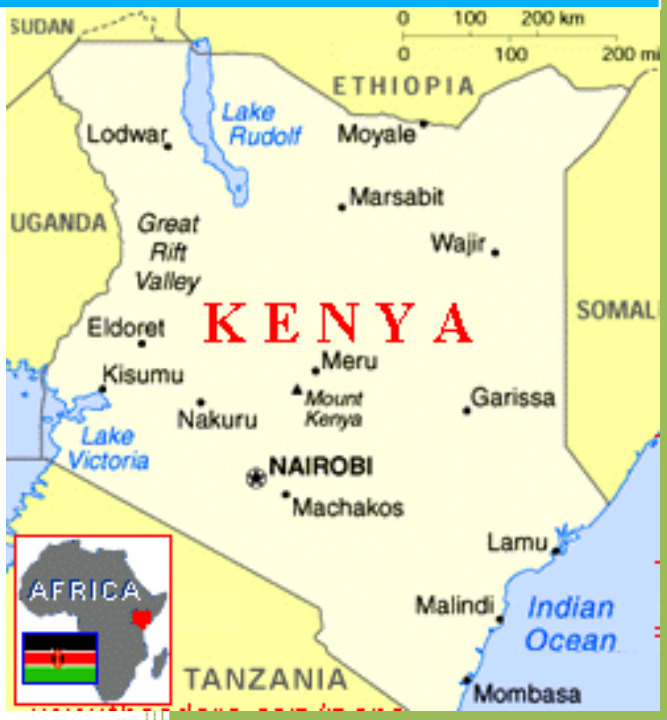
EAC Strategy to Scale-Up Access to Modern Energy Services



KENYA *COUNTRY* BASELINE *REPORT* AND WORKPLAN

April 2008

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ABBREVIATIONS

AfDB	African Development Bank
AFREPREN/FWD	Africa Energy Policy Research Network
ASALs	Arid and Semi Arid Areas
ASCAs	Accumulating Savings and Credit Associations
CBK	Coffee Board of Kenya
CBO	Community Based Organisation
CDF	Constituency Development Fund
CEEC	Center for Energy Efficiency and Conservation
DM	World Bank's Development Marketplace Forum
EAC	East African Community
EAC-EASUP	EAC Energy Access Scale-Up Programme
EATTA	East African Tea Trade Association
EMCA	Environmental Management and Coordination Act
ERB	Electricity Regulatory Board
ESDA	Energy for Sustainable Development—Africa
ESRP	Energy Sector Recovery Project
GEF	Global Environment Facility
GoK	Government of Kenya
GTZ	German Technical Cooperation
GVEP	Global Village Energy Partnership
GVEP-I	GVEP International
ICRAF	World Agro-forestry Centre
ICS	Improved Cookstoves
IPPs	Independent Power Producers
IPRA	Institute of Policy Research and Analysis
JICA	Japan International Cooperation Agency
KAM	Kenya Association of Manufacturers
KEBS	Kenya Bureau of Standards
KEFRI	Kenya Forestry Research Institute
KENGEN	Kenya Generating Power Company Limited
KEREA	Kenya Renewable Energy Association
KES	Kenya Shilling
KFS	Kenya Forest Services
KIHBS	Kenya Integrated Household Budget Survey
KIRDI	Kenya Industrial Research and Development Institute
KNBS	Kenya National Bureau of Statistics
KPC	Kenya Pipeline Company
KPLC	Kenya Power and Lighting Company Limited
KPRL	Kenya Petroleum Refineries Ltd
KSA	Kenya Sugar Authority
LPG	Liquefied Petroleum Gas
MDGs	Millennium Development Goals
MFP	Multi Functional Platform
MoE	Ministry of Energy
MPND	Ministry of Planning and National Development
MSME	Micro, Small and Medium Enterprises
MT or T	Metric Ton
MW	Megawatt
NEMA	National Environment Management Authority

NGO	Non Government Organization
NOCK	National Oil Corporation
PCIA	Partnership for Clean Indoor Air
PIEA	Petroleum Institute of East Africa
PSDA	Private Sector Development in Agriculture
PV	Photovoltaic
RE	Renewable Energy
REA	Rural Energy Agency
REEEP	Renewable Energy and Energy Efficiency Partnership
RESCOs	Rural Energy Service Companies
RETAP	Rural Energy Technology Assistance Programme
RETs	Renewable Energy Technologies
ROSCAs	Rotating Savings and Credit Associations
SACCOs	Saving and Credit Co-operative Organisations
SACDEP	Sustainable Community Development Programme
SHS	Solar Home System
SMDEEs	Small and Medium Energy Enterprises
SME	Small and Medium Enterprises
SWOT	Strength Weakness Opportunities Threats
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
US$	USA Dollar
VJDF	Vanilla-Jatropha Development Foundation
WB	World Bank

Exchange Rates as at 12 March 2008
1 US$ = KES 69; 1 EUR = KES 98

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CONTEXT OF THIS REPORT

The East African Community (EAC) *Strategy on Scaling-up Access to Modern Energy Services* was conceptualized and developed with the aim of enabling the Partner States (Kenya, Uganda, Tanzania, Rwanda and Burundi) to achieve the Millennium Development Goals (MDGs) and poverty reduction. It was adopted in November 2006 by the EAC.

The EAC member countries acknowledge and recognize the fact that the current access to modern energy services for the majority of the population is not only low, but will remain a key barrier to attainment of MDGs in the region. Unless drastic measures are taken on energy access in terms of the level and speed of effort, over 80% of the inhabitants will still have no access to clean cooking fuels by 2015. Moreover, 50% of the urban population, 90% of rural populations and more than 90% of local schools, clinics and community centers will still have no access to electricity. Access to the motive power for mechanical loads, necessary to transform rural economies, will also still be largely lacking.

It is now universally acknowledged—and recognized in Kenya—that even though energy in itself is not part of the MDGs, it's development, access and use will significantly determine the level of success in achievement of the MDGs. Energy is a key input in the fight against poverty, hunger and malnutrition (MDG1), achievement of universal education (MDG2), gender parity through emancipation and empowerment of women (MDG3), reduction of infant and child mortality (MDG4), reduction of maternal mortality (MDG5), halting and reversal of the spread and associated fatalities of diseases, especially malaria, HIV and AIDS (MDG6), and improved access to water and sanitation and application of sustainable environmental policies and practices (MGD7). Energy partnerships and networks such as GVEP and PCIA also exist to foster these goals, in accordance to MDG8.

The objectives of the *EAC Strategy on Scaling-up Access to Modern Energy Services* are segmented into four major and ambitious targets on energy access, to be fulfilled by 2015, in line with the MDG framework.

Target 1: *Provide access to modern cooking practices for 50% of the population that currently uses traditional cooking fuel.*

Indicator: 55% of the total population in the region will have access to LPG, improved cooking stoves and to sustained biomass supply. (Linked to MDGs 3, 5 and 7).

Scale: Number of households to be reached is 2.7 million urban poor, 6.1 million rural poor and 0.9 million in nomadic and conflict regions. Result expected is 73% access to modern energy services by urban poor and 56% access by rural poor and nomadic and conflict region populations.

Target 2: *Provide access to reliable electricity for all urban and peri-urban poor.*

Indicator: 100% of urban and peri-urban households will be provided with electricity service. (Linked to MDGs 1, 4, 5 and 6). Result expected is 56% access to modern energy services by this target population.

Scale: Number of households to be reached is 5.3 million urban poor and 2.2 million in urban slums.

Target 3: *Provide access to modern energy services for all schools, clinics, hospitals and community centres.*

Indicator: 100% of the rural population will live in a locality where social service centres are equipped with modern energy services. (Linked to MDGs 1 through 6).

Scale: Number of institutions to be reached is 46,545 schools, 10,323 clinics and 750 hospitals.

Target 4: *Provide access to mechanical power for heating and productive uses for all communities.*

Indicator: 100% of administrative headquarters and localities with more than 3,500 inhabitants will be equipped with mechanical power and heating technology. (Linked to MDGs 1 through 6).

Scale: Number of communities to be reached are 23,240.

To achieve these targets on a regional basis, it is estimated that a total of US$ 3.2 billion will be required, with half of this cost (US$ 1.6 billion) being contribution by the end users. Other sources will include US$ 1 billion in subsidies from Governments and donors, support from Government programs (US$ 217 million), loan

guarantees from development banks (US$ 291 million), and regional support from EAC Secretariat (US$ 48 million). These targets and investment costs require a committed and sustained effort, as well as well coordinated and scheduled preparatory activities and investment programmes.

In order to achieve the four Targets detailed above, the EAC has undertaken to operationalise the scaling up strategy, thereby transforming it into a programme of action. The key thrust of the *EAC Energy Access Scale-Up Programme* (EAC-EASUP) is a paradigm shift from 'business-as-usual'. This will be achieved though integration and mainstreaming of national planning on a sector-wide basis, policy and regulatory framework reviews and re-formulation, extensive awareness creation, facilitation and implementation of energy access initiatives and investment programmes, with a specific bias towards interventions that can demonstrate conformity with a pro-poor and HILCS (high-impact low-cost and scalable) approach.

It will be necessary for EAC-EASUP to be fast-tracked, adequately funded and supported strongly by political will and appropriate market conditions.

The EAC recognizes that EAC-EASUP can only be implemented based on a long term plan and adequate preparation for the multiple, simultaneous and massive programmes that are necessary to achieve the objectives of EAC-EASUP. This document details the short term implementation plan for the Kenya component of EAC-EASUP. It focuses on the initial 24-month phase of the strategy. The work plans proposed therefore largely involve preparatory work and actions that improve the policy and regulatory environment, as well as improving the information, capacity and knowledge platform that will form a firm foundation for the big push necessary to shift matters from business-as-usual to a scaling-up mode.

Multilateral and bilateral development partners, funders and Government agencies such as the UNDP and GTZ are strongly behind the EAC and its Partner States as they begin implementation of EAC-EASUP.

EXPLANATORY NOTES

Preparation of this report

This report has been prepared by the National Consultant for Kenya, Mr. Ashington Ngigi of Nairobi and Kampala-based Integral Advisory Ltd and ITPower Eastern Africa, assisted by three local consultants, Mr. Daniel Macharia, Mr. Joseph Njuguna and Mr. James Wafula, and in collaboration with both the Regional Team Leader, Mr. Paul Kirai, Ag Director for Renewable Energy at the Ministry of Energy, Eng. Isaac Kiva and his team of Senior Officers, Mr. Paul Mbuthi and Eng. James Muriithi. The document has been reviewed by local energy expert, Mr. Daniel Theuri of Practical Action EA. Relevant documents and other persons or organizations consulted are indicated in the appendices.

This report is for discussion purposes and is therefore not publication-ready. Certain sections can be annexed and others further summarized. Editing and proof-reading is not final.

Methodology

To comprehensively gain relevant information and data within the short period of time availed for this assignment, it became necessary to constitute or consult with the team of experts mentioned above. Objectivity has meant an attempt to use data that is as accurate and as up-to-date as possible, based on the knowledge and best-estimate of the experts.[1] The baseline analysis largely makes use of documented data, and there was no attempt to collect additional independent from the field. In light of this, the following approaches were agreed and adopted by the study team:

[1] *Some data may be in the knowledge and custody of various parties, but not necessarily documented in quotable media.*

Literature review: A wide range of literature materials was collated and consulted to provide data and information that is authoritative. The study paid a lot of attention to the time frame covered by various publications and short-comings have been qualified in the SWOT analysis. The team quickly realized that the studies undertaken in energy are fragmented and the uniformity of time reference for an appropriate baseline was lacking.

Expert opinion and multi-sectoral stakeholders consultative group review: This was sought to affirm certain issues that could not be verified through the literature review, or were otherwise clearly outdated in the literature, or not documented altogether. Various experts in the key sectors under scrutiny were consulted to give their feedback on the current situation and what they think should be done in the near future to ensure that EAC-EASUP's objectives are met. Accordingly, this document was on 20 March 2008 subjected to debate by a consultative group of key stakeholders, including[2] KenGen, AFREPREN/FWD, KPLC, NOCK, Energy for Sustainable Development (ESDA), Ministry of Health, Ministry of Energy, UNDP-Kenya, Practical Action EA, ITPower Eastern Africa, ITC Energy and RETAP. Improvements suggested by the group have largely been incorporated; even though there remains a need to update figures even further to reflect ongoing Government and private sector work. This is proposed as one of the key activities in the 24-month implementation plan in this report.

Structure of this report

An executive summary precedes the body of this report. The substantive report is segmented into five major sections comprising **Part 1—*Kenya Baseline Energy Access Data***; **Part 2—*SWOT Analysis***; **Part 3—*Key Findings***; **Part 4—*Draft Activity Implementation Work plan*** and **Part 5—*Annexes***.

Parts 1 to 3 deal with the current landscape out of which key conclusions are drawn with respect to institutional and capacity challenges, necessary actions and the short term implementation plan. Contents comprise the baseline energy access data and indicators, multi-sectoral institutional frameworks, analysis of policies and the regulatory environment — including codes and standards, and financial mechanisms in Kenya. A detailed SWOT Analysis of the key components of energy access, such as energy resources, institutional capacity, policy and legal frameworks and financial capacity are also contained in these parts.

The Draft Activity Implementation Work plan contained in Part 4 stipulates the key actions, priorities, time schedules and costs that will enable creation of a strong foundation — within the 24-month window — for the mainstreaming and integration of energy access in development planning, developing or enhancement of pro-poor energy policies and regulatory frameworks, strengthening the capacity of institutions and the market players to deliver modern energy services, mapping, developing or enhancing innovative business models.

Important notes

The implementation plan proposed herein, for Kenya's component of EAC-EASUP, is for a limited time-span of 24 months — in conformity with the EAC's overall scheduling of EASUP plans and activities in all the Partner States.

Accordingly, this document does not contain plans and actions related to the actual investment programmes. It is however acknowledged that some pilot projects will be necessary as part of the assessment of the level of preparedness, effort and resources required for the full scale, multiple and simultaneous projects.

The 24 month plan focuses sharply on capacity building, institutional, regulatory and policy re-alignments and enhancements necessary for the fulfillment of the absolute EAC-EASUP goals.

[2] *See abbreviation list for the full names.*

EXECUTIVE SUMMARY

This report concludes that Kenya needs to invest an estimated US$ 3.3 million over the next two years, in order to place the country on the launch pad that would enable achievement of EAC-EASUP objectives.

During a past EAC energy workshop[3] leading to EAC-EASUP, discussants agreed that enhancement of data and information management was crucial, as was the development of an efficient energy market in Kenya. The importance of sustained political will was determined as necessary to shift energy access rate from business-as-usual. It was agreed that it will be necessary to mainstream and integrate energy planning and to prioritise energy initiatives across key sectors. The importance of localized initiatives and needs-based interventions was amplified. Availability (or in some cases access) and affordability of energy supplies was noted as a major constraint. It was also agreed that energy delivery and business models need to be aligned with a pro-poor bias, starting with proven technologies and best practices that enable among, other objectives, rural households to switch to improved cook stoves (ICS), urban households to switch to LPG, distribution utilities to connect urban and peri-urban households, and grid extension for populations within existing grid transmission proximity. The multi-sectoral approach was emphasised, especially collaboration of the Ministry of Energy (MoE) and other key line ministries namely; Planning, Finance, Agriculture, Health, Water, Education, and Environment, with MoE playing a lead role in coordination and energy planning assistance.

The proposals in this report take all these recommendations into account. The implementation plan detailed herein will enable Kenya to harmonise its energy policies and regulations at both the national and regional levels, as well as formulate its up-scaled energy investment program aligned to EAC-EASUP. In the 24-month period, Kenya will start laying the requisite energy sector capacity foundation for both the private and public sectors and to build coordination and programme management frameworks, including relevant data, information and knowledge sharing and networking systems. All these are critical ingredients to success of the regional scaling-up strategy for access to modern energy services in order to fulfill the MDGs.

Kenya's 24-month implementation plan and budget comprises the following:

- A total of US$ 3.3 million is required to implement the short term plan;
- Capacity building, policy and regulatory framework review as the key thrust of the plan;
- Categorisation of the budget by Target, from 1 to 4, and implemented over a 24 month period.

Major activities include mainstreaming EAC-EASUP into national development strategies, detailed update of energy access data; stakeholder workshops to sensitise them on the initiative; establishment and maintenance of an EAC-EASUP Kenya Task Force; design and mainstreaming of the policy framework, including lobbying and undertaking relevant regulatory re-alignments and cross-sectoral workshops.

Capacity building to create the platform scaled up delivery of energy services to the poor will be done through training and organising the supply chains; targeted market awareness campaigns; needs assessments; capacity building of institutions; training service providers, mainly off-grid and training community groups.

Identification and development of innovative business models and pilot-testing these models, as well as implementing at least one pilot project under each target, will be necessary.

Administration and coordination of the plan is also included in the proposed budget, as is internal monitoring and evaluation.

[3] *EAC 'EC ENABLE Project' / UNDP Workshop Report*

1.0 KENYA BASELINE ENERGY ACCESS DATA

This part of the report focuses on a situational brief of energy resources and access in Kenya, and an analysis of the operating environment for energy planning and execution. The analysis is guided by the four EAC-EASUP targets, a multi-sectoral approach and a technology neutral perspective. The end result is identification of gaps and associated recommendations with respect to the energy policy, the national development strategy and position papers, and institutional frameworks. The baseline indicators also offer a reference point[4] for future monitoring.

1.1 Overall Energy Access Scenario

Kenya's population currently stands at approximately 35.5 million, with a growth rate of 2.8% (2007 estimate; last census held in 1999). In 2007, GDP was about US$ 17.39 billion and per capita GDP average approximately US$ 450. GDP growth is reported as 6.1[5] (2006) and forecasted at 5% to 6% in 2007. Energy consumption per capital stood at 494 koe.

The country is divided into eight provinces[6], with Nairobi province hosting the capital city, Nairobi. The other provinces are Nyanza, Rift Valley, Western, Central, Eastern, North Eastern and Coast. Of the 35.5 million[7] people, about 2.8 million live in Nairobi and overall, 20% live in urban and peri-urban areas, including informal urban settlements.

The demand and use of energy is based on location (relative to energy resources), as well as the types of economic activities and local habitat. In general energy needs and uses are for heating, lighting, commercial, agricultural and industrial purposes. Overall, 68% of all energy needs in Kenya are met by traditional biomass, comprising mainly of wood fuel and charcoal. The balance of 32% is met by fossil fuels (crude oil, liquefied petroleum gas), geothermal power, flowing water (hydropower), wind and solar radiation.

Relevant Tables in Annex 2:
Table 1: Summary of Kenya's Energy Needs and Carriers
Table 2: Summary of Kenya's Energy Carriers and Active Technologies
Table 3: Linkage Between Kenya's Energy Carriers and EAC-EASUP Targets
Table 4: Kenya's Energy Resource and Services Matrix

1.2 Overview of Energy Resources

1.2.1 Biomass, Renewable Energy and Fossil Fuels—Demand, Supply and Sources

In the context of EAC-EASUP, biomass, renewable energy and fossil fuel energy sources are most relevant to Target 1 (Provide access to modern cooking practices for 50% of the population that currently uses traditional cooking fuel) and Target 2 (Provide access to reliable electricity for all urban and peri-urban poor).

Traditional biomass-based fuels for cooking and heating are currently the most important source of primary energy in Kenya with wood fuel consumption accounting for 68.3% of total consumption (rural—87.5%; urban—10%; KNBS, 2007). The total sustainable biomass supply from all the sources is estimated at 15 million tonnes. Firewood comes from three main areas: rangelands (25%, Government forests (28%) and small farmlands (47%)[8]. The role of agro forestry on small farms in providing firewood has increased while showing a decline in the other categories.

Revelant Tables in Annex 2:
Table 5: Source and Quantities of Biomass Energy in Kenya.

[4] *Subject to accuracy and age of specific data.*
[5] *Economic Survey 2007, Central Bureau of Statistics*
[6] *See a map of the provinces in Figure 1*
[7] *Kenya National Bureau of Statistics (KNBS), 2007*
[8] *Kamfor Report, 2002*

Table 6: Major Sources of Fuel wood (Year 2000)

Currently the common system used for cooking is the traditional open fire (3-stone) system which is still dominant in most of the rural households. It has very low efficiency, meaning 85-90% of the energy is lost in the atmosphere. There is need for improved biomass technology due to accelerated deforestation and due to a significant burden of disease resulting from indoor air smoke (WHO, 2002).

Use of charcoal stands at about 47% at the national level representing 82% and 34% of urban and rural households respectively. About 92% of all households that use charcoal purchase it from market, while 7% produce their own. Most of the charcoal consumed in Kenya comes from rangelands. These include rangelands targeted for re-settlement particularly in the Rift Valley province. The degradation and deforestation of rangelands, particularly around urban areas such as Nairobi, Mombasa, Nakuru and Kisumu has been attributed to charcoal production.

