activities, Ghana's enviable energy access would not make a correspondingly meaningful impact on MDGs and economic development.

A number of recommendations coming out of the discussion in this paper are summarised below.

4.1 Need for database for energy access

There is a need for more studies to generate a database for determining the pattern of energy access improvement over the years, challenges and prospects as well as the main drivers of energy access in the country. This will help provide useful information for accurate projections about how to achieve a certain time-bound access rate given certain sets of prevailing conditions especially on LPG. For instance, due to the limited data on LPG, the government's commitment to spur on LPG access rate seems to be a mere wishful promise/projection instead of evidence-based or realistic data on the pattern of change in access to LPG use and access.. This amply raises questions about the government's plan to achieve 50% access to LPG in 2015 whiles the current rates hover between 6%-12%.

4.2 Integration of Solar PV systems with grid electricity

There is also the need to ensure a proper integration of Solar PV systems with grid electricity so that the problems associated with the promotion of off-grid electrifications options would be avoided or at least reduced. This would help to increase Ghana's access rate because grid electricity which is mostly preferred cannot be possible in all non-electrified communities now due to economic and physical accessibility constraints.

4.3 Harmonization of energy access data

Data from different institutions/sources should be harmonized. For instance, there is a mixture of electricity access data: coming from Ghana Living Standards Survey (GLSS), Housing and Population Census and Ministry of Energy bearing different computational methodologies. It is therefore suggested that the data sources should be given proper time-stamp and a methodology for computation agreed to allow a good historical (trend) analysis to provide a more nuanced

report on the trend of energy access rates at the community/district/municipal/metropolitan levels. Methodology for computing electricity access rates also needs a further reading. For instance, electricity computations are limited to grid electricity to the neglect of off-grid electrification options such as solar PV and diesel-mini grids. Meanwhile it is stated that, there are about 4,500 Solar PV systems installed in households in Ghana. In addition, most hotels, rest/guest houses in Ghana and some households use diesel generators to provide electricity as back-ups. Even some households are entirely put on diesel mini-grid electrification but unfortunately, these forms of electrification are excluded in the computation of electricity access rates. These lapses obscure the correct estimates of electricity access rate for the country.

4.4 Need to reduce system losses

Reduce system losses (technical and commercial losses in distribution): The grid electricity system losses in Ghana has been estimated at 1,372 GWh representing 24.6% of the total electricity consumption which far outstrips the commercial consumption of 803 GWh (14.4%) (Ghana Energy Statistics, 2007). In other words, if reduced to the barest minimum, areas of the country without electricity access due to inadequate electricity power generation could be served with the energy saved through the reduction of the system losses. The increased transmission losses have been attributed to the transmission of power from the south to the middle sector and eventually to the north of Ghana (Energy Commission, 2006) due to the absence of power generation plants in the northern parts of the country. The long distance transmission translates into significant losses and stability problems for the transmission network (ibid.). The faster completion of the Bui hydro power dam in the middle part of the country could help reduce the losses by way of balancing energy transmission inland or a higher transmission like the 330 KV proposed by ECOWAS would be required.

4.5 Sensitization workshops on energy

Sensitization workshops on energy efficiency practices in household with electricity access: Although earlier attempts have been made on the distribution of 10 million CFL bulbs. However, energy efficiency should go beyond mere distribution of free bulbs. Ghanaians must be educated to adopt a more positive attitude towards saving electricity and should be encouraged to save energy by means of switching off lights when appropriate. The present situation where street

lights are left on in some places even after mid-day points to the unfinished tasks of sensitization workshops on energy saving practices.

4.6 Need to address LPG Shortages

Despite numerous efforts to curb its usage, biomass consumption is still prevalent. The high cost and shortages of LPG in the urban areas further encourages the use of biomass and thus traditional fuel consumption is unlikely to take a nosedive as expected. The issue of adapting car engines to use gas as a fuel has further worsened the availability of LPG in most urban areas of the country. It is recommended that something be done to address the situation. A number of measures would have to be taken to increase access to LPG including creating a favourable investment environment for private sectors into the provision of LPG to ensure a regular and adequate supply to peri-urban and rural areas in order to prevent shortages that might compel people reverting to using woodfuels. Provision of subsidies by the government solely for domestic users of LPG will also encourage its use for cooking and hence reduce in-door pollution and the accompanying health risks (respiratory diseases).

4.7 Data collection/sharing syndrome

Data collection/sharing and accuracy problems: One of the problems that featured prominently during the GIS-EAP project was the difficulties in collecting energy-related data, socio-economic, demographic and spatial/geographic data sets for the evaluation of Ghana's current energy needs and future projections. The Government of Ghana has two major energy access targets: (1) Universal Access to Electricity by 2020; and (2) 50% Access to LPG for Cooking by 2015. Recent and ongoing consultancy/research activities at the Ministry of Energy and The Energy Center, KNUST suggest the country may be on course to attain the electricity target but unlikely to do so in the case of LPG if things continue as they are. Various research projects at The Energy Center in particular have exposed difficulties in obtaining the necessary data to monitor progress of Ghana's energy access and the idea of setting up Data Task Force. This came up during a Stakeholder Forum organised for representatives from the Ministry of Energy (MoEn), Energy Commission (EC) and the distribution utilities (VRA/NED and ECG).

The intent of the proposed Energy Access Data (EAD) Task Force is to facilitate the development of a shared database on access to electricity and LPG in Ghana.

Specific objectives of the EAD Task Force will include:

- i) Collation of all the data required to monitor progress in the implementation of energy access programmes in Ghana, and
- ii) Analysis of energy access data to provide timely information to Government and other stakeholders on prospects for achieving Ghana's energy access targets.

The EAD Task Force will initially consist of representatives from the Energy Commission (Convener and Chair), National Petroleum Authority, Volta River Authority /Northern Electricity Department (VRA-NED), Electricity Company of Ghana (ECG), Ghana Statistical Service, The Energy Center, KNUST, CERSGIS, University of Ghana, and Ministry of Local Government & Rural Development.

Beside the quest for the formation of EAD Task Force, the study faced problems with inconsistencies regarding specific data sets and their years and even the non-existence of geographic and demographic data such as mean inter-household distance, average rural and urban population growth rates at the regional and national levels as well as average rural and urban household sizes across the ten regions of Ghana. These data sets were needed especially to compute realistic projections of population growth and their corresponding energy demands to guide policy formulation. The study thus recommends Msc/Mphil and PhD research works to address the afore-mentioned data gaps to complement extant studies. The study also recommends further research into the energy needs of delicate sectors of the economy such as health, education etc to ease sectoral energy access evaluation. Finally, it is recommended that further studies be undertaken on the availability of improved cook stoves in households across the ten regions of Ghana and the improvements made so far.

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