Improved stove research started in the 1970s, resulting in the *Kenya Ceramic Jiko* (KCJ), one of the most successful stoves programmes in Africa. Initially reduction of fuel consumption was the key objective, but improved health and socio-economic issues have since come strongly to the fore, locally and internationally. The *maendeleo* and *rocket* stoves are among others introduced subsequently.

Modern biomass technology in Kenya takes the form of biogas for cooking and lighting (much lesser application). According to a survey carried out by Kamfor (2002), 1100 biogas plants are in operation in Kenya. Most of these systems are between 4-16m^3 with a maximum gas capacity of 3m^3 which is considered sufficient to meet the cooking and lighting needs of a family of 5 persons. The operational status of most of these digesters is believed to be average to poor, even though data on the same is incomplete.[9] The small biogas plants are primary candidates for up-scaling due to their modular sizes and applications in rural areas.

Fossil fuel-based domestic energy in Kenya is important, with kerosene and LPG being crucial carriers used widely in Kenyan homes. Petroleum fuels are the most important source of commercial energy in Kenya and are mainly used in the transport, commercial and industrial sectors. In 2006 the consumption of petroleum fuels was 3.0 Million TOE, equivalent to a per capita consumption of approximately 88 kilograms, a figure which is low even by the standards of developing countries.

Kenya has not yet discovered any significant fossil deposits although exploration is ongoing. Kerosene is popular for lighting in the rural areas, and for both lighting and cooking in the urban areas. Nationally 13.2% of households use kerosene for cooking where approximately 44.6% of urban households use it for cooking (rural use: 2.7%) and 46.3% of urban households use it for lighting (rural: 86.4%). The total sales for kerosene mainly for households in 2006 was 364,234M^3.

The LPG national average coverage is 3.5% (urban—11.9%; rural—0.7%). LPG is mainly produced at the Kenya Petroleum Refineries Ltd (KPRL). In 2006 the refinery produced 30.1 thousand tones. Household LPG use in Kenya has been constrained by high costs and low supply rather than market. KPRL and KPC are, in conjunction with private sector players, are building a KES3.5 billion (US$ 50 million) storage facility at Mombasa with a capacity of 6,000 tonnes (current capacity is 2,600 tonnes.)

Other sources of domestic energy Other sources fulfilling the domestic demand for cooking, heating and drying needs in Kenya are solar thermal and biofuels (which have since 2006 received increasing attention).

Solar thermal applications have also been in use in some urban households, although the largest applications have been in the hospitality sector. It is estimated that by 2003, a total of 140,000M^2 of solar heat collectors were in place.

[9] *The Ministry of Livestock Development has undertaken recent censuses in certain parts of the Country.*

Kenya has experience in bio-fuels with commissioning of Muhoroni Agro Chemical Food and Allied Chemicals Complex where power alcohol was produced and blended to fuel vehicles in Nairobi and Kisumu in 1983 and discontinued in 1993 due to unsustainable pricing. The country sugar belt in western Kenya and coast holds promise in sizeable production of this fuel.

1.2.2 Electrical Energy—Demand, Supply and Sources

In the context of EAC-EASUP, electrical energy sources are most relevant to **Target 2:** *Provide access to reliable electricity for all urban and peri-urban poor.* **Target 3:** *Provide access to modern energy services for all schools, clinics, hospitals and community centres* and **Target 4:** *Provide access to mechanical power for heating and productive uses for all communities.*

National grid electrification levels

Sharp population growth coupled with economic growth has over the past decade led to tremendous growth in energy demand, especially for electrical power. Electricity demand is projected to grow from 5035GWh in 2003/04 to 8561GWh in 2013/14, representing an average growth rate of 5.6% and the average energy production from all the potential sites is at least 6,600GWh per annum (MoE, 2004). The peak demand for electricity averages about 864MW; however, the maximum daily peak demand ever recorded was 1025MW in 2007/08[10]. The current demand is not comfortably met and secure owing to a number of issues including drought, as hydro is the principle source. Losses on transmission and distribution currently stand at 17.9% in 2006/07. Target is to reduce these loses to at least 14.5% by 2012.

Kenya Power and Lighting Company Limited (KPLC), Kenya's grid transmission and distribution utility, is currently improving service delivery, under a World Bank funded programme (Energy Sector Recovery Project—ESRP, 2004-2010). Strategies include management contracting, promoting Independent Power Producers (IPPs), contracting out distribution work, and substantial capital investments on the network[11] to reduce power outages.

The key policy objective for rural electrification in Kenya is to expand access to electricity. The Government of Kenya (GoK) target is to provide electricity service connections to 20% of the rural population by 2010 (40 % by 2020). The electrification growth rate in Kenya is about 7% which is far below the sub-Saharan average of 22.6 % (GoK, 2004) and 32% for developing countries. According to the Kenya National Bureau of Statistics report (2007), 15.6% of all households in Kenya have access to electricity for lighting (rural—3.9 %; urban—51 %; Kenya National Bureau of Statistics – KNBS, 2007). The penetration could be slightly higher than documented because in urban areas, especially town suburbs and informal settlements, some households share one connection and metering point, especially in rented one to two-roomed houses. An estimated 0.6 % of all households utilize electricity for cooking (rural—0.2 %; urban—1.8 %; KNBS, 2007).

Even though KPLC targets to make up to 150,000 connections annually (MoE, 2004), high grid expansion costs at the macro level and high connection costs at the retailer level, both up-front investments, inhibit the speed of implementation. However KPLC achieved the target of 120,000 connections in 2006/07 alone, including the one millionth KPLC customer[12]. KPLC is targeting to connect an additional one million customers in the next 5 years.

National off-grid electrification levels

The most notable off-grid electricity solution in Kenya is solar photovoltaic (solar PV) systems, mainly solar home systems (SHS). In Kenya, solar PV is commonly used for lighting, refrigeration, telecommunications and water pumping. Due to its strategic location near the equator, where insolation (energy available/unit

[10] *KPLC, 2007*

[11] *For instance, in 2007 contract awarded to Montreal Montajes for network upgrade and rehabilitation of areas surrounding Nairobi.*

[12] *KPLC communication, 2008*

area/unit time) is high. Over 20,000 solar systems, mainly small (12Wp to 30Wp) SHS, are sold annually in the commercial market (aggregate estimate is over 200,000[13]). Estimated installed capacity is 4 MWp (MoE, 2004).[14] Others are the thermal diesel generating sets operated by KPLC. These are for towns located far from the national grid network. There also exist mini hydro power stations for communities and missionaries.

Standalone diesel generator sets and inverters are also in use, but are mainly limited to hotels and lodges.

Supply and sources of electrical energy in Kenya

Kenya's electricity comes from hydro, diesel-fired generators, co-generation, geothermal, wind, and imports from Uganda. The current power generation mix for grid electricity in the country has an installed capacity of 1197MW; effective: 1153.3MW (see Table 11 in Annex 2 for the full list). The main sources of electric power are hydro power, geothermal, thermal, co-generation and wind[15].

In 2006/07 KPLC purchased 4599 GWh from KenGen, 145 GWh from IPPs and 13 GWh from Uganda Electricity Transmission Company Ltd (UETCL).

Hydro power electricity provides the main share of energy for the country, with an installed capacity of 677.3MW, which is 58% of the total installed capacity[16]. However, the total undeveloped hydro power potential stands at 1,558MW of which 1310MW is for projects of 30MW or higher (MoE, 2004).

The estimated potential for small hydro (micro and pico) is 3000MW. By 2004, about 32MW had been installed by KenGen, tea factories, missionary centers and communities. Several community initiatives for pico and micro hydro (such as Tungu Kabiri—18kW installed and Thiba River Mirco Hydro Project—approximately 100kW) have either been initiated or under construction.

Kenya Electricity Generating Company (KenGen) is the main electricity generator in the country and generates about 80% of electricity consumed in the country. It operates all major grid-connected hydro sites, including Seven Forks (547.2MW), Turkwel (106MW). Sondu Miriu, with an additional 60MW, is nearing completion. KenGen also manages mini-hydro power generation sites with an installed capacity of 28.08MW, including Tana (14.4MW).

Kenya's geothermal resource is mainly in the Rift Valley, and is estimated at greater than 2000MWe identified potential (MoE, 2004). Total developed capacity currently is 128MW (see Table 11 in Annex 2). Of this, KenGen operates two geothermal sites—Olkaria I and II—with a total installed capacity of 115MW. About 13MW is provided by an IPP, OrPower4, and an additional 620MW is planned to be operational by 2019[17]. The formation of the Kenya Geothermal Development Company, as required by the Sessional Paper No.4 of 2004, is expected to accelerate the appraisal drilling in Olkaria IV Dome (35MW expected by end of 2008). Geothermal resource assessment is ongoing in eleven other sites including Suswa, Longonot, Eburru, Menengai, Arus, Bongoria, Lake Baringo areas, Korosi, Chepchuk and Paka, as well as Silali. Other potential sites for geothermal include Emurauangolak, Barrier Volcanoes, Namaruru volcanic fields, Badlands Volcanic Field and Lake Magadi (MoE, 2004). Despite the exploration of geothermal being expensive, geothermal power is important in providing the country with the required base load.

Thermal power contributes about 420.7MW which constitutes 40.4% of the total effective installed capacity, mainly from diesel-fired plants[18]. A number of thermal stations for isolated grids (Wajir, Malindi and

[13] *Kamfor, 2002 and Hansjoerg G, 2004*

[14] *More recent quoted figures – though not officially available for quote – indicate over 280,000 PV systems and over 7MWp in installations.*

[15] *MoE, 2004, Kengen, 2008*

[16] *KenGen, 2008 & KPLC, 2007*

[17] *KenGen, 2008*

[18] *KPLC, 2008*

Marsabit) are operated by KPLC. Lamu and Garissa plants are operated by KenGen. Other thermal stations are operated by IPPs such as Iberafrica and Tsavo. Thermal stations are expensive but are readily available, faster and easier to bring online and to service isolated locations.

Wind energy has mainly been tapped in dry areas for water lifting (Kamfor, 2002). Preliminary wind potential is estimated at 346W/m^2 in a few isolated places; namely Malindi, Turkana, parts of Kajiado, Lamu, Marsabit and Ngong. MoE prepared a National Wind Atlas in 2003 and emphasises development of hybrid wind-diesel systems. By the year 2004, about 450 windmills were installed in the country largely in ranches and remote community and institutions with one local integrator dominating the market. Wind electric generation was introduced in the country in the early 1980s with a grant from the Belgium Government of a 2 turbine 400kW installation on Ngong Hills (effective 350kW) connected to the grid and a 200kW turbine in hybrid with diesel engine in Marsabit town. The estimated annual output from wind energy is 1.6GWh, mainly from Ngong. The Marsabit turbine, however, broke down a few years ago.

Cogeneration potential mainly rests with bagasse, a waste product of the cane milling process. Annual bagasse production is roughly 1,760,000T (Kamfor, 2002), a gross oil equivalent of 400,000T and with an estimated capacity to feed the grid with 550 GWh of energy. Total installed cogeneration capacity is 36.5 MW (potential is 300MW) used as captive power within the industry while. Mumias Sugar Company in Western Kenya has recently started feeding 2MW into the national grid and plans to deliver 25MW to the grid by the end of 2008 are at an advanced stage.[19] Other cogeneration potential exists from wood and paper industries, crop residue (rice husks, maize cobs, coffee residues and spent process grain), all estimated at 2.7 million tones annually.

Electricity Consumption Patterns

There has been marked growth in electricity consumption in the country in the last three years. This has been 8% in 2007 and a long term average has been 5.7% per annum. Like many countries in the sub-Saharan African, Kenya electricity per capital consumption is considered low, at around 125kWh, and the national access rate is at 15 % (MoE, 2004, World Bank 2006). On average, household electricity consumption was around 694 kWh with rural areas registering 544 kWh and urban areas consuming 844 kWh per year (Kamfor, 2002). Electricity at household level is largely used for lighting, entertainment e.g. television, radios and provision of other services such as ironing, refrigeration and micro enterprises. A recent survey (Kenya Integrated Household Budget Survey—(KIHBS), 2007) shows that urban areas are large electricity users estimated at 46% access, compared to rural areas at slightly less than 4%. Furthermore, earlier surveys show that the majority of those with access are high and middle income class groups; only 26 % of the low income urban households have access to electricity (Kamfor, 2002).

The major challenge in increasing electricity connectivity in Kenya has been the sparse rural settlement patterns. The Government is currently subsidizing connections.

Relevant: Table 7: Electricity Consumption in Urban and Rural Areas (Year 2000) and Figure 1: Electricity-Energy Resources Map of Kenya

1.3 Overall Energy Institutional and Regulatory Framework

The Kenya energy sector is still dominated by largely by Government in electricity sub sector and private sector in petroleum sub sector and household energy sector dominated by the small scale operators like NGOs, CBOs and rural communities and to an extent the private sector. The development/bilateral partner have been instrumental in supporting the Government in developing energy resources and increasing transmission network. The Chinese and Germans are supporting the geothermal energy assessment.

[19] *UNEP, 2008, Osawa and Yuko, 2004, Kenya Sugar Board, 2008*

The Energy Act 2006 forms the main legal and regulatory framework in the country with the Government concerned with coordination, management and policy formulation. MoE was created at the end of 1979; it currently comprises four technical departments, viz, Geo-exploration, Electric Power and Renewable Energy and the Administrative unit. The main challenges currently facing the Ministry is inadequate technical staff (and in some cases specific skills), lack of up to date data for effective planning and lack of resources.

There are several specialist parastatal bodies working in the energy sector, including: KenGen, KPLC, Kenya Pipeline Company (KPC), National Oil Corporation of Kenya (NOCK) and KPRL.

Other institutions and bodies impacting on energy supply and demand are Kenya Forestry Research Institute (KEFRI), Kenya Forest Services (KFS) Kenya Industrial Research and Development Institute (KIRDI), Coffee Board of Kenya, Kenya Sugar Authority (KSA), Kenya Bureau of Standards (KEBS), Kenya Association of Manufacturers (KAM) among others. While the Ministry of Energy provides oversight, facilitation and coordination role, each of the foregoing agencies perform specific functions as stipulated in their respective statutory laws that created them. They are therefore instrumental in the success of the implementation of EAC-EASUP.

In addition to the above primary energy sector public agencies, a number of other Government ministries are crucial in energy supply and demand, among these are: Ministry of Agriculture, Ministry of Water, Ministry of Trade and Industry, Ministry of Health, Ministry of Roads and Public Works.

Kenya's newly established energy law, the Energy Act 2006, provides for the establishment of the Energy Regulatory Commission (ERC) whose role includes protection of consumers, investors and other stakeholder interests. The Act also provides for establishment of the Energy Tribunal and the Rural Electrification Authority (REA). ERC regulates the energy sector and is also mandated to lead on environmental issues. It also maintains the National Grid Code and is the lead energy tariffication agency.

The Government strategy in the medium term (2004-2012), is committed to resource assessment, increased access to energy services, network development promote efficiency in delivery of services while building the prerequisite capacities and expertise. This is anticipated to increase access to services, for example rural electrification penetration will be increased to 20 % by 2010 and then 40% by 2020 (MoE, 2004).

1.3.1 The Power Sub-sector

Currently, the power sub-sector comprises generation, transmission and distribution utilities. KenGen and independent power producers and UETCL, under a Power Purchase Agreement (PPA), supply power to KPLC for distribution. Electricity transmission and distribution is still the exclusive function of KPLC. However the Sessional Paper No. 4 calls for unbundling of power transmission and distribution, leaving distribution role to KPLC.

The new Energy Act 2006 is perceived to be friendlier than the earlier laws as it creates easier access to energy resources. It removes earlier barriers that limited development of sites only by KPLC and has allowed community groups, companies and even individuals to develop small hydro plants of up to 3MW. Several tea factories have already started initiatives to develop small hydro towards reducing their overall cost in production.

The major challenge remains increasing the distribution network to impact the largely dispersed rural community. Other challenges include perceived high connection costs, unacceptably high system losses and poor power sector investment record. However this is set to improve with the Energy Sector Reform Programme initiated in 2004 and planned to run up to 2010.

The reforms are aimed at improving service delivery and increasing electric energy to the country by the utilities. Several strategies are currently on course including the formation of ERC in 2007 and increasing the number of bids to Independent Power Producers (IPPs). There have also been substantial capital investments

undertaken in order to reduce outages and energy losses. Other initiatives to increase electrification include: implementation of a network and distribution upgrade and system expansion.

REA is one of the new institutions in the power sub-sector and has taken over the management of the Rural Electrification Programme (REP). REA is mandated and expected to be the main driver in realizing the rural electrification targets set by the Government between 2010 and 2020. Its predecessor, the Rural Electrification Programme, was set up in 1973 to increase access electricity by rural consumers, but was over time faced by various institutional challenges. REA is also expected to implement the Government's policy objectives to expand access to electricity as a means of promoting sustainable socio-economic development for rural communities.

The achievement of the above targets will be realized through a number of national grid and off-grid interventions. Among these include increased grid connections and the development of small hydro and other hybrid off-grid systems comprising of renewable energy and oil fired components for areas not economically viable for national grid. Where possible, a financial subsidy will be provided to the local communities and the private sector[20].

IPPs in Kenya play a major role in supply of electricity for peaking and emergency power. Iberafrica, Tsavo Power and Aggreko use thermal systems while Mumias Sugar Company is in cogeneration and OrPower in geothermal. Their combined installed capacity is 245MW by end of June 2007. The challenge is to cost-effectively manage IPPs which tend to play a major role in peaking and emergency power but are becoming increasingly expensive due to rising fuel costs.

With the vast geothermal resources in Rift Valley most of which has not been assessed, the Government and the private sector are developing geothermal power plants. The Government over the years has been financing geothermal assessment with development partner support. The Sessional Paper No. 4 of 2004 recognizing the risks associated with geothermal exploration recommend creation of a special purpose company, Geothermal Development Company (GDC) to undertake geothermal resources assessment including exploration, appraisal and appraisal drilling in prospective areas. The company will be responsible for development and management of proven steam fields and sells steam to KenGen and IPPs.

Other institutional and regulatory framework is similar to the other electricity generating companies.

1.3.2 Petroleum Sub-sector

Whereas the petroleum sector is largely private sector driven having been liberalized in 1994, a number of state corporations play a major role in transmission while the private sector is involved in distribution and outletting. The Kenya Petroleum Refineries Ltd. (KPRL) processes the bulk of the petroleum products consumed in the country while the Kenya Pipeline Company (KPC) provides storage facilities along the pipeline route to Western Kenya. There are plans to extend the pipeline to other EA countries. The National Oil Corporation (NOCK) is involved in both upstream and downstream activities as the lead agency in oil exploration and recently entered the retail market for white products. Regulatory functions in the petroleum sub-sectors are shared amongst various players including MoE, ERC, the provincial administration and local authorities. The Petroleum Institute of East Africa (PIEA), a voluntary membership institution patronized by major oil companies plays a key role in capacity building and awareness creation.

LPG is one of the cleanest cooking fuels and is gaining wider use in the country especially in the urban areas where about 11.9% cook using gas compared with rural areas where only 0.7% use it. This is attributed to a number of institutional and regulatory issues. The Government through the Finance bill of 2006 lowered some taxes to encourage wider use of LPG and to reduce pressure on biomass. Whereas LPG is marketed by petroleum companies which have a number of depots in rural areas, it is still yet to have a wide coverage in

[20] *(MOE, Sessional Paper, 2004 and Energy Act, 2006)*

many areas. For many years, the country has been having only a small LPG handling facility in Nairobi. KPC's plans are to build a 2,000-tonne storage and cylinder filling facility in Nairobi, as well as storage and distribution facilities in Nakuru, Eldoret, Sagana and Kisumu.

The other major constraint was consumers were held captive by the few outletting companies though limited outletting and customized cylinders and valves. The Ministry is spearheading the standardization of cylinders and valves that will lead to increased use of LPG by consumers currently estimated at 50,000 tonnes. It is instructive to note that for many years the Government required the gas consumed in the country be throughput in the KPRL but has since been liberalized and allowed importation. The introduction of the small gas cylinders has further expanded the use of LPG. Another major challenge with LPG is that being a petroleum product, it is vulnerable to the escalating international oil prices.

1.3.3 The Renewable Energy Sub-sector

Renewable energy plays a significant role in delivery of modern energy services especially in houses, communities and institutions remote to the grid. It is anticipated that renewable energy will provide HILC and scalable interventions. The challenge is to increase the level of consumption of often low valorization fuels while protecting the environment. Although ERC is expected to come up with regulatory framework for renewables, their range and diversity remains a challenge. Furthermore, several institutions are currently involved in specific renewable often under diverse policy instruments or guidelines and there is need to harmonize and organize the various activities to contribute effectively to national energy access agenda.

Solar energy in Kenya has been largely private sector driven and for many years without a regulatory mechanism and standards. The recent formation of Kenya Renewable Energy Association (KEREA) is expected to introduce self regulatory practice. The Government has occasionally influenced the uptake of solar in the country; for example through the recent electrification of secondary schools in Arid and Semi Arid Areas (ASAL) with solar PV.

The exploitable mini hydro sites in Kenya are found within the major drainage system in the country. Small hydro systems have been demonstrated to be capable of meeting local demand for electricity where the grid is remote. At the moment MoE is reorganizing efforts towards a greater utilization with participation of NGOs and donor community. The policy and the Act allow wider use of this resource and in effect allowing development and use of up to 3MW without licensing. Some of the challenges include limited skills to plan, implement, operate and maintain the schemes; lack of standards, site specific data and the local capacity to manufacture equipments. It is also important to note that some safety and environmental requirements will be necessary to regulate the development of this resource.

Although wind has been in use for water lifting applications, it can play a major role in delivering electricity and non electricity services to segments of people currently un-served. One of the major barriers on wind energy update is lack of data for decision making on investments. In this regard, the Kenya Government initiated a wind energy resource assessment in 2002 culminating into a national wind atlas. The quality of the atlas that was generated was felt to be inadequate largely because it relied on agro-climatological data as opposed to wind data. To overcome this challenge, MOE and UNEP agreed to collaborate in further assessment of both wind and solar using satellite generated data and validated using the national metrological synoptic data. It is anticipated an improved wind atlas will trigger investments in wind energy. However several renewable energy companies have started selling domestic wind systems.

The production of bio-fuel crops is governed by several policies and regulatory frameworks – agriculture, sugar, trade and industry. It will be interesting to see how ERC will address the regulation with this scenario. The country is developing a national strategy for production of bio-diesel. Some of the challenges that need to be addressed include land and land use issues, the secondary processing of the primary fuel and the cost of the product and consumer education. There are several actors getting into this field; one of the most notable

ones is the Vanilla-Jatropha Development Foundation (VJDF), which has established several outgrower farming activities of the Jatropha crop, with the aim of producing bio-diesel, essentially for domestic processing and use. MoE recently convened a workshop in Nairobi to discuss the strategy for development of biofuels.

Biogas technology was introduced in the country in the early 1950s and picked momentum in the early 80s with some state and donor interventions. Although by 2002 it is believed that over 1,000 biogas digesters were installed in the country, a number of them fell into in disuse due to a host of problems—among them poor water supplies, lack of skills in management of the plant and poor development of the milk industry. There has been a recent rise in interest on larger biogas units and several initiatives are underway driven by some donors and the private sector. Biogas technology is a clean cooking technology and provides modern cooking services while improving health and agricultural productivity.

N.B. Although geothermal is classified as renewable energy, in Kenya it is primarily used as base load and has been addressed under the power sub-sector.

1.3.4 The Biomass-Based Energy Sub-sector

The Ministry of Energy sets policy guidelines, undertakes strategic planning and financing of biomass energy development programmes. While most of the biomass in the country is produced by the private farmers on their land and from trust land, various policies govern its production and use. The Government forests are increasingly becoming of secondary value in production of biomass energy but still play an important role in supplying institutions and wood based industries especially in the rural areas. MoE has an elaborate outreach programme through a number of strategically located field energy centers where technology development testing and demonstration is done. Other agencies involved include Ministry of Agriculture whose extension arm provide the front line extension services to MoE and both collaborate through a long standing Memorandum of Understanding.

The Kenya Forest Service which manages forest development in Kenya has traditionally been a key actor in tree planting programme particularly through rural aforestation extension service. The Kenya Forestry Research Institute (KEFRI) provides the country with quality germ plasm and is the leading authority in species trials, introduction and silvi culture.

Development partners continue playing an active role in the development and management of biomass sub-sector through financial and technical support; e.g. GTZ, Government of Netherlands, JICA, SIDA etc. CBOs, NGOs, individual farmers and local private sector are engaged in tree farming and management activities with reasonable success, e.g. Thuiya Enterprises, ESDA, Practical Action, etc. Joint collaboration between parties are being used to address localized biomass production e.g. the special energy programme under MOE and the Private Sector Development in Agriculture (PSDA) under the MoA.

The biomass sub-sector is faced with various challenges amongst them conflicting policies, land and land use issues, lack of clear mandates and inadequate budgetary support.

1.4 Overall Energy Policy Framework Analysis

Analysis of Kenya Government energy sector policy approach

Energy Sub-Sector/Issue	Identified Challenges	Policies to address the challenges
1. Electricity		
1.1 Hydropower	i. High costs associated with	i. Government will set aside funds for carrying out resource reconnaissance survey, pre-feasibility and feasibility

Energy Sub-Sector/Issue	Identified Challenges	Policies to address the challenges
	undertaking pre-feasibility and feasibility studies of potential hydropower projects. ii. Dwindling large sites and environmental impacts.	studies. ii. Government will seek external assistance to augment its resources. iii. Unattractive sites to the private sector will be implemented by Government as multipurpose projects. iv. Communities and private sector will be encouraged to develop potential sites to generate electricity for their own consumption and for export of surplus electrical power to the national grid. v. The Government is to undertake environmental rehabilitation. vi. Increasing use of small hydro sites.
1.2 Geothermal	i. Risks associated with initial geothermal exploration, drilling and resource assessment.	i. Government will establish a special purpose geothermal development company to undertake resource assessment and production drilling in prospective areas. ii. Government will provide attractive tax incentives.
1.3 Rural Electrification	i. Ineffective institutional framework. ii. Low electrification access. iii. Low private sector investment. iv. Current isolated electricity generating systems have limited financial capacity for expansion. v. Lack of resources.	i. Government has established a Rural Electrification Authority to manage rural electrification. ii. Government's goal is to provide electricity service connections to 20% of the rural population by 2010, increasing to at least 40% by 2020. iii. Government to fund rural electrification activities on a cost-sharing basis with communities. iv. Government will establish a conducive regulatory framework including cost reflective tariff structures for small power utilities. v. Consideration will be given to supporting either community or private sector managed national grid interconnected rural electrification projects through a one-off financial subsidy. vi. Government will privatize or concession the isolated systems. vii. Introduction of rural levy and committed budgetary support.
1.4 Transmission and Distribution	i. Closed power transmission system. ii. Prudent management of the transmission, distribution	i. Power transmission system will be transformed into an open access system that would allow large electric power consumers to contract with generators of their choice. ii. Unbundling of the transmission, distribution network.

Energy Sub-Sector/Issue	Identified Challenges	Policies to address the challenges
	network.	
1.5 Electricity Accessibility and Consumer Connections	i. Inadequate financial resources for investment.	i. Government will assist where necessary the public electricity suppliers to mobilize financial resources for establishment of revolving funds, to finance financially viable extensions.
1.6 Cogeneration	i. Cogeneration potential is underexploited.	i. Promote cogeneration to generate 300MW by the year 2015 in the sugar industry and other commercial establishments where opportunities exist. ii. Undertake appropriate studies on co-generation including standardization of PPA.
2. Petroleum		
2.1 Petroleum Fuels	i. Regional imbalances in supply of petroleum fuels.	i. Government is to ensure provision of adequate supply and distribution of petroleum products in all parts of the country at least cost. ii. Address non-tariff barriers, incentives to investors in petroleum refining. iii. Promotion of kerosene and LPG by households.
2.2 Hydrocarbon Exploration	i. Perceived risks associated with prospecting.	i. Government will enhance an enabling environment through which petroleum exploration and resource development can be undertaken. ii. Government will carry out pre-exploration works including collection and analysis of primary data and introducing service contracts to enhance exploration in areas designated for licensing.
2.3 Coal	i. Exploration of local resources.	i. Encourage adoption of clean coal technologies, continue coal exploration and encourage private sector involvement in coal exploration.
3. Biomass		
Wood fuel	i. Unsustainable supply to meet rising demand. ii. Poor coordination of biomass related RandD. iii. Unregulated charcoal industry iv. Inefficient utilization of wood fuel. v. lack of clear	i. Promote private sector participation in biomass energy production, distribution and marketing. ii. Promote fast maturing trees for energy production; promote establishment of commercial woodlots including peri-urban plantations. iii. Formulate a national strategy for coordinating energy research. iv. Regulate charcoal market to encourage sustainability. v. Increase the rate of adoption of efficient charcoal stoves from 47% currently to 80% by 2010 and to 100% by 2020 in urban areas; and to 40% by 2010 and 60% by 2020 respectively in rural areas.

Energy Sub-Sector/Issue	Identified Challenges	Policies to address the challenges
	mandates for the charcoal governing institutions.	vi. Increase the rate of adoption of efficient fuel wood (firewood) stoves from 4% currently to 30% by 2020. vii. Promote inter-fuel substitution especially kerosene, biogas and LPG. viii. Increase the efficiency of the improved charcoal stove from the current 30 -35% to 45-50% by 2020. ix. Promote introduction of efficient charcoal kilns in charcoal production. x. Offer training opportunities for Jua Kali artisans at the village level for the manufacture, installation and maintenance of renewable energy technologies including efficient cook stoves. xi. Address the issues of clear mandates of institutions dealing with charcoal.
4. Other Renewables		
4.1 Solar, Wind, Biogas and Small Hydro	i. Inadequate data for effective planning. ii. Low exploitation of various renewable energy resources. iii. High upfront costs. iv. Lack of standards and code of practice for several RETs.	i. Continue to collect data on renewable energy and undertaking of pre-feasibility and feasibility studies. ii. Formulate and enforce standards and codes of practice on renewable technologies to safeguard consumer interests. iii. Package and disseminate information on renewable energy systems to create investor and consumer awareness on economic potential offered by these alternative sources of energy. iv. Promote research in, and development and demonstration of the manufacture of cost effective RETs. v. Promote development of appropriate local capacity for manufacture, installation, maintenance and operation of basic RETs. vi. Promote development for RETs which are yet to reach commercialization. vii. Allow duty free importation of renewable energy hardware to promote widespread usage. viii. Provide tax incentives to producers of renewable energy technologies and related accessories to promote their widespread use. ix. Provide fiscal incentives to financial institutions to provide credit facilities. x. Support community based water lifting and pumping, using renewable energy technologies through cost sharing arrangements and fiscal incentives.
4.2 Municipal Waste	i. Energy recovery	i. Promote feasibility studies on the utilization of municipal

Energy Sub-Sector/Issue	Identified Challenges	Policies to address the challenges
	potential from municipal waste not exploited.	waste as a source of energy.
5. Rural Energy		
	i. Dependence on unsustainably produced traditional biomass by rural households. ii. Low access of LPG by rural households. iii. Lack of interest in rural energy by private sector.	i. Government will encourage and promote private sector initiatives to enter clean biomass and other renewable technologies energy market. ii. Government will allocate resources for RandD and promote mature alternative technologies. iii. Government will continue to promote distribution of petroleum fuels including LPG as part of the energy infrastructure.
6. Cross-Cutting Issues		
	i. Weak energy regulatory framework. ii. Poor Institutional support. iii. Appropriate energy pricing. iv. Gender parity in energy production and consumption. v. Enhancing energy conservation and efficiency.	i. The Government has already transformed Electricity Regulatory Board (ERB) into the Energy Regulatory Commission (ERC) with an elaborate regulatory mandate for the entire energy sector. ii. The Government has already established the REA to manage rural electrification. iii. Make the ERC a one-stop office for facilitating permitting and licensing by different Governmental authorities iv. Provide for a long term dual or multiple licenses for generating, distribution, combined generation and distribute on, wholesale and retail of electrical energy, but with an obligation to extend network as appropriate. v. Provide for establishment of a competitive market structure and power market pool in Kenya and within the region. vi. Mainstreaming gender issues in policy formulation and in energy planning, production and use. vii. The Government will remove barriers and constraints to adoption of energy efficiency and conservation technologies.

1.5 Overview of Financial Mechanisms in Kenya

Kenya's Financial Sector

The Kenyan financial sector has 46 banks (December 2007) with mobilized deposits totaling KES 752 billion (US$[21] 11 billion). About KES 540 billion of loans were outstanding as at December 2007. Average liquidity was 44.8%, compared to the statutory requirement of 20%. Microfinance institutions have recently become regulated under the Microfinance Act 2006, which is currently being operationalised. The Association of Microfinance Institutions of Kenya indicates that its current membership ranges from large to small institutions which have diverse legal status ranging from microfinance banks, wholesale MFI's, Retail MFI's, development institutions and insurance companies which represent the entire landscape of the microfinance industry in Kenya. "Currently we have 33 members with four new ones awaiting appraisal before end of 2007. Our membership serves over 4 million clients with an outstanding loan portfolio of over US$ 303 million."[22]

There are six mainstream MFIs in Kenya: Equity Bank Ltd, Cooperative Bank, K-REP Bank, Family Bank, Kenya Commercial Bank and Kenya Post Office Savings Bank (KPOSB). Equity Bank has the largest footprint, currently at 2 million customers, mainly micro entrepreneurs, rural and peri-urban savers and civil servants, especially teachers.

During a November 2007 Microfinance Workshop, the Central bank of Kenya Governor stated that "The majority of the poor, low income households and MSEs, in Kenya, just like in many developing countries, however, largely experience lack of access to financial services, including credit, savings, insurance, money transfers among others." He also asserted that "According to a most recent survey on the access to financial services in Kenya, *FinAccess Study,* whose findings were launched in January 2007, only 19% of Kenyans have access to formal financial services through commercial banks and Postbank. An additional 8% of Kenyans are served by SACCOs and MFIs, while 35% depend primarily on informal financial services such as Rotating Savings and Credit Associations (**ROSCAs)** and Accumulating Savings and Credit Associations (ASCAs). This brings to about 62% the population that is "financially included" meaning that they have access to financial services and products either from formal, semi-formal or informal financial service providers. On the other hand, 38% of Kenyans, classified as "financially excluded", have no access to financial services and products. This implies that more effort is required to improve access to financial services and products. Undeniably, providing financial services to the poor, low-income households and MSEs can go a long way in alleviating poverty. In Kenya, microfinance services and products are provided by a variety of institutions of different institutional forms under more than nine different Acts of Parliament. These microfinance providers can be clustered into three broad categories, notably, formal, semiformal and informal institutions, with the level of formality defined by the degree of formal regulation and supervision. The formal category includes banks and financial institutions licensed under the Banking Act, building societies and the Kenya Post Office Savings Bank. The semi-formal category includes SACCOs, Development Finance Institutions Agricultural Finance Corporation (AFC), Industrial and Commercial Development Corporation (ICDC), Kenya Industrial Estates (KIE), Industrial Development Bank (IDB), and Kenya Tourist Development Corporation (KTDC)} and microfinance institutions; while Accumulating and Rotating Savings and Credit Associations (ASCAS, and ROSCAs), shopkeepers and money-lenders dominate the informal category."

It is important to note that the largest category of those lacking access to modern energy services in Kenya start with this last category of 38% un-banked people, moving up to those using informal financial systems. This means that 73% of Kenyans who are outside the formal banking system form the majority of EAC-EASUP's target group.

[21] *Central Bank of Kenya*
[22] *AMFI website: http://www.amfikenya.com*

It therefore is important to consider carefully any proposed financing mechanisms if EAC-EASUP targets are to be met. Unfortunately, the MFI and SACCO sectors, which are mainly rural based, account for only 8% of those banked. Innovative rural-based channels therefore need to be devised and utilized by EAC-EASUP if energy access limitations caused by lack of financial resources are to be overcome.

According to the CBK Governor, "alternative financial services providers have emerged with new, innovative, and pro-poor alternative modes of financing the poor, low income households and MSEs in the rural and urban areas of Kenya."

Due to the low level of engagement in energy by the private funding market, the Government of Kenya, through the Rural Electrification Fund (REF), and in partnership with development partners, remains the largest financier of energy projects in Kenya. The Government has several bilateral and multilateral partners in energy projects, such as JICA, World Bank, Chinese Government, USAID, IFC and others. There are several actors, however, involved in energy financing at both small project and pilot levels. Some examples are listed below:

Financiers of Non-Governmental Energy Initiatives in Kenya

UNDP/GEF Small Grants Programme has supported several projects in the past, especially in partnership with NGOs (such as Sustainable Community Development—SCODE and Rural Energy Technology Assistance Programme—RETAP).

A UNEP/GEF/AfDB initiative is currently supporting both the *Greening Tea Project*, for small hydro power, and *Cogen for Africa Project*, for cogeneration, implemented by the East African Tea Trade Association (EATTA) and AFREPREN/FWD, respectively.

GTZ, working in partnership with the Ministry of Agriculture, is supporting biogas sector capacity building and installation of pilot projects under the *Private Sector Development in Agriculture* (PSDA). This has led to the formation of the Association of Biogas Contractors of Kenya (ABC-K), involving local installers such as SCODE and Reecon.

The Global Village Energy Partnership (GVEP) has been supporting experience sharing and networking in Kenya. In March 2008, GVEP began implementation of an East African-wide initiative to building the capacity of local energy enterprise under a project named *"Developing Energy Enterprises in East Africa Project"* (DEEP-EA). GVEP has partnered with ITPower Eastern Africa, Practical Action, Emerging Markets Africa, Aga Khan Foundation and the East Africa Technology Development Network.

Private sector funding mechanisms have been few and have come far apart. They include the Solar Development Group, the *IFC/GEF Photvoltaic Market Transformation Initiative* (PVMTI), the *Triodos Renewable Energy for Development Fund*, represented by local green finance consultants, Integral Advisory Limited. The World Bank's *Development Marketplace* (DM) competitive programme has also financed a number of energy-related projects, such as Solar Ice. The Wuppertal Institute (Germany), is also active, with projects such as for institutional biogas, being promoted by ITPower Eastern Africa. The Shell Foundation has also supported household cooking energy access through the Breathing Space Project, in partnership with KUSCCO, KWFT and ITPower Eastern Africa.

Carbon finance is recently also gaining momentum in Kenya, with companies such as Mumias Sugar and Bamburi progressing towards sales of credits. Active private sector players include Environmental Cost Management Centre (ECM Centre) and ESD Africa (ESDA).

NGOs such as Practical Action and SACDEP have been active in energy projects at community level, especially in biomass-related household technologies. Other NGOs, for instance AFREPREN, have been supported by institutions such as Swedish Development Agency (SIDA) to undertake energy policy research. The Ashden Trust has supported institutions such as Solarnet, whereas the IFC/GEF PV MTI project has

supported the Kenya Renewable Energy Association. TRED Fund has also been instrumental in financing the core budget of KEREA since KEREA's formation. Recently, GTZ, too, is supporting energy sector associations.

Energy Finance Experiences in Kenya and Eastern Africa

The following are practical energy finance experiences encountered by the National Consultant for Kenya for EAC-EASUP, Ashington Ngigi, from involvement with or local management of various initiatives[23].

These can be divided into four categories: design experiences, management experiences, implementation issues and monitoring concerns.

Design Experiences

- Project and investment preparatory duration often too long compared to the urgency of the need.
- *Understanding the Local Environment*
  - Misconceptions about "markets." There is confusion between "needs" and "demand"
  - Too much "hype" and "romanticism" about finance as the magical solution to market development
  - Both volatile and dynamic market environment can severely affect project progress
  - Need to cut down bureaucracy
  - A financier does not have as much time or exposure in the field as the entrepreneur. Understanding each other is sometimes difficult
  - First impressions are important and a sponsor can lose a good financing opportunity because he did not present himself and his ideas properly. Financiers therefore need to be patient.
  - Is there a hurry to make a deal? If either of the financier or the sponsor is in a hurry, there is likely to be a weak point in the deal and a higher probability of project failure.
  - Everyone does not always understand their respective roles
  - Terms of financing are sometimes not clear and tenable, until a problem occurs
  - Logical framework (log frame) is a difficult / complicated tool for most project sponsors. They believe it is done for the sake of the financier.
- *Preparatory work is vital*
  - Legal matters, permits, environmental assessments, site rights, resource rights, etc.
  - Scheduling is indispensable: what comes first? Is the market ripe for up-scaled production or will this lead to a 'glut'? Is industry capacity built? When will market awareness and product marketing be undertaken?
- *Quality of proposals and information provided to the financier*
  - Information is often incomplete
  - Communication is poor or unclear
- *Origination of the proposal*
  - Who owns the business concept and/or plan? In many cases it is not the entrepreneur or implementer, but a consultant or funder
  - Energy access projects normally require that the financier 'picks' the entrepreneur's brain to get the real business plan
- *Documentation Requirements*

[23] *Ashington Ngigi has acted as the local energy investment portfolio representative for the Triodos Renewable Energy for Development Fund (TRED Fund), as Country Manager for the IFC/GEF Photovoltaic Market Transformation Initiative (PVMTI), as Coordinator for the Shell Foundation Breathing Space Project, as lead local consultant for the pre-feasibility study leading to the formation of the GVEP-EA Energy Access Fund, as consultant for the preparation of the Uganda PV Targeted Market Approach (PVTMA) and as investment evaluator undertaking due diligence for the African Agricultural Capital (AAC), Alliance for a Green Revolution in Africa (AGRA), as well as Private Sector Advisor for Rockefellor Foundation, Nairobi. He doubles as Managing Director and founder of both Integral Advisory Ltd and ITPower Eastern Africa.*

- "Onerous" proposals and "huge" contracts are undesirable/unattractive to even the most willing sponsors, technical and financing partners
- *Leveraging / co-finance requirements*
  - Overemphasis on "local participation" concept – a need to appreciate the practical limits
  - Leveraging mechanisms require simplicity
- *Setting funding limits*
  - Minimum project size vs. existing capacity
- *Building consortiums and managing partnerships*
  - Too much work! Often leads to failure. Keep project structure simple and partners few.
- *What is CDM (clean development mechanism)?*
  - This question arises almost automatically and endlessly.

Management Experiences

- *Local Project Oversight Concept*
  - Advantages of "local" contact. If project is in the rural areas, the implementation partner should be located there
  - Customisation of solutions and adaptation of replication models to suit local conditions
- *It's not (actually never is) all about money! The following are critical:*
  - Project management and admin support services
  - Provision of technical services
  - Business development services
  - Financial support services
  - Relationships management
  - Market development activities

Implementation Experiences

- Sustaining partnerships is particularly challenging
- Sustaining interest among sponsors—whose job is it?
- Management of funds drawdown is important, but if bureaucratic and not prompt can be a bottleneck and even contribute to failure
- Design of operations and maintenance is crucial for technical success
- Management of risks is crucial: they may be avoided, mitigated, retained, restrained or transferred
- Re-definition of project direction based on emerging results is important. Financier must be ready for this and be flexible enough to respond promptly.
- *The appropriate policy environment is necessary*
  - Investors and funders are interested in shifting part of the project costs to others—e.g. to the public sector/Government. For instance resource assessment costs.
  - Project and business sponsors are keen on guaranteed access to markets. For instance, they fear Government policies and pronouncements that interfere with the open market, for example—"the Government will electrify all rural households"—without substantiating that grid will not be universally viable. If possible, they want a certain guaranteed market size (e.g. through a concession). They also want price guarantees, e.g. through PPAs, feed-in-tariffs or reverse metering frameworks.
- *Lack of energy service companies (ESCOs)*
  - Despite the potential for ESCOs in terms of market, there are virtually none in Eastern Africa, due to associated financial and market risks, and lack of ESCO business transaction experience.
- *Need for specialist funds to finance energy projects in Eastern Africa*

- A fund designed to create a special purpose financing vehicle is necessary.

Project Monitoring Experiences

- What is monitoring and evaluation? Most project implementers and sponsors find this a difficult subject.
- Schedule of project milestones is necessary, for completion of various tasks
- Responding to technical matters—importance of technical performance guarantees
- Several challenges in changing project direction
- Difficulties brought by changing project partners
- Challenges can be expected in detailed reporting
- Accounting should always be predefined—should the sponsor keep each and every voucher for an eventual audit?

1.6 Overview of Kenya's Energy-related Standards and Codes of Practice

The Kenya Bureau of Standards (KEBS) is mandated to develop standards and codes of practice for energy systems, equipment and services through a collaborative process with relevant stakeholders. It collaborates with stakeholders in development of energy technology and appliance standard. In the recent past, KEBS has been instrumental in development of solar PV standards and codes of practice, biomass household cook stove standards, and is working on wind, small hydro and biomass-based institutional cooking stove standards, among others.

The ERC has one of its mandates as overseeing, and where necessary reviewing, standardization in collaboration with KEBS.

The pace of development for standards and code of practice in the energy sector has been low due to inadequate capacity and resources. In the sectors where standards have been developed, enforcement of some of the standards and code of practice are hampered by lack of resources, policy conflicts and inadequate human capacity. There is also need for awareness on standards and code of practice for effective service delivery and performance.

The major challenge however remains enforcement of the various standards and codes of practice in place.

1.7 Linking the Energy Baseline to EAC-EASUP Targets

1.7.1 Target 1: Modern Energy Services for Cooking

1.7.1.1 Target 1: Demand and supply framework analysis

In Kenya, energy access for cooking and heating at the domestic level involves biomass energy (hence traditional, improved and modern biomass use practices and technologies) and fossil fuels (kerosene and LPG). Five distinct uses of firewood have been documented: cooking (99%), water heating (66%), house heating (33%), lighting (4.4%), and home business (2.8%). The demand for fuel wood and other biomass is estimated at 34.3 metric tonnes[24].

Nationally about 21% of households use farm residues but their use is mainly in rural areas with 29% of the households as compared to 0.5% of urban households. Farm residue is mainly used for cooking (97%), water heating (46%), ironing (5.5%), lighting (3.3%), and home business (1.2%) Only 2.5% of households reported using wood waste comprising of wood shavings, sawdust, timber rejects, and off-cuts. Major uses of wood waste are cooking (96%), water heating (60%), Lighting (8%), and home business (6%).

[24] *Although biomass is the largest source of energy, there is a lack of reliable data.*

According to WHO, 13.000 deaths are attributable annually to indoor air pollution from solid fuel use which is responsible for 2.9% of Kenya's national burden of disease (2002).

Biomass energy will likely persist as the primary source of energy for the rural population and urban poor. Increasing awareness and education is expected to impact on biomass use shifting from traditional use to adoption of modern practices and technologies.

The demand side practices display poor energy and energy resource management, which has led to severe fuel wood deficits (20 million MT; expected to rise to 33 million MT by 2020; MOE, 2004). Fuel wood in the rural areas is collected freely from farms and rangelands; only a small percentage is commercially traded. Urban average fuel wood consumption is 1.2kg per person per day while the national figure stands at 1.5kg.

A 2000 report[25] indicates that close to 89% of rural and 7% of urban households reported regular use of firewood, giving a national average of 67% of all households. The average annual per capita consumption was approximately 741 kg and 691 kg for rural and urban households respectively. For urban areas, it is the lowest income households who depend on firewood the most. Trends showed that per capita consumption dropped from 1000 kg/year in 1980 to 737 kg/year in year 2000 (Kamfor, 2002). The main reason being that wood resources have become scarcer and secondly, some conservation measures have been successful.

Relevant: Table 9: Firewood Consumption in Rural and Urban Areas

Charcoal production is principally commercial and most of the resource emanates from rangelands and trust lands. Production, despite the high consumption, is illegal; hence the production kilns used are traditional, with very low efficiency. Prices vary wildly according to production zone, season and location of demand. Urbanites use more charcoal than rural folk; 30.2% and 7.7% of households, respectively (nationally—13.3%). Among the demand drivers in urban areas are domestic cooking and '*nyama choma*' (charcoal-grilled) meat eateries. On average, the urban charcoal consumption was 156kg and 152 kg per capita (year 2000) for rural and urban dwellers respectively. Contrary to the popular view that charcoal is a fuel for the low income urban dwellers, 83% of high income groups regularly use charcoal (Kamfor, 2002).

There are over 200,000 charcoal producers in the country catering for a consumption of 2.4 million metric tones[26]. Per capita consumption was 156 kg in urban areas and 152 kg in rural areas.

Relevant: Table 10: Savings from improved stove (Kenya Ceramic Jiko) in Kenya and Table 11: Charcoal Consumption in Rural and Urban Areas

The Kamfor report indicated that 41% of Kenyan households were observed to be using the Kenya Ceramic Jiko while another 6% were using other types of improved cookstoves. Five distinct uses of charcoal were identified: domestic cooking (99%), water heating (62%), house heating (43%), ironing (57%), and home businesses (51%). Charcoal has a dynamic market throughout the country and their price varies with the nearness to the production zones and seasons. Current prices of a 4 lt tin container retails at KES 30 while a bag of approximately 30kg retails at KES 700 in Nairobi.

Modern biomass technologies such as biogas have the potential to provide improved energy services based on available biomass resources and agricultural residues. The availability of low cost biomass power in rural areas could help provide cleaner, more efficient energy services to support local development, promote environmental protection, provide improved domestic fuels and improved rural livelihoods (Karekezi, *et al*. 2004).

Development of a vibrant biogas market has however been elusive. The mean daily consumption of biogas works out to be 0.6m^3 which translates to an annual per capita of 219m^3 of biogas. Research shows that out

[25] *Kamfor, 2002*

[26] *Source: UNDP and GTZ 2005, GOK, Ministry of Energy 2002.*

of the currently estimated 1100 systems installed in Kenya, about 30% are not in working condition (Kamfor, 2002). The notable causes are poor design and construction, low end-user awareness on system management and lack of standards to govern the sector. The most notable biogas promotion effort was in the 1980s by GTZ and MOE. The uptake declined after the project ended in the early 1990s.

The GTZ has recently started promoting biogas systems and improved stoves under the Ministry of Agriculture's Private Sector Development in Agriculture project. The Shell Foundation's Breathing Space Project, implemented by ITPower Eastern Africa, is also promoting financing mechanisms for household biogas and LPG through the Kenya Union of Savings and Credit Cooperatives Organizations (KUSCCO) and the Kenya Women Finance Trust (KWFT). ITPower is also implementing an institutional biogas project supported by the Wuppertal Institute (Wisions), Germany. DGIS has also launched a new initiative, Biogas for Better Life, expected to kick off once an implementation plan for Kenya is ready. The initiative is at feasibility study phase and a stakeholder workshop is planned for April 2008.

Kerosene is the second most popular domestic cooking fuel in Kenya. It is used by approximately 13.2% of all households comprising 2.7% of rural households and 44.6% of urban households (KNBS, 2007). Kerosene is also used for lighting by approximately 76.4% of all households nationally, 86.4% of the rural households and 46.3% of the urban households (KNBS, 2007). The annual per capita consumption of kerosene per household was estimated at 90 litres and 41 litres for urban and rural households respectively (Kamfor, 2002). It is also noted that over 54% of kerosene users are able to purchase it within a 10-km radius from their homes.

The need for cleaner fuel and broadening of the energy mix has led to the promotion of LPG as an alternative fuel for cooking both in the rural and urban areas which, despite initial investment costs, can result in a 7-fold return on investment according to a WHO study. 11.9 % of urban households and 0.7 % of rural households use LPG giving a national average of 3.5 % of all households. The low use of LPG in rural and low income areas is attributed to the high cost of the LPG as well as its appliances coupled with poor delivery infrastructure. LPG is used along with firewood and charcoal in rural areas while in urban areas it is used along with kerosene, charcoal and electricity.

Various multi-national companies market LPG with each group using its own designated cylinders and sizes. The conventional LPG cylinders in Kenya are in two size categories—lower range: 3kg and 6kg; upper range: 12-15kg. The lower range has increased the penetration rate both in rural and urban areas due to affordability.

The private sector has an extensive network for distribution and marketing of oil products in different parts of the country and accounts for about 99.4% of the total market sales of petroleum fuels. Seven oil companies, Shell, BP, Total, Mobil (Now Oil Libya), Kenol, Kobil and Caltex account for about 85% of the total sales and the balance of 15% by NOCK and several small companies. Most oil companies are affiliated to multi-nationals who control the lion's share of the oil trade.

However, the major access challenge on the supply side of LPG remains the lack of sufficient distribution and storage facilities. There are LPG distributors in most residential areas in urban centres and consequently most users get their supplies from within a 5km distance. Depots for LPG in the rural areas are however notably very few. There are plans to upgrade the LPG storage and handling facilities in the entry port of Mombasa.

In the market, upfront capital costs inhibit many who would be willing to adopt LPG, because they have to purchase the cylinder and cooker. Financing mechanisms are however being implemented, with one of the most notable ones being through the Shell Foundation's Breathing Space Project coordinated by ITPower Eastern Africa and rolled out by the Kenya Women Finance Trust (KWFT). Under this loan product, rolled out since July 2006, over 2,000 KWFT clients had accessed LPG loans amounting to over KES 20 million (about US$ 300,000), while a total of 169 KWFT clients had taken solar loans worth KES 3.9 million (about

US$ 58,000) as at end of April 2007. A major success has been the financing of women taking up energy enterprise loans: LPG Stockists—13 entrepreneurs; manufacture of clay-based cookstoves—2 women groups.

Out of the estimated 5.14 million households in rural areas, 78% use traditional stone fires while another 4% use ordinary charcoal jikos while in urban areas, out of the estimated 1.71 million households, 9.1% use traditional stone fires with 16.6% using ordinary charcoal jikos[27]. According to this target, the challenge is to provide close to 2.1 million households, which are 50% of national total currently using traditional fire stones and another 245,000 households which are 50% of the households using traditional charcoal jikos with improved cook stoves and /or substitute for biomass.

Note that these households are distributed in various rural and urban areas cross cutting several population segmentation including coastal rural settlements to pastoralists.

1.7.1.2 Target 1: Institutional framework analysis

The institutional infrastructure to deliver energy and devices for modern cooking practices may be clustered into several categories including: Government agencies, national and regional NGOs, research and training institutions, consultants, financial institutions, international organizations, multilateral and bilateral development partners, private sector, civil society organizations (CSOs) and community based organizations (CBOs). Each of these has a vital role to play in the scale up of access to modern cooking practices.

- *CBOs* are numerous, diverse and range in size from small-village based groups to regional organizations such as dioceses of the Anglican and Catholic Churches in Kenya. Self-help groups have been instrumental in facilitating rural electrification schemes while some Savings and Credit Cooperatives provide soft credit for members to procure RETs.
- *Research and Training institutions* are critical in the development and promotion of modern cooking devices and practices. While energy research is not yet effectively mainstreamed and utilized to inform energy planning and management, a few energy research institutions currently exist. They include public and private Universities, AFREPREN, KEFRI, KIRDI, ACTS, World Agrofrorestry Centre (ICRAF), RETAP, etc. These institutions play an important role in the provision of access to modern energy services to the people who are currently using traditional energy and will be instrumental to success of EAC-EASUP.
- *Financial institutions* to support the scaling-up initiative for modern energy services in the rural areas include commercial banks, microfinance institutions and co-operative societies, among others. Local institutions already involved in specific energy financing programmes fitting within Target 1 of EAC-EASUP include KWFT, KREP, KUSCCO and Equity Bank.
- *Health sector involvement is supported by WHO, offering expertise and technical support linked to household energy, indoor air pollution and health.*
- *International organizations* supporting Target 1 type of transactions in Kenya include GVEP International and REEEP. Multilateral and bilateral development partners such as UNEP, UNDP, UNIDO, World Bank, etc and bilateral donor agencies such as DFID, USAID, GTZ, DGIS, JICA, DANIDA, SIDA, have played and are able to continue playing key roles in providing financial resources to facilitate implementation of projects and programmes for scaling-up access to modern cooking devices, consistent with their respective functional mandates.
- *Private Sector Players* are key in the provision of modern energy services for cooking and heating. Examples include oil marketing companies, modern energy technology hardware importers/manufactures and

[27] *KNBS, 2007*

distributors; rural energy service companies (RESCOs), improved efficient stove fabricators and energy consultants, among others.

- *Civil Society and Community based Organizations (CSOs and CBOs)* play a vital role in the promotion of access to modern cooking services. These organizations comprise of women groups, energy service associations—examples are Kenya Renewable Energy Association, Kenya National Improved Stove Association and Kenya Charcoal Working Group, among others.
- *The Kenya Forest Services (MoEandNR)* The Kenya Forest Services (KFS) under the Ministry of Environment and Natural Resources is charged with overseeing all aspects of forestry development in Kenya. Traditionally this is the key actor in tree planting programmes. With assistance from donor agencies, the KFS developed the Kenya Forestry Master Plan in the early 1990s to take stock of Kenya's forestry status compared to demand for products and services.
- *Other Government agencies* such as the Ministry of Agriculture (involved in agricultural extension work), Ministry of Regional Development, Ministry of Transport and Communication, and the Ministry of Local Government have programmes that routinely cover similar energy issues addressed by the Forest Department. This leads to some overlap in the mandate of some ministries. For instance the bulk of charcoal consumed in Kenya is sourced in range-lands currently held in trust by County Councils that fall under the Ministry of local Government. The involvement of the Ministry of Health to mitigate health impacts from solid fuel use on human health could still become a valuable addition to current national efforts towards target 1. Through its network of healthcare providers, community health workers, etc. the Ministry of Health could provide an excellent means of raising awareness about the need to promote cleaner energy services among households, in particular women and children
- *Non-Governmental Organizations* active in the biomass sector include the Green Belt Movement and Forest Action Network, currently undertaking advocacy, capacity building, fund raising and project implementation in the field of biomass initiatives (as well as other RETs). Others such as Practical Action, IPAR and KIPPRA facilitate research and strategic planning in diverse power sub-sectors.
- *Strategic Partners* also play a major role in this sub-sector. The World Bank is the most active donor in the energy sector. The Japan International Cooperation Agency (JICA) was instrumental in facilitating establishment of a socio-Forestry Training Project under KEFRI.

1.7.1.3 Target 1: Policy and legal framework analysis

From the policy analysis ('Sessional Paper No. 4' of 2004), it is evident that there is need for policies review to remove policy related conflicts between ministries and agencies implementing biomass related interventions. The key policies requiring immediate attention include environment, land and land use and trade, There is need to harmonize these policies to promote a progressive shift to modern energy services. Within the energy policy, the following subjects are relevant to meeting Target 1; wood fuel development and other renewables and petroleum fuels..

It is noted that policies in non-energy sectors such as the Health sector do not explicitly contain energy policy objectives and there is need to bring them into conformity with energy policy and scaling-up strategy.

The Energy Act 2006 provides the legal framework required for promotion of modern energy services particularly those pertaining to cooking. Under the Act, the Minister for Energy is required to provide an enabling environment addressing biomass production and use including substitution fuel like LPG and kerosene, while the forest Act provides for regulation, production, transportation and marketing of tree products. While EMCA provides regulation framework for the management of environmental issues, scaling-up access to modern energy services will require the Acts to be harmonized.

1.7.1.4 Target 1: Financial mechanism analysis

Financial support to projects and initiatives promoting behavioral and technology shifts in the biomass sector, as well as those encouraging micro entrepreneurship, have so far been dominated by donor agencies. This means that most efforts are grant-financed. The largest technological beneficiary has been the cookstove, with several women groups and NGOs involved. Finance has typically been for establishment of kilns and for market development and capacity building.

More recently, notable funding is coming from the GEF-funded Biomass Energy Project, which aims to transform markets for highly efficient biomass stoves for institutions (schools and hospitals) and medium-scale enterprises (restaurants, hotels) in Kenya by promoting highly efficient improved stoves, establishing woodlots owned and managed by the institutions and private sector and removing policy and financial barriers to the widespread adoption of stoves. It is a four year project of the Ministry of Energy being implemented by RETAP under supervision from the UNDP Kenya country office.[28] RETAP works closely with a network of micro enterprises involved in improved stove manufacture, and administers a GEF/UNDP supported revolving fund for lending to schools for improved stoves.

The Shell Foundation's Breathing Space project, coordinated by ITPower Eastern Africa, and which ends in the first quarter of 2008, has over the past three years enabled mainstreaming of lending for modern domestic heating and cooking products. The initiative has achieved commendable success, and has resulted in Kenya Women Finance Trust (KWFT) mainstreaming energy products as part of their standard micro credit offering. KWFT energy loans are both for end users and small and medium domestic energy enterprises (SMDEEs). KWFT's product line includes LPG, solar PV, improved cookstoves, and fireless cookers. Plans to include biogas are also under consideration. The Kenya Union of Savings and Credit Cooperatives (KUSCCO) have also commenced lending for domestic biogas through Saccos, and biogas installations procured commercially are ongoing.

ESD Africa has in the past also worked to introduce financing institutions to energy lending. Examples are solar and biogas loan schemes with Kiegoi Sacco and Michimikuru Sacco. Useful lessons can also be drawn from their experiences.

GTZ, working with the Kenya Government under the Private Sector Development in Agriculture (PDSA) is also supporting the biomass sector and has recently enabled the training of several biogas private contractors and the formation of the Association of biogas Contractors of Kenya (ABC-K).

There are many other examples of projects, supported by international organisations such as UNDP and UNEP, as well as multiple private sector players and NGOs with ongoing projects. Practical Action is among the foremost stakeholders in biomass and improved energy technology matters in Kenya, through donor funded projects.

Local banks remain uninvolved in supporting specific action plans or loan products for heating and cooking services, although most will say they serve 'everyone' and therefore it is possible they are lending to such clients, albeit oblivious of them as a group or sector.

One major observation is that biomass and biomass appliances are considered a poor man territory and do not excite financial institutions with only a few NGOs and CBOs working with communities to improve access. There is also the issue of frequent replacement of the cookstoves which overburden the production capacity, often reducing the urge of continued use and requiring a financial arrangement.

1.7.1.5 Target 1: Standards and Codes of Conduct analysis

Due to subsequent awareness campaign by various organizations promoting the ICS, the improved design was adopted in many localities. Widespread adoption has been hampered by lack of standards and

[28] *RETAP website: www.retap-africa.org*

enforcement to protect the consumers. There is also need to translate the standards to local languages for easier understanding by these artisans.

National standards for commercial charcoal kilns have not been developed. Existing traditional charcoal making techniques are not efficient and with diminishing charcoal sources, there is need to develop such standards to improve the techniques.

The adaptation/translation of the WHO International Air Quality Guidelines into national policies and standards is highly recommended.

Standards for uniform LPG regulators were developed in 2006 and the process for biogas standards is underway.

1.7.2 Target 2: Modern Energy Services for all the Peri-Urban and Urban Poor

1.7.2.1 Target 2: Demand and supply framework analysis

Energy Resources

Modern energy for the peri-urban and urban poor includes electricity from the grid, diesel generating sets, electricity from renewable energy, petroleum products like kerosene, gasoline, and diesel. The energy is used for various services like domestic lighting, powering electronic gadgets, running equipments and machines for productive end-uses. Electricity is a modern and clean form of energy associated with development and increased standard of living. If grid extension is expedited to the peri-urban and urban poor it has profound benefits.

Electricity consumption patterns

From the survey KIHBS, 2007, 51% of urban population and 3.9% of the rural are served by electricity translating into 875,000 households in urban and 201,000 households in rural areas (KIHBS, 2006/07 Rev.ed). For the urban households, majority of the consumers are from the high and middle income groups with only 26% of the low income urban household having access to electricity.

The average annual consumption is 694 kWh with urban households averaging 844 kWh and rural households averaging 544 kWh. The low number of the rural households connected has led to a low national per capita consumption of 125kWh. Most of the electricity in peri-urban and urban areas is used for lighting and powering productive end-uses and service sector. Cooking is not a major user of electricity with only 1.8% of the urban population and 0.2% of the rural areas reporting cooking with electricity.

The major challenge with the urban and peri-urban areas is lack of data especially for the poor. The classification peri-urban denotes proximity to urban neighborhood with most of them reflecting a rural outlook. The other problem is the low per-capita consumption of electricity especially for productive end-uses for the urban and peri-urban poor considering the relative high cost of electricity and the slow pace for connection. Another challenge worth recognizing is that most of the urban poor live in informal settlement and connecting them to electricity is handicapped by lack of plans, legal ownership of land and the temporal nature and the temporal nature of the consumers.

Recognizing the pro-active lifestyles in urban and peri-urban areas in use of electricity, there is need to address the generation capacity especially in remote areas with isolated networks.

1.7.2.2 Target 2: Institutional framework analysis

MoE formulates and articulates electrification policies. In line with the Government obligation to provide access to electricity, MoE has come up with innovative strategies to accelerate the electrification of urban and peri-urban poor households. For example use of the ready boards for domestic consumers which connects

several customers through one board in highly concentrated areas; it is pro-poor and good for informal settlements, peri-urban and urban areas;

The KPLC provides transmission and distribution infrastructure, undertakes customer connections and services. To accelerate the rate of access to electricity to the urban and peri-urban poor, it has come with policy interventions namely transformer maximization; new customer creation (*Umeme Pamoja)* connection programme where customers within 600 meters radius of a transformer are connected ; and new concept of electrifying peri-urban areas where KPLC initiates power connection to upcoming new peri-urban settlements.

It is noteworthy that rural electrification funds have been widely used in electrification of peri-urban areas and REA whose main role is to ensure the rural electrification targets set by the Government are met is expected to continue playing a major role in electrification of peri-urban areas.

In the cities and towns the local authorities also play a major role street light electrification and service centers.

One of the challenges faced in urban and peri-urban areas is institutional weakness in policing and management of the power line occasioning power theft. There is need to come up with an innovative mechanism for connecting consumers especially for productive end uses in the urban slum areas to reduce power theft.

1.7.2.3 Target 2: Policy and legal framework analysis

Electrification of urban and peri-urban areas is supported by the Sessional Paper No. 4 of 2004 on Energy which advocates electrification of all Kenyans. The new Energy Act No. 12 of 2006 offers a conducive legal framework for generation and supply of electricity to consumers. Currently, distribution and supply of electricity to consumers is by KPLC-the only licensed public distributor, with the Act providing for any other player to apply for licensing.

The ERC is expected to continue advising the Government on tariff setting which currently is one of the major obstacles faced by the poor. One major policy need is undertaking an analysis of the effect in power sector on urban and peri-urban poor (lifeline tariff).

One major challenge is electrifying informal settlements, there is need for all key players to adequately address connection to informal settlements.

1.7.2.4 Target 2: Financial mechanism analysis

The most relevant financial services for access to urban and peri-urban relate to electricity connection and reduced use of fossil-fuel based carriers for lighting and cooking. KPLC has recently introduced a new connection product for the informal settlements (targeting Mukuru, Mathare, Kayole, Kangemi, Kibera and Kamukunji areas) that bulks several users under one connection. KPLC is currently planning connection financing mechanisms for its consumers.

Faulu Kenya, a micro finance institution, has implemented consumer finance for energy with a good measure of success. Faulu provides micro credit and in 2005, raised about KES 500 million (US$7.3 million) though a bond issue listed on the Nairobi Stock Exchange, with the support of AFD (Agence Francaise de Developpement), a French Government agency which underwrote the subscription. These funds have helped Faulu develop its products, including the energy loan offering. The point to note is that EAC-EASUP can learn from these kind of transactions in raising funds for its activities.

KWFT's, Faulu's and KUSCCO's financial products for solar PV also offer a rich (good and bad) experience base for EAC-EASUP.

Where as peri-urban areas may be covered by rural electrification programme, thus accessing rural electrification fund the urban areas do not benefit from thus and there is need to develop a public finance scheme for the urban poor.

1.7.2.5 Target 2: Standards and Codes of Practice analysis

Electricity transmission and distribution in the country is governed by the grid code of 2005. The co-existence of various systems i.e. the grid, micro wind turbines and solar systems pose a challenge.

The relevant standards and safety codes are developed. These are contained in the Grid Code that was formulated and launched by the Electricity Regulatory Board in 2005 (currently the Energy Regulatory Commission). The actual implementation and enforcement has not started as the relevant stakeholders especially the electricity distributing company has requested for more time to upgrade the existing infrastructure to conform to the requirements of the grid code. The requirements envisioned in the grid code require capital investments that will have an impact on the company's bottom-line. For example, the requirement of the end user voltage to be 230V instead of 240V will require shorter distribution distances than the current existing ones and consequently more transformers. This will in effect increase the distribution losses for the supplier. When the actual enforcement and implementation begins, capacity and resource constraints on the ERC will be a challenge. There will also be a need to raise awareness among the consumers on the existence of the code. A project for development of standards and labelling of energy consuming equipment is in the development stage. It is expected to be funded by UNDP and Global Environment Facility (GEF).

1.7.3 Target 3: Modern Energy Services for Health, Educational and Social Institutions

1.7.3.1 Target 3: Demand and supply framework analysis

Target 3 focuses on the social and institutional facilities serving the rural communities (educational facilities, dispensaries, clinics and health centres and community centres) and rural market centres. The target aims to meet the modern energy service needs (such as lighting, refrigeration, information and communication technologies, water treatment and supply) for ALL of them.

MDG 2 aims at achieving universal primary education and building the capacity of this sub-sector. The majority of schools in Kenya, particularly those located in the rural areas, have no access to modern energy services—be it for cooking or lighting.

In Kenya in 2006, (provisional, Ecomonic Survey 2007), there were 20,229 primary schools. Only about 5% of these schools are electrified.[29] Secondary schools in Kenya (public and private) total 4,215[30]. Of these, over 3,000[31] are non-electrified. The electrification scenario is similarly low for markets, health centres and dispensaries (see full breakdown by province in Table 13, Annex 2).

Non-electrified dispensaries and health centres total 1,521 (total number of health institutions including urban and rural, as well as hospitals, is 5,170[32]—Government-owned are 1,628 dispensaries and 460 health centres, 75 district hospitals, 8 provincial hospitals, and 2 national hospitals.[33]), while rural markets non-electrified[34] are 2,255[35].

[29] *It is also necessary to document how many have access to water supply and modern cooking services.*

[30] *Economic Survey, 2007, pg 44*

[31] *This needs to be reconfirmed with figures from MoE on the Schools Electrification Programme.*

[32] *Economic Survey, 2007, pg 53.*

[33] *Energy Group, Columbia Earth Institute Report to the World Bank, 2007.*

[34] *(MoE) It is noteworthy that a number of electrification progammes, for example the West Kenya Electrification Programme and the Coffee Rural Electrification Programme in coffee-growing regions of Kenya, increased access to electricity to institutions, market centres and households.*

[35] *Provisional data, Rural Electrification Masterplan.*

MOE through the rural electrification programme has an elaborate plan to electrify the rural areas mostly schools, markets, health centers and dispensaries. The creation of REA is expected to increase the rate of electrification in these institutions. Deducing from the above, the task of EAC-EASUP is clear; for instance, scaling-up efforts need to lead to electrification of 19,200 primary schools in Kenya between now and 2015.

The main challenges that need to be resolved by EAC-EASUP include quantification of the amount and type of energy needed for the target, taking into account the grid infrastructure and available energy alternatives (for example MoE solar PV programme for schools in ASAL regions provides an insight on this). Another challenge is packaging the services. With respect to market centres, which are supposed to be suppliers of energy services to enterprises and social amenities, the challenge is scoping such market centres and their energy demands, vis-à-vis the services they potentially can provide. Water supply also has infrastructural requirements that may be complicated by sparse distribution of the relevant health and educational facilities, as well as the availability of the water resources (or the distance from sources). Some market centres are also sporadic, especially in pastoral communities.

1.7.3.2 Target 3: Institutional framework analysis

Government agencies, private sector and faith-based organizations are active in assisting institutions to access modern energy services. Religious bodies, which own several schools, hospitals and health centres, are also active, but most do not have a specific strategy with respect to energy.

A number of NGOs are also involved in promotion of improved energy practices in these institutions, the most notable one being RETAP, a local NGO that promotes and finances installation of institutional cooking stoves with funding from a past successful GEF/UNDP project that created a revolving fund. Other NGOs include Practical Action and Thuiya Enterprises.

Challenges include the lack of an institutional arrangement to coordinate and plan provision of modern energy services to the institutions.[36]

1.7.3.3 Target 3: Policy and Regulatory framework analysis

From the analysis in the baseline, the Sessional Paper No. 4 of 2004 provides for integrated energy planning and the main challenge is availability and reliability of data, and linking integrated energy planning with human development and policy making process. There lacks a multi-sectoral energy planning framework.

Various sub-sectors also formulate policies which affect provision of modern energy services, without necessarily referring to the existing energy policies and institutions. The policy calls for least cost approach and development of local resources to meet the energy needs. The challenge is to identify the least cost option for the energy service needed.

The Energy Act provides for an appealing mechanism for the service providers and consumers.

1.7.3.4 Target 3: Standards and Codes of Practice analysis

Kenya Bureau of Standards (KEBs) working with respective institutions and users develop standards and respective codes of practice. ERC on the other hand has developed a grid code, which sets configuration and specifications for the various supply options. In the recent past KEREA is pro-actively involved in review and spearheading the standards and quality assurance by the industry. The main challenge remains most of renewable energy technologies do not have national standards. The other challenge is keeping the cost of energy services low considering some of the conventional standards; and The slow pace in development of standards and codes of practice by the KEBS. It is important to note in the the absence of national standards, international standards and prudent practice applies.

[36] *GVEP Kenya Study*

It is felt that, to ensure quality services, certification of operators, installers, maintenance and manufactures need to be addressed. Considering the wide range of energy services required by this target (lighting, cooking, refrigeration, ICT, water pumping etc), a major challenge remains in enforcement of the rules and standards, capacity and expertise both at the standard bodies and the consumer organisations.

1.7.4 Target 4: Access to mechanical power for heating and productive uses for all communities

1.7.4.1 Target 4: Demand and supply framework analysis

EAC-EASUP recognizes the need to introduce energy services for productive end uses (including motive power and water heating) to reduce human drudgery, addressing gender specifics issues (women pounding grains, manual sawing timber etc) and provides services on grand scale compared to the traditional methods, e.g. water supply.

Motive power for productive uses is mostly useful for rural communities. Sources of this power include animals, hydropower, wind, biomass (bio-diesel, bio-ethanol, producer gas, biogas) and fossil fuel (gasoline and diesel). The power can be used for water pumping/lifting, agro-processing activities, de-husking, flour milling, stone crushing, ploughing, saw milling, jaggeries, etc). Equipments and technologies for transforming the energy resources to motive power are easily available.

Assuming that the un-served market centres (about 2,500 non-electrified centres) will provide the demand for motive power, then the potential is immense.

The challenge is to configure motive power systems that address local needs at least cost. The other challenge is the high upfront costs associated with the primary technologies driving the motive power like hydropower or wind compared to diesel engines or grid electric motors.

Another challenge is coming up with appropriate innovation in applying motive power to meet the target considering target three.

It is important to note, in delivering multiple services, the Multi Functional Platform (MFP) approach may be cost-effective but studies need to be undertaken to prove local circumstances.

Solar water heating applications in the country have been mainly applied in the hospitality sector. A few health institutions and a limited number of households also utilize this energy source. One of the largest efforts in the past to promote solar water heating was for urban household purposes (e.g. Buru Buru Estate), where performance was mixed. Apart from the World Bank Study of 1987, there is need to assess the demand for water heating outside major urban centres.

For productive end uses, the target market for efficient heating technologies such as efficient driers, boiler and kilns, in small rural-based restaurants, small service establishments and agro-processing.

1.7.4.2 Target 4: Institutional framework analysis

Several institutions are mandated to bring specific services like the ministry of water delivering water services and national utilities delivering electricity related services. The limited application of motive power is largely market driven and there is not single institution responsible for it.

MoE in pursuance of the Energy Policy, and the potential impact that solar water heating can have in the country, initiated and is carrying out studies on the market and related costs. MoE is also holding provincial exhibitions to create awareness on solar water heating.

The private sector has a number of integrators for solar water heating, using mainly imported components. They target largely institutional customers.

A key need that can be addressed by EAC-EASUP is to map the productive uses in the rural areas requiring heating applications, sizing and costing them.

Another challenge is to coordinate service delivery including prioritization; infrastructure for the promotion and scaling-up of motive power provision and adequate site specific data for decision making.

1.7.4.3 Target 4: Policy and legal framework analysis

The fact is that most of the service provision in the rural areas is driven by specific sector policies (such as water, agriculture, livestock, fisheries, etc.); hence the challenge for EAC-EASUP is to enable integration and coordination of these policies.

1.7.4.4 Target 4: Financial mechanism analysis

Most applications for motive power are movables and durables that easily qualify for cash purchase or hire purchase (HP), which is readily available in Kenya. However, the HP sector is known to be expensive, with consumers paying as much as 200% price for goods procured through HP outlets.

Besides the HP sector, recent developments that have seen banks and microfinance institutions venture into consumer finance and unsecured rural enterprise loans can benefit the energy for productive use agenda.

Even though savings and credit cooperatives are widespread in Kenya, the challenge for the scale-up initiative is that the majority of SACCO lending remains in emergency and long term family needs (education, health, farm preparation and housing). Furthermore, the strategically placed Saccos which could play a major role in promoting and financing energy for productive use require capacity building, policy support and funding programmes.

1.7.4.5 Target 4: Standards and Codes of Practice analysis

Whereas standards for conventional energy equipment exist, there is need to study multiple applications (hybrids) and develop guidelines for such applications.

The development of relevant standards and codes of practice for solar heating water systems has started. KEBS has completed the specifications and testing methods. This is expected to be in place by the end of 2008.

Lack of national experts and capacity at KEBS contributes to the slow development of these standards.

2.0 SWOT ANALYSIS

Some constraints to accelerated market penetration

Target 1: Access to modern cooking practices for 50% of traditional biomass users

Biomass fuels are the most important source of primary energy in Kenya with wood fuel consumption accounting for over 68% of the total primary energy consumption.

About 2% of Kenya's land area is covered by forests, which produce about 45% of the biomass energy resources including wood wastes. The balance is derived from farmlands in the form of woody biomass as well as crop and animal residues. There is widening gap between supply and demand for wood fuel and recommended policy interventions to redress this challenge.

Lack of a favourable legal framework for charcoal production, distribution and marketing presents a threat to Target I. In addition, there is low awareness of tree growing as a commercially viable business enterprise. Lack of close harmonization of the policies and activities of the various ministries responsible for biomass energy issues e.g. Ministry of Energy and Ministry of Environment and Natural Resources also pose a threat. An opportunity is presented through promotion of sustainable biomass harvesting achieved by innovative and efficient exploitation and utilisation technologies while at the same time providing policy triggers to shift rural energy consumption to cleaner fuels like Liquefied Petroleum Gas (LPG) and kerosene

The country is endowed with significant amounts of other renewable energy sources which include solar, wind and small hydropower. Others include power alcohol, biogas and municipal waste energy. However, only solar, wind and small hydropower are currently harnessed for use in Kenya.

Although biogas technology provides an alternative to ordinary biomass use, its penetration rate is still very low. Research has shown that about 30% of the 1100 biogas digesters introduced in the1980s have fallen into disuse. The main problems are poor management, high initial capital costs, high maintenance costs, limited water supply and weak technical support. There is need to increase the level of awareness so as to enhance wider acceptance and adoption of the technology.

Change of Government policy is necessary to cater for houses with piping that can increase the safety of LPG.

Strengths	Weakness
▪ High acceptance and wide use of ICS. ▪ Large number of NGOs spearheading the uptake of ICS. ▪ Low initial cost of ICS make it a viable option. ▪ Ease of replication of the ICS technology. ▪ Policy intention of increasing adoption rate of improved cookstoves in rural and urban areas. ▪ Government intention to promote fast maturing trees, establishment of commercial woodlots, peri-urban plantations.	▪ Inefficient charcoal kilns widely used. ▪ Reduced soil fertility as residuals are used as energy source. ▪ Lack of adequate and reliable data on biomass consumption and production. ▪ Over reliance on biomass as the cheapest source of energy by majority of citizens. ▪ Lack of implementation of standards for ICS. ▪ Lack of awareness on harmful effects of traditional cook stoves. ▪ Unwillingness by LPG main suppliers to adopt the universal LPG regulator standards.

▪ Promotion of ICS for domestic and institutional use by NGOs and other organizations e.g. GTZ, GEF, RETAP.	▪ Lack of capacity building initiatives for stove and kiln artisans. ▪ High incidence of poverty as a constraint to shifting from traditional biomass to modern energy. ▪ Weak biomass energy focus by policymakers. ▪ Slow adoption of fast cooking foods as compared to the traditional foods that take longer time. ▪ High initial costs of LPG appliances (cylinder and cookers). ▪ Inability to buy LPG quantity as per consumer need. ▪ Limited capacity to produce LPG at the local refinery coupled with limited LPG retail distribution especially in the rural areas. ▪ Lack of incentives to promote reforestation in cleared areas. ▪ Lack of implementation strategies and targets for biomass energy. ▪ Weak capacity for agro forestry and farm woodlot development among communities.
Opportunities	**Threats**
▪ Low initial costs of ICS. ▪ Free education is reducing availability of 'free labour' for biomass collection. ▪ Strong self help groups can be used as avenue of promoting ICS. ▪ Increased conservation measures by Government to protect forests. ▪ Review building code to make ventilation a requirement for housing. ▪ New CDF fund to provide start-up capital for ICS manufacturers. ▪ Possibility of obtaining cheap natural gas from Tanzania. ▪ Fuel substitution due to the rising cost of charcoal as supply dwindles and therefore outstripping demand. ▪ Existing ready and growing market for LPG and kerosene. ▪ Existing NGOs that are promoting organized tree planting and reforestation programmes. ▪ Large number of users provide a potential	▪ Increasing population surpasses biomass availability. ▪ Illegal logging continues unabated despite Government efforts. ▪ Degradation and deforestation of rangelands on the rise. ▪ Poor maintenance culture among users imply high replacement costs. ▪ Unattractiveness and unreliability of other energy options like biogas. ▪ Lack of prerequisite awareness for local technicians on need for ICS standards. ▪ Lack of proper regulatory mechanism for charcoal business increases illegal charcoal production. ▪ Lack of Government policy on external LPG supply to houses. ▪ Lack of consistent policy on forest *shamba* system. ▪ High cost of alternative clean energy options is too high for most households to afford. ▪ Lack of harmonization of the policies and activities of the various ministries responsible for biomass energy issues. ▪ No specific law to regulate the management of biomass.

market for modern cooking devices. ▪ Modernization of the only petroleum refinery will provide for more LPG output. ▪ Potential cooperation between Ministry of Energy and Ministry of Health to leverage programmatic actions on household energy and health especially regarding awareness raising through the health sector and capacity building	▪ Low awareness among the ICS consumers and manufacturers on need for efficient cooking stoves. ▪ High cost of procuring an ICS as compared to ordinary CS. ▪ High mark-up on kerosene prices especially in rural areas discourages change of energy source.

Target 2: Access to reliable modern energy services for all urban and peri urban poor

Improved national economic outlook in Kenya has resulted to increased demand for reliable modern energy services as compared to available supply. As an indication, total installed capacity for electricity generation rose marginally by 1.8% from 1156.6 MW in 2005 to 1177.1 MW in 2006. Total electricity supply grew by 6.3% from 5547GWh in 2005 to 5894.9GWh in 2006. Domestic electricity consumption rose by 5.6% to reach 4,752.4GWh in 2006. Demand for electricity for street lighting rose by 17.6% from 8.5GWh in 2005 to 10.0GWh in 2006. The increase in electricity consumption by street lighting category can be attributed to the street lighting rehabilitation programme by city councils and other major towns in the country. However, this is done at the expense of providing clean energy supplies in the residences. There exist an opportunity to create 'virtual power stations' for increased supply of electricity through the energy efficiency and conservation measures undertaken by Kenya Association of Manufacturers for Kenyan industries. The Ministry of Energy is providing financial support equivalent to KES 20 million per annum to the Center for Energy Efficiency and Conservation (CEEC).

There is a possibility of generating electricity from municipal waste using different technologies. For the large cities in Kenya that continue to experience serious waste management problems, the use of waste for electricity generation is a unique solution to frequent revenue shortages. The threat to this option is lack of adequate waste management that includes sorting to identify waste suitable for electricity generation. There is need for research to identify appropriate technologies with potential for electricity production using municipal waste as feedstock

Strengths	Weakness
▪ Government policy of upgrading slum settlements includes provision of clean energy services. ▪ Availability of CDF funds to deepen electricity availability. ▪ Provision by World Bank to provide funds for strengthening electricity grid will ensure power reliability. ▪ Expanding economy has increased energy demand and created a ready market. ▪ Establishment of state owned	▪ Lack of security thus fear of installing expensive energy system like solar. ▪ Inability of energy supplier to meet the real energy demand of the poor. ▪ Although KPLC is required to connect a minimum of 150,000 new customers annually, there is no requirement to ensure wide reach to the poor. ▪ Inability of many urban poor to pay market rates for energy services. ▪ Concentration of local authorities on street lighting programmes compared to provision of clean energy services in council residences.

Geothermal Development Company (GDC) will accelerate exploitation of geothermal sources for further electricity generation. ▪ Increasing the lifeline tariffs on domestic consumers of up to 50 kWh per month. ▪ Policy reforms that have led to splitting of KPLC and KenGen, creation of ERC and REA.	▪ Lack of prepaid metering to cater for low income people with unstable incomes. ▪ Expansion of human settlements with little regard to planning laws increases population without access to energy and inadequate infrastructure to increase the access. ▪ lack of legal and regulatory framework and institutional support to promote widespread use of solar energy and protect consumer interests. ▪ high capital costs of the systems relative to consumer incomes. Despite gradual reduction of the indirect taxes by the Government over the years, the cost of solar home systems has remained beyond the reach of many potential consumers.
Opportunities	**Threats**
▪ Plans for regional power interconnection. ▪ Creation of ERC to regulate the energy sector and serving as one stop shop for energy matters. ▪ Single source for use by multiple consumers. ▪ Contracting of private sector to undertake installation work for KPLC. ▪ Adoption of Grid code developed by ERC will increase safety and system reliability. ▪ Requirement for KPLC to purchase power at set rates from private generators. ▪ Energy efficiency measures by CEEC act as virtual energy sources for other uses. ▪ Increased accountability of local authorities will avail resources to deepen electrification of urban poor. ▪ Availability of cheap loans from cooperatives will provide initial capital requirements. ▪ Possibility of utilising municipal waste in power generation. ▪ Unbundling of KPLC into	▪ Lack of adequate national hydro generation capacity. ▪ Increased theft of power infrastructure equipment which could discourage private energy providers. ▪ Growing population will outstretch supply. ▪ Unattractiveness of other energy sources. ▪ Lack of adequate capacity at the ERC to ensure proper adherence to set standards. ▪ Lack of Government subsidies for initial connections in these areas as compared to rural areas. ▪ Lack of incentives for private sector to engage in power development. ▪ Requirement for power supply by KPLC e.g. pin number, postal address reduces number of applications from informal settlements. ▪ Existing poverty and thus reduced purchasing power. ▪ High initial/upfront connection charges. ▪ Lack of financial investments by KPLC to implement the ERC grid code, which would improve supply and safety.

transmission and distribution entities will accelerate electricity reach. ▪ Increasing population in these areas imply a potential market ready to be exploited.	

Target 3: Access to modern energy for all schools, clinics, hospitals and community centers

The Government of Kenya initiated the rural electrification programme in 1973 to stimulate socio-economic growth, stem rural-urban migration through creation of social amenities and employment opportunities at close proximities to the rural population and thus uplift the quality of life in the rural areas. However, the rate of penetration has been slow with only 91,069 directly metered consumers having benefited from the programme by January 2004. The scheme operated under KPLC has now been transferred to the Rural Electrification Authority (REA) established under the Energy Act 2006. REA is responsible for the management of Rural Electrification Programme fund. It also has the responsibility of developing and updating the rural electrification master plan and promotion of the use of renewable energy sources. The institutional change coupled with Government's intention of increasing electricity reach has led to increased customers

By July 2006, the number of customers under the REP has grown by 8.8% to 110,724 from 101,793 in July 2005. Consumption by Rural electrification category rose by 17% from 175.8GWh in 2005 to 205.6GWh in 2006 due to the ongoing reforms in rural electrification.

The Government subsidizes rural electrification through collection of RE levy from other consumers. A total of KES 1,085M was collected in 2006 compared to KES 1,046M in 2005. However, the initial connection is still out of reach of many of the targeted beneficiaries. An opportunity arises in the innovative schemes where many consumers are pooling resources together to apply for single connection.

Due to high maintenance costs of rural electric supply, high cost of network extension, low consumer densities and the scattered nature of the human settlements in rural Kenya there are limited funds for system expansion. The rural electrification schemes also incur higher operating costs per unit sold than the KPLC system sales. Despite the efforts to increase connection in the rural areas, only a few have made productive use of electricity. This has been attributed to poor entrepreneurship, high poverty incidence which nationally stands at about 56% of total population, lack of awareness on the potential for electricity to stimulate income generating activities and lack of innovative and appropriate financing schemes to promote commercial and industrial enterprises including irrigated agriculture and fisheries.

Strengths	Weakness
▪ Possibility of generating power from bagasse in sugar plant which can be sold to grid supplier. ▪ Establishment of Rural Electrification Authority is stimulating further rural electrification. ▪ Policy changes now allows private power producers to sell to KPLC. ▪ Existing potential in harnessing the small rivers for mini-hydro in electricity	▪ Isolated institutions located far way from main grids. ▪ High initial cost of installation as previous building design did not include necessary supply installations. ▪ Lack of adequate finance to install necessary energy systems. ▪ Lack of harmonisation on energy issues for policies on energy, water, education, agriculture, health and rural development. ▪ Initial installations are made expensive by lack of building

generation.	designs that would allow cheap energy installation. ▪ No legal enforcement to ensure building designs include energy distribution. ▪ Lack of appropriate credit and financing mechanisms to facilitate acquisition of solar systems.
Opportunities	**Threats**
▪ Promotion of mini hydro as an alternative will utilise the existing small but viable river sources. ▪ Government policy on ICT to accelerate access to energy. ▪ Provision of funds from the CDF fund. ▪ Policy intention to privatise or concession isolated power stations to reduce operating costs. ▪ Poverty reduction programme by Government has identified need to develop rural areas to reduce poverty levels and rural-urban migration. ▪ Expansion of horticultural industry that is leading to new community centres in rural areas requiring energy supply.	▪ Many of the institutions are isolated and located far away from each other and from the main grid. ▪ Lack of capacity and resources at the Ministry of Energy to undertake feasibility studies on existing rivers for mini hydro. ▪ Lack of policy incentive for private operators to set up isolated generating stations. ▪ Environmental concerns are hampering the cheap construction of rural electric lines due to the mitigation measures that have to be put in place. ▪ Lack of alternative innovative mechanisms for funding the Rural Electrification Programme. ▪ Rigid land laws hampers acquisition of land for mini-hydro development and way leaves.

Target 4: Access to mechanical power within the community for heating and productive use

Promotion of energy for productive use is key in ensuring that energy services play an integral part in economic development. The lives of rural communities can be significantly transformed by access to energy for motive power and heating. Agriculture, industry and trade in rural areas can benefit from technologies that utilize animals, flowing water, wind, biomass, solar (for water heating) and fossil fuels to provide power for activities such as water pumping, agro-processing, milling, crushing, grinding, etc.

With respect to heating, options include thermal power from biomass and solar. The country receives good all year round solar insolation coupled with moderate to high temperatures estimated at 4-6 kWh/m²/day. This can be harnessed for water heating and cost effective crop drying.

There is need to develop fiscal and regulatory frameworks to create an enabling environment to accelerate the development and utilization of the technologies that provide motive power and heating capabilities.

There exists a substantial potential for power generation using forestry and agro-industry residues including bagasse from the sugar industry for own consumption and supply to the grid. Change of policy to allow private power producers to sell to the grid company will act as an incentive for electricity cogeneration in sugar production.

Although wind energy has been used in the past especially for water lifting, its popularity has been limited due to its low reliability as compared to the conventional diesel engines. However, with the rising cost of oil, the exploitation of wind energy is becoming increasingly more attractive particularly in areas remote from the grid

and oil supply outlets. To promote investment in wind energy generation, the Ministry of Energy has recently completed preparation of a broad National Wind Atlas. In addition, the Government is promoting the development of wind-diesel hybrid systems for electricity generation under rural electrification programme in areas remote from the national grid in order to attract substantial private sector investments in the fabrication of wind power systems and in wind energy generation, and with a view to significantly increasing the role of wind energy in rural communities.

The Government is also exploring the potential use of bio diesel from locally grown trees and crops.

Strengths	**Weakness**
▪ Availability of cheap bagasse for power generation. ▪ Promotion of cogeneration in the country's sugar belt through an attractive bulk tariff regime. ▪ Availability of all year round solar insolation (for water heating) that can be easily harnessed. ▪ Fully operational REA.	▪ Lack of incentives to develop biotechnologies for production of crops suitable for production of bio-diesel in low and medium potential lands. ▪ Inadequate data on wind regimes. ▪ Lack of awareness about the economic opportunities offered by the wind technology. ▪ High costs of undertaking feasibility studies for mini-hydro projects. ▪ high capital costs, which make wind energy less attractive relative to diesel fired alternatives for applications such as small scale commercial farming. ▪ Limited access to micro-credit to the rural and urban poor. ▪ Inability to develop energy conversion equipment manufactured locally. ▪ Erosion of consumer confidence because of inappropriate system standards, faulty installations, importation of sub-standard systems and poor after sales service.
Opportunities	**Threats**
▪ Rising oil prices makes other sources like wind attractive. ▪ Dwindling biomass availability will make other options more attractive. ▪ Environmental concerns nationally and worldwide will discourage inefficient biomass utilisation. ▪ Possibility of extracting bio fuels from local trees. ▪ Policy intention of promoting private or community owned vertically integrated entities operating either renewable energy	▪ Lack of incentive packages to promote private sector investments in renewable energy and other off-grid generation ▪ Lack of tax waivers and tariff adjustments to make clean energy affordable. ▪ Lack of system standards for wind systems. ▪ Limited after sales service for wind energy systems. ▪ Lack of finance for research and development on the potential for the exploitation of bio-diesel from local trees and crops. ▪ Lack of appropriate credit schemes and financing mechanisms for establishing wind energy systems. ▪ High capital costs, which make it less attractive relative to diesel fired alternatives for applications such as small scale

power plants or hybrid systems to exist with licensed electricity distributors.	commercial farming. ▪ Lack of awareness about the economic opportunities offered by the existing technology like wind. ▪ Inadequate data on wind regimes. ▪ Limited after sales service on wind energy systems.

3.0 KEY FINDINGS

3.1 Integrated Energy Planning

- Integrated energy planning is critical in addressing all the targets given the cross-sectoral linkages and sub-sectoral issues within the energy sector.

3.2 Data and information

- Lack of adequate and updated data and information for effective decision making. Most of the target related data and information require more data, segregation and deeper analysis to inform the planning processes, system sizing etc.
- A number of baseline data are based on outdated studies and there is need to update the studies and harmonise findings from some of them.

3.3 Institutional issues

- Whereas the energy policy is very clear on mandates and responsibilities of the present energy infrastructures, there is need to address the institutional arrangements necessary for delivery of non-energy services critical in meeting the targets or facilitating delivery of services to meet the targets.
- There is need for coordination between various institutions addressing targets related outputs.

3.4 Capacity issues

- There is need for requisite capacity building in human, technological, scientific, organizational, and institutional and resource capabilities in meeting all the targets. It is instructive to note that capacity building is necessary for all the players- public, private including the consumers. The presence of existing structures in other sectors, such as the health sector might be an opportunity to bypass lack of public sector personnel involved in energy access issues.
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- In addressing capacity building, it is important to critically review the needs for effective delivery of services and meeting the targets. There is a need for capacity building to address both software and hardware to be effective in addressing the targets.

3.5 Policy issues

- There is need to harmonise cross-sectoral policies and mainstream energy into non-energy sectors in delivering the targets.

- EAC-EASUP by virtue of it wide spectrum may require a specific policy agenda in the country and at regional level.

3.6 Legal issues

- Various products identified by the target are often addressed by various regulations which are often conflicting to effectively deliver the targets; For example the biomass industry.

3.7 Standards and codes of practice

- Unavailability of standards for some of the products and services being promoted for the targets
- Lack of enforcements
- There is need for harmonization of standards and codes of practices between countries.
- There is need for information, education and consumer awareness

3.8 Financial issues

- Low income earners and rural subsistence farmers form the largest potential market for energy products, because they are the most affected by low levels of modern energy access. Ironically, they are faced with low disposable income and a multitude of priorities—and modern energy is rarely among the top three, which are reserved for shelter, health, education and food.
- The challenge for EAC-EASUP is to engage the all-inclusive financial sector (including the "alternative financial services providers" in development of financial products that will support access to modern energy services.
- Numerous donor agencies and international project financiers operate in Kenya. However, focus on energy financing has not been as strong as in other sectors, with generic micro credit and Micro, Small and Medium Enterprises (MSME) support being the favourites
- Enterprise development in energy is still largely supported by donors and projects.
- Relative to other funding initiatives, only a few funds focus specifically on financing energy projects, unless they are in the multi million dollar range. Even then, bilaterals and multi laterals are the main actors.
- Locally, banks remain reluctant to consider energy as a viable product line, mainly due to low levels of sensitisation and understanding of the sector.

4.0 DRAFT ACTIVITY IMPLEMENTATION WORKPLAN

4.1 Activity Time Plan

No.	Outputs and Activities	Milestone	Organisations responsible	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
1	***Modern energy services provision across the 4 targets incorporated in budgets, sectoral strategic plans and medium terms plan at national, district and local level***										
	Conduct a detailed review of relevant sectoral strategic plans and associated sectoral need assessment in relation to modern energy services to support their objectives.	Strategic plans review completed by the end of Q1.	PMU-MOE								
	Hold consultative workshop(s) to review consultant report with MOPND, MOF, MOE and relevant sectoral Ministries.	Two consultative workshops held by the end of Q2.	PMU-MoE/MoF/MoPND								
	Constitute an interministerial working group to incorporate modern energy provision issues in the draft sectoral plans.	Revised draft sectoral plan in place by the end of Q2.	Sectoral focal points								
	Discuss and Validate the final report through a workshop.	Workshop held by the end of Q3.	PMU-MOE								
	Prioritise modern energy services for the 4 targets in budgetary allocation as a co-poverty programme.	Modern energy budgetary allocation plan completed by the end of Q5.									
	i. Prepare a concept paper	Concept paper by the end Q2	MoE								
	ii. Conduct Sentization Seminar for policy and decision makers to support the initiative.	Two seminars held by the end of Q3.									
	iii. Develop a five years budgetary implementation plan.	Implementaton plan by the end of Q4.	MoE/MoF								
2	***Multisectors (governments, private and NGOs sectors) policies and action plans on provision of modern energy services harmonised and strengthened.***										
	Identify, map and analyse actors in the provision of modern energy services in the country.	Institutional analysis completed by the end of Q2.	PMU-MoE/NGOs/Private sectors								
	Hold a joint consultative workshop for all the actors in modern energy services provision.	Final workshop report by 3rd quarter.	PMU-MoE								

No.	Outputs and Activities	Milestone	Organisations responsible	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
	i. Setup a technical multisectoral committee to oversee the process.	Technical committee constituted by mid of Q2.	PMU-MoE								
	ii. Review the findings of the consultants and convene a joint consultative workshop to validate the findings.	Validation meeting held by the end of Q3.	PMU-MoE/NGOs/Private sectors								
	Review, identify gaps of current policies and action plans and propose a menu of frameworks including timeline for implementation.	Need assessment completed by the end of Q4.	PMU-MoE								
	i. Prepare a terms of reference for the consultancy.	ToRs developed by the mid of Q2.	PMU-MoE								
	ii. Hire the consultants.	Consultant contracted by the mid of Q2.	PMU-MoE								
	iii. Develop an implementation plan for a new 'multisectoral coordination' framework.	Impementation plan completed by the end of Q4.	PMU-MoE								
	iv. Hold a review and validation workshop.	Validation workshop held by end of Q3.	PMU-MoE/NGOs/Private sectors								
	Harmonise sectoral policies on sustainable fuelwood supply in the agriculture, forestry service, energy and environment and natural resources sector among others.	Study on integrated fuelwood supply completed by end of Q5.	PMU-MoE/MoA/MoENR/FS/NEMA								
	i. Review public sectors policies- gaps, threats, opportunities and strength in addressing fuelwood supply.	SWOT on fuelwood completed by end of Q3.	PMU-MoE								
	ii. Hold a joint consultative meeting of key stakeholders to strategise on policies harmonisation.	Workshop by the end of Q4.	PMU-MoE/MoA/MoENR/FS/NEMA								
	iii. Select a technical working group.		PMU-MoE/MoA/MoENR/FS/NEMA								
	iii. Develop a clearly defined framework of roles and responsibilities of each sector.	Integrated framework completed by the end of Q5.	PMU-MoE/MoA/MoENR/FS/NEMA								
3	***Strategy for public and private partnership (PPP) for modern energy services put in place.***										

No.	Outputs and Activities	Milestone	Organisations responsible	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
	Undertake a needs assessment for PPP in modern energy services provision.	Need assessment completed by the end of Q5.	PMU-MoE								
	Organize a public and private sector consultation forum.	Workshop held by the end of Q6.	PMU-MoE/Private Sectors								
	Prepare the draft strategy.	Draft strategy report by the mid of Q7.	PMU-MoE								
	Review, adopt and disseminate the PPP strategy on modern energy services provision.	Final strategy out by Q8.	PMU-MoE/Private Sectors								
4	***Peri-urban and urban poor clearly mapped out and electrification strategy developed.***										
	Undertake a modern energy need assessment for peri-urban and urban poor.	Need assessment completed by the end of Q4.	PMU-MoE								
	Prepare peri-urban zoning guidelines.	Zoning guidelines completed by the end of Q5.	PMU-MoE								
	i. Hire a consultant to prepare the guidelines.	Consultant contracted by the mid of Q3.	PMU-MoE								
	ii. Workshop for physical planners and other key stakeholders to discuss and validate the findings.	Workshop held by the mid of Q6.	PMU-MoE/MoL/MoLG etc								
	iii. Constitute a technical team to oversee the implementation of the guidelines.	Technical team in place by the beginning of Q7.	PMU-MoE/MoL/MoLG etc								
	Develop an electrification strategy for peri-urban and urban poor.	Electrification strategy completed by end of Q8.	PMU-MoE								
	i. Convene a stakeholdes workshop to give input to the consultant draft document.	Stakeholders workhop held by mid of Q7.	PMU-MoE								
	ii. Visit a best pracice country for experience and learning.	At least one best practice country visited by mid of Q7.	PMU-MOE								
	ii. Incorporaton of the stakholders comments in the draft strategy.	Incorporation of stakeholders comments by end of Q7.	PMU-MoE								
	iii. Publication of the strategy and commencement of it implemention.	Electrification strategy completed by end of Q8.	PMU-MoE								
5	***Modern energy services need incorporated in education, health and productive sectoral policies.***										

No.	Outputs and Activities	Milestone	Organisations responsible	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
	Undertake energy needs assessment for education, health and productive sectors.	Needs assessment completed by Q3.	PMU-MoE								
	Hold a stakeholders workshop to validate needs assessment report.	Workshop held by Q4.	PMU-MOE/MoH/MoE/MoTI								
	Constitute a taskforce to develop a strategy for integrating modern energy services in their sectoral policies.	Task force constituted by mid of Q4.	PMU-MOE/MoH/MoE/MoTI								
	i. Terms of reference for the task force developed.	TOR developed by the end of Q4.	PMU-MOE/MoH/MoE/MoTI								
	ii. Develop modern energy services integration strategy.	Strategy completed by the end of Q7.	PMU-MOE/MoH/MoE/MoTI								
	iii. Visit to the best practice countries for experience and learning.	Best practice country visited by mid of Q6.	PMU-MOE/MoH/MoE/MoTI								
	iv. Disseminate the taskforce report through a consultative meetings.	Dissemination started by mid of Q7.	PMU-MOE/MoH/MoE/MoTI								
6	***Standards and codes of practice developed/enforced and harmonised.***										
	Create awareness and sensitisation for the existing codes and standards.	Awareness campaign started from Q2.	PMU-MoE/ KBS								
	Develop /finalise standards and codes of practice for renewable energy technologies (biogas, small hydros, wind, solar heating systems).	Standards and codes completed by the end of Q8.	PMU-MoE/ KBS								
	Disseminate and enforce standards.		PMU-MoE/ KBS								
	Harmonise regional codes and standards **	Regional codes and standards where necessary harmonised by the end of Q8.	EAC/ KBS/UNBS/TBS								
	i. Develop the terms of reference for the consultant.	TOR completed by end of Q4.	EAC/ KBS/UNBS/TBS								
	ii. Hire a consultant to review the regional standards and codes of practice.	Consultant report completed by mid of Q7.	EAC/ KBS/UNBS/TBS								
	iii. Regional workshop to deliberate on harmonised standards and codes of practice.	Regional workshop held by mid of Q7.	EAC/ KBS/UNBS/TBS								
	iv. Draw an implementation plan.	Implementaton plan completed by end of Q8.	EAC/ KBS/UNBS/TBS								

No.	Outputs and Activities	Milestone	Organisations responsible	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
7	***Sensitisation created, manpower trained and equipped with the necessary tools at all levels and across gender divide.***										
	Undertake training and awareness needs assessment for all actors across the 4 targets.	Need assessment for training and awareness completed by the end of Q3.	PMU-MoE								
	Develop technical and non-technical training action plan.	Training plan completed by end of Q4.	PMU-MoE								
	Prepare training modules and tools for each target group.	Training modules completed by end of Q5.	PMU-MoE								
	Undertake the training.		PMU-MoE								
	i. Training for stove producers	30 groups trained by the end of Q8.	PMU-MoE								
	ii. Training seminars for MFIs, NGOs and utilities on their roles in modern energy services provision.	Training seminars completed by the end of Q7.	PMU-MoE								
	iii. Targeted technical trainings on small hydro, solar PV, Biogas technology, wind etc.	Technicians training commenced as from Q6.	PMU-MoE								
	iv. Undertake community group trainings on opportunities for productive uses of energy.	At least 10 community groups trained on productive opportunities.	PMU-MoE								
	Identify analyse the most appropriate communication media for awareness and sensitisation campaigns for all target groups.	Target medium of communication identification completed.	PMU-MoE								
	Develop awareness materials (print media and audio/visual programmes) and organise targeted campaigns on modern energy services on households, institutions and productive opportunies of energy.	Technical information for flyers, brochures etc Q1.	PMU-MoE								
	i. Posters A4 and A3 sizes.		PMU-MoE								
	ii. Brochures and flyers.		PMU-MoE								
	iii. Radio programmes.		PMU-MoE								
	iv. TV programmes.		PMU-MoE								

No.	Outputs and Activities	Milestone	Organisations responsible	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
	v. Bill boards.		PMU-MoE								
8	***Innovative business models developed.***										
	Analyse existing business models, gaps and strengths.	Needs Assesment report completed by the end of Q1.	PMU-MoE								
	Develop innovative business models reflecting the diverse socio-economic conditions in the country.	Innovative models developed and completed by the end of Q3.	PMU-MoE								
	Hold stakolders workshop with MFIs, MOE, MOF, NGOs and private sectors.	At least 3 workshops held by the end of Q6.	PMU-MoE/MoF/Fis/NGOs/Private sectors								
	Assist financial institutions in developing energy loans products and related publicity materials.	At least 3 financial institutions supported in developing energy loans product by the end of Q7.	PMU-MoE								

4.2 Budget for the Implementation Plan

This budget is provisional and based on a 24-month action plan. Figures may change based on overall EAC budgeting and ultimately agreed activities

	Outputs and Activities	Organisations Responsible for the Action and Output	Activity Explanation *(where necessary)*	No of Units	Unit Name	Cost per Unit (US$)	Total Cost
1	***Modern energy services provision across the 4 targets incorporated in budgets, sectoral strategic plans and medium terms plan at national, district and local level.***						**36,900**
	Conduct a detailed review of relevant sectoral strategic plans and associated sectoral need assessment in relation to modern energy services to support their objectives.	PMU-MOE	Contracted and to take 30 days	30	man days	500	15,000
	Hold consultative workshop(s) to review consultant report with MOPND, MOF, MOE and relevant sectoral Ministries.	PMU-MoE/MoF/MoPND	30 pax for a two days workshop	2	days	2,000	4,000
	Constitute an interministerial working group to incorporate modern energy provision issues in the draft sectoral plans.	Sectoral focal points	Five days to come up with a draft revised sectoral plans; a team of an average 6 persons	30	man days	150	4,500
	Discuss and Validate the final report through a workshop.	PMU-MOE	30 pax for a one day workshop	1	day	2,000	2,000
	Prioritise modern energy services for the 4 targets in budgetary allocation as a co-poverty programme.	PMU-MoE/MoF					-
	i. Prepare a concept paper.	MoE	To be developed by the project management unit	3	man days	400	1,200
	ii. Conduct Sentization Seminar for policy and decision makers to support the initiative.		Hold two seminars for the policy makers and energy committees, one day each	3	days	3,000	9,000
	iii. Develop a five years budgetary implementation plan.	PMU-MoE/MoF	To be developed by the PMU-MoE in conjunction with the	4	days	300	1,200.00

	Outputs and Activities	Organisations Responsible for the Action and Output	Activity Explanation *(where necessary)*	No of Units	Unit Name	Cost per Unit (US$)	Total Cost
			ministry of finance technical staff				
2	***Multisectors (governments, private and NGOs sectors) policies and action plans on provision of modern energy services harmonised and strengthened.***						**68,500**
	Identify, map and analyse actors in the provision of modern energy services in the country.	PMU-MoE	Contracted and to take 20 days	20	days	500	10,000
	Hold a joint consultative workshop for all the actors in modern energy services provision.	PMU-MoE	All stakeholders to be invited to be about 60 pax	2	days	4,000	8,000
	i. Setup a technical multisectoral committee to oversee the process.	PMU-MoE	Will have 4 sessions to complete the process, composed of 8 persons	32	man-days	300	9,600
	ii. Review the findings of the consultants and convene a joint consultative workshop to validate the findings.	PMU-MoE/NGOs/Private sectors	Stakeholders workshop of about 60 pax consequtively hence accomondation for some.	2	days	4,000	8,000
	Review, identify gaps of current policies and action plans and propose a menu of frameworks including timeline for implementation.	PMU-MoE					-
	i. Prepare a terms of reference for the consultancy.	PMU-MoE	This will be done by the technical multisectoral group, same budgetas in Row 14	1.5	days	-	-
	ii. Hire a consultants to undertake the analysis on best approach of harmonisation different institutions.	PMU-MoE	Contracted and to take 25 days to conduct the assignment	25	days	500	12,500

	Outputs and Activities	Organisations Responsible for the Action and Output	Activity Explanation *(where necessary)*	No of Units	Unit Name	Cost per Unit (US$)	Total Cost
	iii. Develop an implementation plan for a new 'multisectoral coordination' framework.	PMU-MoE	To be done by a consultant for subsequent submission to stakeholders to adopt it	5	day	500	2,500
	iv. Hold a review and validation workshop.	PMU-MoE/NGOs/Private sectors	A one day workshop	1	day	2,000	2,000
	Harmonise sectoral policies on sustainable fuelwood supply in the agriculture, forestry service, energy and environment and natural resources sector among others.	PMU-MoE/MoA/MoENR/FS/NEMA					-
	i. Review public sectors policies- gaps, threats, opportunities and strength in addressing fuelwood supply.	PMU-MoE	Contracted or technical members of the target ministries to take 15 days to complete the assignment	15	days	500	7,500
	ii. Hold a joint consultative meeting of key stakeholders to strategise on policies harmonisation.	PMU-MoE/MoA/MoENR/MoH/FS/NEMA	interminesterial workhshops for 2 days, to have about 20 pax	2	days	3,000	6,000
	iii. Select a technical working group.	PMU-MoE/MoA/MoENR/MoH/FS/NEMA	This will be done during the workshop and hence no separate budget	0.5	days	-	-
	iii. Develop a clearly defined framework of roles and responsibilities of each sector.	PMU-MoE/MoA/MoENR/MoH/FS/NEMA	Select committee to have a sitting of 4 sessions to complete the task each with two days	8	man days	300	2,400
3	***Strategy for public and private partnership (PPP) for modern energy services put in place.***						**30,000**

	Outputs and Activities	Organisations Responsible for the Action and Output	Activity Explanation *(where necessary)*	No of Units	Unit Name	Cost per Unit (US$)	Total Cost
	Undertake a needs assessment for PPP in modern energy services provision and identification of practical roles they can play.	PMU-MoE	To be contracted and to undertake the assignment for 15 days	15	man days	500	7,500
	Organize a public and private sector consultation forum.	PMU-MoE/Private Sectors	Will be attended by the public and private sectors. 40 pax for one day	1	day	1,500	1,500
	Prepare a PPP strategy.	PMU-MoE	Contracted and to take 30 days	30	man days	500	15,000
	Review, adopt and disseminate the PPP strategy on modern energy services provision.	PMU-MoE/Private Sectors	Consultative workshop for 2 days	2	days	3,000	6,000
4	***Peri-urban and urban poor clearly mapped out and electrification strategy developed.***						**63,600**
	Undertake a modern energy need assessment for peri-urban and urban poor.	PMU-MoE	Contracted and to take 20 days	20	man days	500	10,000
	Prepare peri-urban zoning guidelines.	PMU-MoE	Contracted and to take 20 days	20	man days	500	10,000
	i. Hire a consultant to prepare the guidelines.	PMU-MoE	Same as in Row 34			-	-
	ii. Workshop for physical planners and other key stakeholders to discuss and validate the findings.	PMU-MoE/MoL/MoLG etc	One day workshop; 20 pax	1	day	1,500	1,500
	iii. Constitute a technical team to oversee the implementation of the guidelines.	PMU-MoE/MoL/MoLG etc	To be composed from the relevant government department and utilities; have a quarterly sitting during project period and to continue after ; 8 pax	16	man days	300	4,800

	Outputs and Activities	Organisations Responsible for the Action and Output	Activity Explanation *(where necessary)*	No of Units	Unit Name	Cost per Unit (US$)	Total Cost
	Develop an electrification strategy for peri-urban and urban poor.	PMU-MoE	Contracted out for a period of 30 days	30	man days	500	15,000
	i. Convene a stakeholdes workshop to give input to the consultant draft document.	PMU-MoE	one day workshop; 20 pax	1	day	1,500	1,500
	ii. Visit a best pracice country for experience and learning.	PMU-MOE	a team of 8 visit to another country for 5 days	8	persons	2,000	16,000
	ii. Incorporaton of the stakholders comments in the draft strategy.	PMU-MoE	Budget as in Row 37			-	-
	iii. Publication of the strategy and commencement of it implemention.	PMU-MoE	Technical team constituted in Row 36 will oversea the implementation; to be meeting quarterly	16	man days	300	4,800
5	***Modern energy services need incorporated in education, health and productive sectoral policies.***						**46,400**
	Undertake energy needs assessment for education, health and productive sectors.	PMU-MoE	Contracted and to take 25 days to conduct the assignment	25	man days	500	12,500
	Hold a stakeholders workshop to validate needs assessment report.	PMU-MOE/MoH/MoE/MoTI	A one day workshop for 25 pax	1	day	2,000	2,000
	Constitute a taskforce to develop a strategy for integrating modern energy services in their sectoral policies.	PMU-MOE/MoH/MoE/MoTI	Task force to be comprised of 8 persons and to have 6 sessions	48	man days	300	14,400
	i. Terms of reference for the task force developed.	PMU-MOE/MoH/MoE/MoTI	To be done by the PMU staff			-	-

	Outputs and Activities	Organisations Responsible for the Action and Output	Activity Explanation *(where necessary)*	No of Units	Unit Name	Cost per Unit (US$)	Total Cost
	ii. Develop modern energy services integration strategy.	PMU-MOE/MoH/MoE/MoTI	Task force to come up with the strategy, the budget is the same on Row 45			-	-
	iii. Visit to the best practice countries for experience and learning.	PMU-MOE/MoH/MoE/MoTI	a team of 8 visit to another country for 5 days	8	persons	2,000	16,000
	iv. Disseminate the taskforce report through a consultative meetings.	PMU-MOE/MoH/MoE/MoTI	One day workshop; 20 pax	1	days	1,500	1,500
6	***Standards and codes of practice developed/enforced and harmonised.***						**79,000**
	Create awareness and sensitisation for the existing codes and standards.	PMU-MoE/ KBS	To be done through the media (television, radios, posters and flyers	1	Block allocation	10,000	10,000
	Develop /finalise standards and codes of practice for renewable energy technologies (biogas, small hydros, wind, solar heating systems).	PMU-MoE/ KBS	Technical committee meetings for 5 sessions each for the 3 technologies not started and fast-tracking the others; 6 man team each	90	man days	100	9,000
	Disseminate and enforce standards.	PMU-MoE/ KBS	The project to offer a supportive role by offering two technical persons to ensure that the standards are adhered by for 120 days distributed throughout the project	120	days	500	60,000
	Harmonise regional codes and standards **	EAC/ KBS/UNBS/TBS	This is a regional activity and the				-

	Outputs and Activities	Organisations Responsible for the Action and Output	Activity Explanation *(where necessary)*	No of Units	Unit Name	Cost per Unit (US$)	Total Cost
			budget should come from the EAC				
	i. Develop the terms of reference for the consultant.	EAC/ KBS/UNBS/TBS					-
	ii. Hire a consultant to review the regional standards and codes of practice.	EAC/ KBS/UNBS/TBS					-
	iii. Regional workshop to deliberate on harmonised standards and codes of practice.	EAC/ KBS/UNBS/TBS					-
	iv. Draw an implementation plan.	EAC/ KBS/UNBS/TBS					-
7	***Sensitisation created, manpower trained and equipped with the necessary tools at all levels and across gender divide.***						**385,500**
	Undertake training and awareness needs assessment for all actors across the 4 targets.	PMU-MoE	Contracted and to take 15 days	15	man days	500	7,500
	Develop technical and non-technical training action plan.	PMU-MoE	Contracted and to take 5 days	5	man days	500	2,500
	Prepare training modules and tools for each target group.	PMU-MoE	Contracted and to take 25 days to prepare all the modules to be used for training	25	man days	500	12,500
	Undertake the training.	PMU-MoE					-
	i. Training for stove producers.	PMU-MoE	A total number of 10 groups to be targeted with each group taking 10 days to be trained	10	sessions	5,000	50,000
	ii. Training seminars for MFIs, NGOs and utilities on their roles in modern energy services provision.	PMU-MoE	Three different seminars will take place each taking two days with a pax of 15	6	days	1,500	9,000

	Outputs and Activities	Organisations Responsible for the Action and Output	Activity Explanation *(where necessary)*	No of Units	Unit Name	Cost per Unit (US$)	Total Cost
			each				
			Trainer	6	man days	500	3,000
	iii. Targeted technical trainings on small hydro, solar PV, Biogas technology, wind etc.	PMU-MoE	PV to take 10 days targeting 3 groups of 10 each	30	groups	700	21,000
			Biogas and smallhydro will be done in phased approach 5 individuals trained in each	10	persons	1,000	10,000
			Wind 15 days for 10 persons	150	days	100	15,000
			Trainer	85	man days	500	42,500
	iv. Undertake community group trainings on opportunities for productive uses of energy.	PMU-MoE	Technical training for 5 groups with different productive opportunities each for 5 days. @ group allocated US$ 50 dollars per day	25	days	100	2,500
			Trainer	25	man days	500	12,500
	Identify and analyse the most appropriate communication media for awareness and sensitisation campaigns for all target groups.	PMU-MoE	To be conducted by the PMU- budget absorbed in administration			-	-

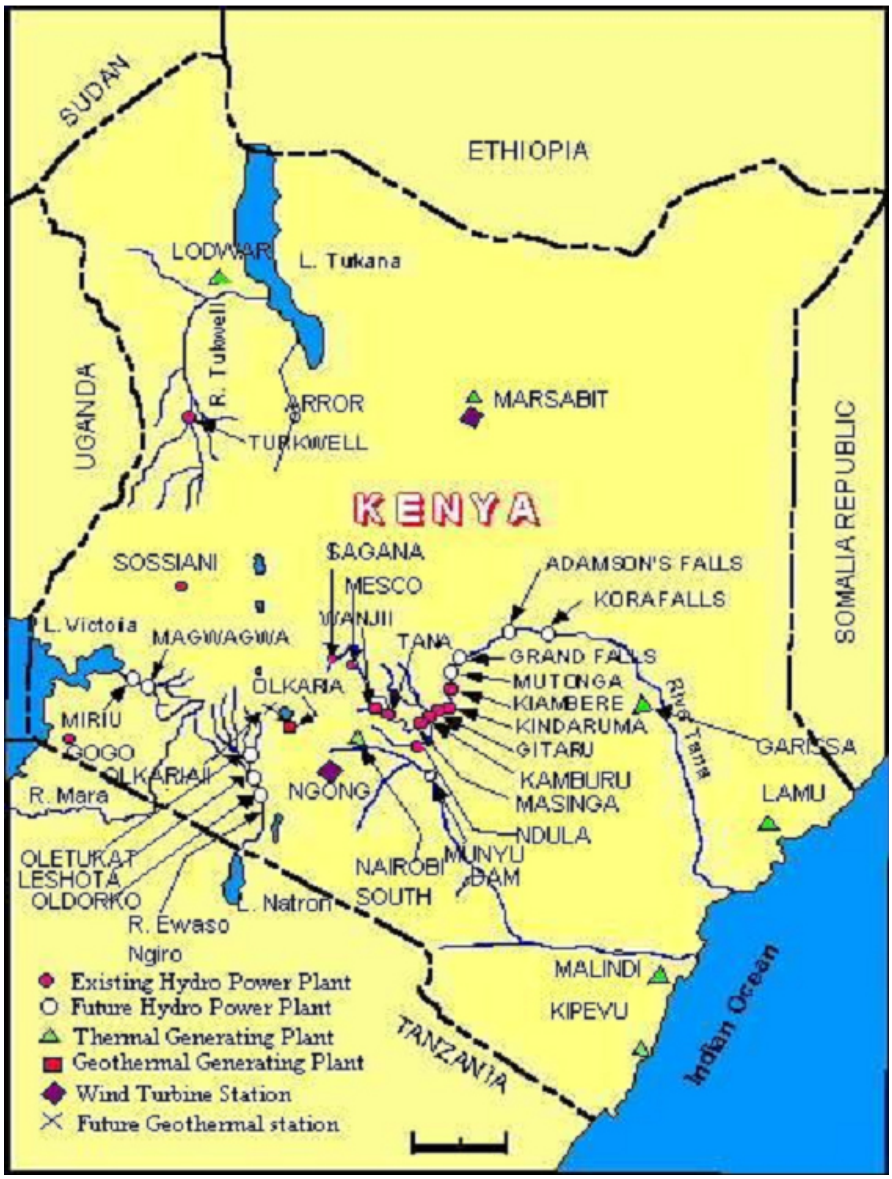
	Outputs and Activities	Organisations Responsible for the Action and Output	Activity Explanation *(where necessary)*	No of Units	Unit Name	Cost per Unit (US$)	Total Cost
	Develop awareness materials (print media and audio/visual programmes) and organise targeted campaigns on modern energy services on households, institutions and productive opportunies of energy.	PMU-MoE	Contracted for design and production				-
	i. Posters A4 and A3 sizes.	PMU-MoE	A total of 5000 pieces each costing US$ 1	5000	pieces	1	5,000
	ii. Brochures and flyers.	PMU-MoE	A total of 10,000 brochures and flyers each costing US$ 0.25	10000	pieces	0.25	2,500
	iii. Radio programmes.	PMU-MoE	Each mention costing US$ 100 for 200 mentions using different stations	200	mentions	100	20,000
	iv. TV programmes.	PMU-MoE	Each programme costing US$ 2000 for 10 mentions	10	programmes	2,000	20,000
	v. Bill boards.	PMU-MoE	Each costing US$ 3000 for a 50 billboards	50	billboards	3,000	150,000
8	***Innovative business models developed***						**24,000**
	Analyse existing business models, gaps and strengths.	PMU-MoE		10	days	500	5,000
	Develop innovative business models reflecting the diverse socio-economic conditions in the country and based on HILCs approach.	PMU-MoE		20	days	500	10,000

	Outputs and Activities	Organisations Responsible for the Action and Output	Activity Explanation *(where necessary)*	No of Units	Unit Name	Cost per Unit (US$)	Total Cost
	Hold stakeholders workshop with MFIs, MOE, MOF, NGOs and private sectors.	PMU-MoE/MoF/Fis/NGOs/Private sectors	This will be a joint meeting to discuss the best way forward by involving particularly the MFIs in enhancing energy access	2	days	2,000	4,000
	Assist financial institutions in developing energy loans products and related publicity materials.	PMU-MoE	This assignment will be distributed throughout the project period	10	days	500	5,000
	Project management unit (PMU)						**273,100**
	1 Project manager			24	months	3,000	72,000
	2 programme officer			48	months	1,500	72,000
	1 administrative secretary			24	months	500	12,000
	Project accountant			24	months	1,500	36,000
	A messenger			24	months	300	7,200
	2 driver			48	months	300	14,400
	3 computers desktop			3	units	700	2,100
	2 laptops			3	units	800	2,400
	1 photocopier			1	unit	2,000	2,000
	2 project vehicle			2	units	20,000	40,000
	5 office seats			5	units	100	500
	5 office desks			5	units	100	500
	Office running budget			24	months	500	12,000
						Total	**1,007,000**
	Contigency (5%)			5%			50,350
						Grand Total	**1,057,350**

ANNEXES

Annex 1: Figures

Figure 1: Electricity-Energy Resources Map of Kenya



Source: KenGen, 2008

Annex 2: Tables

Table 1: Summary of Kenya's Energy Needs and Carriers

Energy Needs	Light	Cooking	Heating	Cooling	ICT	Mechanical	Pumping	Transport
Energy Carriers								
Electricity	√	√	√	√	√	√		
Solar PV	√			√	√			
Kerosene	√	√						
Wind	√						√	
Wood fuel	√	√	√					
Biofuel						√		√
Biogas	√	√			√			
Lead Acid Batteries	√				√			
LPG	√	√	√					
Petroleum / Diesel						√		√
Thermal-Diesel	√	√		√	√	√		

Table 2: Summary of Kenya's Energy Carriers and Active Technologies

Technologies / Applications	Light	Cooking	Heating	Cooling	ICT	Mechanical	Pumping	Transport
Light Bulb	√							
Flourescent tube	√							
Traditional stove		√	√					
Improved stove		√	√					
Kerosene stove		√	√					
Wick lantern	√							
Biogas digestor	√	√	√					
Lead acid battery	√							
Gas lamp	√							
Telephone					√			
Computer & Internet					√			
Automobile								√
Grain Mills						√		

Table 3: Linkage Between Kenya's Energy Carriers and EAC-EASUP Targets

EAC targets	Light	Cooking	Heating	Cooling	ICT	Mechanical	Pumping	Transport
Target 1		√	√					
Target 2	√	√	√	√	√	√	√	√
Target 3	√			√	√			
Target 4				√		√	√	√

Table 4: Kenya's Energy Resource and Services Matrix

Energy Source	Plant Biomass	Animal Biomass	Fossil Fuels	Geothermal	Thermal	Co-generation(bagasse)	Water (hydro)	Wind	Solar PV	Biofuel
	(Million Tonnes)	(Biogas) m3/day	(Million ToE)		(MW)	(MW)	(MW)		(MW)	(Litres)
Potential Resource			2000MWe			300	1558	346W/m2		
Active / installed Resource	33.9	16,704	2.3	121MW	420.7	36.5	681.28	550Kw	4	
Services Rendered										
Illumination	√	√	√	√	√	√	√		√	
Heating(Space & Water)	√		√	√	√		√			
Cooking	√	√	√	√	√	√	√		√	
Refrigeration	√			√	√	√	√			
Communication		√		√	√	√	√		√	
Mechanical Power	√			√	√	√	√	√		
Pumped water	√						√	√		√
Transportation			√							
Relevance to EAC Targets										
Target 1	√	√	√	√	√	√	√		√	
Target 2	√	√		√	√	√	√			
Target 3	√	√		√	√	√	√	√	√	
Target 4	√		√	√	√	√	√			√

Table 5: Source and Quantities of Biomass Energy in Kenya.

Source	Quantity m3
1] Indigenous vegetation	16,307,703
2] Farmlands	14,380,951
3] Plantations	2,717,972
4] Residues from agriculture	3,085,800
Total	**33,406,626**

Table 6: Major Sources of Fuel wood (Year 2000)

Major Sources	Breakdown of Agroforestry Sources	Percentage Contribution (%)	Percentage Contribution (%)
Agroforestry	Boundary/Fences	25	
	Crop Land	13	
	Woodlot	8	
	Roadside	5	
	Neighbour	13	64
Trust Land			8
Gazetted Forest			8
Others			20
Total			**100**

Table 7: Electricity Consumption in Urban and Rural Areas (Year 2000)

Electricity, Kenya	Rural Areas				Urban areas			
	High Potential Zone	Medium Potential Zone	Low Potential Zone	Rural average	High Income	Medium Income	Low Income	Urban average
Household size	4.5	4.4	4.8	4.6	4.1	4.2	3.8	3.9
Electricity consumption (kWh/hse/yr.)	511	541	672	544	1352	931	606	844
Per capita consumption (kWh/yr.)	106	121	140	115	338	217	162	217
%age using Electricity (%)	4.2	5.3	1.8	3.8	89	83	26	45.7

Adapted from Kamfor, 2002

Table 8: Firewood Consumption in Rural and Urban Areas

Description	Rural Areas	Urban Areas
Household Size	4.6	3.9
Fuelwood consumption (kg/hse/yr)	3,394	2,701
Per capita consumption (kg/yr)	741	691

Table 9: Saving from Improved Stove (Kenya Ceramic Jiko) in Kenya

Average Daily Charcoal Consumption *(kg per person per day)*		Yearly savings per family (kg)	Value of savings (US$)	GNP per Capita (US$)
Traditional Stove	**Improved Stove**			
0.67	0.39	64.7	613	350

***Source**: Karekezi and Ranja, 1997; World Bank, 2003*

Table 10: Charcoal Consumption in Rural and Urban Areas

	Rural Areas	Urban Areas
Household Size	4.6	3.9
Charcoal consumption (kg/hse/yr)	717	593
Per capita consumption (kg/yr)	156	152
Percentage using charcoal (%)	34	82

Table 11: Current Exploited Energy Resources

Source	**KenGen**		**IPP**		**KPLC**	
Units in MW	**Installed**	**Effective**	**Installed**	**Effective**	**Installed**	**Effective**
Hydro	677.3	659.4				
Thermal	153.7	135.1	232	239		
Geothermal	115	115	13			
Isolated	0	0			5.6	4.4
Wind	0.4	0.4				
Imports	0					
Total	**946.4**	**909.9**	**245**	**239**	**5.6**	**4.4**
Total combined capacity = 1197; effective = 1153.3MW						

Source: Kenya Power and Lighting Co. Limited Annual Report 2007

Table 12: Summary of Non-Electrified Loads in Kenya[37]

Province	**Secondary Schools**	**Markets**	**Health Centres and Dispensaries**
Central	369	273	143
Rift valley	676	222	549
Nyanza	753	540	169
Western	415	390	105
Eastern	921	618	348
North Eastern	15	21	81
Coast	89	191	126
Total	**3238**	**2255**	**1521**

Source: Current Rural Electrification Master Plan Update

[37] *These figures are changing regularly due to the Government Schools Electrification Programme using solar power.*

Annex 3: EAC-EASUP Demand-side Options for Energy Finance in Kenya

Demand Side Finance Tools

Energy Service Or Application Acquisition Tool	Explanation of The Tool	Relevance To Energy Access Market	Potential Application In EA-EASUP
Consumer Subsidies	A subsidy is any intervention that results in a sub-market price, whether for goods or services, including financial services. The sub-market price can also be zero.	Subsidies have been applied in Kenya in many interventions, especially in project environments. Examples include domestic consumer tariff subsidies by KPLC, interest rate and capital cost subsidies for the purchase of solar PV systems and institutional stoves.	In the foreseeable future, subsidies will continue to play a key role in encouraging market penetration and popularization of energy products in Kenya. This is because of the combined effect of current low levels of sensitization and high levels of poverty; not forgetting relatively high cost of energy products and services. *Potential:* EAC-EASUP will of necessity need to apply 'smart subsidy' strategies if the access to modern energy services is to be up-scaled significantly and promptly.
Grant	Subsidies and grants are terms commonly used inter-changeable, even though some attempt to make a distinction between the two. One school of thought is that a grant is a free item or service provided by a third party to a consumer, either directly or indirectly; as opposed to a subsidy which is a reduction in financial exposure. Another thought is that grants can be repayable or written off, whereas subsidies can never be repaid. The confusion however, is that a 100% subsidy can also be referred to as a grant.	This is a familiar term, having been applied widely by donors in Kenya in the past. It is inevitable in public (Government, multilateral; and bilateral) finance. With respect to energy, a good example is the biogas installations of the 1980's in Kenya, which were largely free systems.	Grants have received mixed review results, with some claiming they are ineffective and market destroyers, whereas others argue that poverty beckons grants. *Potential:* EAC-EASUP will need to raise funds from donors and development partners. The programme will also have to address access to modern energy services by the poorest of the poor. Targeted grants programmes will therefore need to be a notable component of the initiative.
Upfront	Cash across the counter or	Most common transaction	Distribution and logistical

Energy Service Or Application Acquisition Tool	Explanation of The Tool	Relevance To Energy Access Market	Potential Application In EA-EASUP
Cash Purchase	upon collection or delivery.	tool in Kenya's domestic energy sector, with the exception of electricity bills. Examples include purchase of LPG refills and KCJ stoves.	efficiencies are critical for a cash purchase system. The buyer needs to find the energy product or application in stock. *Potential:* EAC-EASUP support to entrepreneurs.
Advance Cash Purchases or Lay Away	Advance payments are made in installments until the full price is achieved, enabling the buyer to collect the item purchased.	The seller maintains the purchase price while the buyer makes agreed installments. It is practiced mainly in rural and urban stores where a customer has confidence in the seller. Examples are mainly in energy applications, such as water pumps, TVs and radios.	Consumers making advance payments to vendors are capable of making regular savings. Vendor who can hold a price on a guaranteed sale are capable of getting into a consumer finance programme. *Potential:* EAC-EASUP can design a guarantee that enables vendors to hold prices and financial institutions to advance the balance of purchase price once a consumer has paid half-way, hence enabling accelerated access to energy services and products.
Modular Cash Purchase	Incremental purchase of energy components.	This is most common where low income earners purchase components that make up a system they cannot afford in full upfront. Examples include purchase of solar systems on piecemeal basis, with an additional component being purchased whenever cash is available.	Where modular purchases involve components that make up a system, such as solar PV, quality and performance of the system can be compromised. *Potential:* an evaluation by EAC-EASUP of the systems which face modular purchases, and to design alternative purchase mechanisms for the consumers.
Co-op Finance	Savings and Credit Co-operatives in Kenya bring together a group of people involved in similar business, employment, agricultural or other economic activity.	A typical Sacco borrower, normally a member (shareholder) of the Sacco, can borrow against a combination of his savings and peer guaranteed backed by peer savings. Examples include loans for grid connection, purchase of	Saccos are increasingly willing to sample new profitable product lines and have recently adopted both microfinance and front office service strategies. *Potential:* The cooperative finance channel is a highly viable route for EAC-EASUP in accessing rural based energy consumers.

Energy Service Or Application Acquisition Tool	Explanation of The Tool	Relevance To Energy Access Market	Potential Application In EA-EASUP
		water pump, etc. Some Saccos in Kenya have experimented with solar and LPG loans as well.	Partnership with local the local distribution utility KPLC should also be examined. Can be back by a national credit guarantee, if necessary.
Consumer Finance	A mostly unsecured or loosely secured loan by a commercial bank or MFI to a consumer with a guaranteed source of income.	The loanee pays an interest based on a rate higher than market to compensate for the increased portfolio risk. Examples include consumer finance schemes for LPG, cookers, SHS, generators, etc. Ordinarily the bank would not require the loanee to prove purchase of the intended item.	EAC-EASUP can play a key role in sensitization of banks and MFIs to energy lending. *Potential:* Replication and expansion of successful initiatives.
Micro Finance Loans	In Kenya, microfinanciers focus on both group-based lending (where a properly constituted group issues a group guarantee for a member to access a loan) and individual loans where the borrower can provide collateral.	The uniqueness of microfinance is flexibility of lending terms and collateral, as well as lending in small loan units. However, most microfinance models require close monitoring of loans and this results to higher than average banking sector interest rates and other charges.	The microfinance sector has grown tremendously in Kenya, to the extent of threatening the cooperative movement, hence the reason for Saccos to venture into microfinance and FOSAs. There are currently over 5 million Kenyans in this sub-sector. *Potential:* EAC-EASUO cannot ignore MFIs as a vehicle for delivery of financial services. There are already some MFIs who have put their footprint into energy, and EAC-EASUP can not only encourage them further, but also assist in capitalizing dedicated energy product portfolios.
Hire Purchase	Product based credit where the buyer takes the product away and makes equal periodical payments (which	The seller maintains ownership of the item until fully paid for. Examples in Kenya are mainly for	Hire purchase is considered an expensive way to finance energy systems as final payments total, in many cases, over 150% of the

Energy Service Or Application Acquisition Tool	Explanation of The Tool	Relevance To Energy Access Market	Potential Application In EA-EASUP
	includes a finance cost loaded to the price). The item acts as collateral, under a chattels mortgage.	household items, including energy-related items such as LPG cookers, lanterns, solar systems and components.	cash price. It is more expensive that taking a loan. *Potential:* EAC-EASUP can however bring down the HP margin for energy products by issuing a guarantee or funded line of credit to HP companies.
Fee-for-Service	Similar to the hire purchase system where the seller retains ownership. The distinction however is that the buyer pays only for the service rendered by the equipment. In some cases, at the end of a lease period, the customer has the option of purchasing the equipment at some pre-agreed residual value.	The customer receives services as long as regular or usage-linked payments are made. Grid connection is an example of a fee-for-service (FFS). Solar and generator installations have also been modeled into FFS systems. Stoppage in payments results in removal of connection or equipment.	Energy Service Companies, which ordinarily undertake FFS business, are non-existent in Kenya, save for the national utility KPLC. In recent time, community groups undertaking micro and pico hydro projects have also started to distribute power. *Potential:* This is nascent ground for EAC-EASUP. The potential exists and needs to be harnessed. It can make a major contribution to energy access.
Retail Credit	This is effectively a loan-in-kind. The buyer promises to pay at certain date(s). The seller releases the product and waits for servicing of the 'loan'.	It is attractive to the buyer as there is no interest on the 'loan.' It is not widely applied in Kenya for energy products, though popular with grocery stores and local kiosks. It is built on a personal relationship between the buyer and seller. The closest energy product example is the improved cookstove.	Due to the personal touch element, retail credit has major limitations. However, it can be harnessed at the village level where habitat is permanent and family and friendship lineage is strong. *Potential:* Specific manufacturing and distribution initiatives can apply this type of credit. EAC-EASUP can help instutionalise this kind of credit—for example, a stoves manufacturing women group can partner with a social women group to transact, at group level, in retail credit. Peer pressure and reputation would in this case be key.
Informal Credit or	The loan is made under informal or semi-formal	Such loans are normally taken under pressure and	In the context of EAC-EASUP, informal credit may not play a

Energy Service Or Application Acquisition Tool	Explanation of The Tool	Relevance To Energy Access Market	Potential Application In EA-EASUP
Shylocking	arrangements. Collateral terms are highly flexible. The process is fast and interest rates much higher than all other forms of financing, including HP. Non-payment attracts highly punitive surcharges.	emergency situations, or when a 'deal' that is highly profitable may be lost. It is normally for business purposes or to deal with personal cash crisis. It is not very relevant to energy products, except in emergency situations, such as a power disconnection.	major role. This is because of lack of an institutional framework to inter-face with the informal lenders. In any case, and in most circumstances, such lenders do not desire publicity with the Government or the formal private sector.

Annex 4: Consultative Group Meeting

Minutes of the stakeholder meeting held at the Ministry of Energy on 20th March 2008

Time **10.30 am**
Date: **20th March 2008**
Place: **Ministry of Energy, Nyayo House — 23rd Floor, Conference Room.**

Agenda

Regional Strategy on Scaling Up Access to Modern Energy Services: *Presentation of the Baseline and National Implementation Plan for Kenya by the National Consultant in order to obtain comments and get validation of contents by the stakeholders.*

Members present

1. Ashington Ngigi – National Consultant
2. Boniface Kinyanjui – KPLC
3. Charles Gitundu – RETAP
4. Daniel Macharia – IT Power
5. Daniel Theuri – Practical Action
6. Doris Murigi – NOCK
7. Edwin Kibe –
8. Eng James Mureithi – Ministry of Energy
9. Foulata Kwena – UNDP-Kenya
10. Francis Kiptor – Kenya Pipeline Company
11. James Wafula – University of Nairobi
12. James Wakaba – Energy for Sustainable Development
13. Jennifer Gachie – KENGEN
14. Joseph Njuguna – Consultant
15. Kenneth Muzee – AFREPREN
16. Maina Manyeki – Ministry of Energy
17. Margaret Ndung'u – Ministry of Agriculture
18. Martin Owino – Ministry of Health
19. Paul Kirai – GTZ/UNDP Consultant
20. Paul Mbuthi – Ministry of Energy
21. Peter Koome – Ministry of Energy.

Absent with apologies

1. Eng. I. N. Kiva – Ag. DRE, MOE
2. Myra Mukulu – GTZ Regional Energy Advisory
3. Timothy Mogambi – Kenya Pipeline Compnay
4. Kiremu Magambo – Consultatant, Ministry of Energy

Absent without apologies

1. Frederick Nyang – Energy Regulatory Board
2. Ng'anga Munyua – Rural Electrification Agency

Minutes 1/20: Introduction

The meeting started at 10.30 am with the National Consultant, Mr. Ashington Ngigi, giving an opening introduction of the EAC and the reason for the validation workshop. All the members present were given an opportunity to introduce themselves and the organisations they represent.

- Apologies were received from the Ag. Director of Renewable Energy (MOE) Eng. I. N. Kiva who was attending to official matters elsewhere. Comments and suggestions attributed to Eng. Kiva were however availed and subsequently included in the final document.
- Ashington highlighted that the documents belong to the whole of Kenya
- He gave a brief introduction of the EAC scale-up strategy that was started in 2005 following Energy for Development meeting between the EAC countries.
    - The initiators of the process included among others, Daniel Theuri of Practical Action, who was then asked to give a brief summary of the origins of the EAC Energy Scale-up Strategy.
    - Daniel Theuri then took the meeting through the origins of the EAC scale up process:
        i. The discussions regarding access to modern Energy Services for the vast majority of the population in the EAC countries started in 2005. These discussion involved the UNDP, Bernard Osawa (then with IT Power), and Daniel Theuri (Practical Action).
        ii. After several round table meetings, four target areas were identified as being crucial in up-scaling modern energy services in the region. These are:
            1. Adoption of modern cooking practices.
            2. Electricity for the Peri-urban and urban poor.
            3. Energy services for schools, clinics and community centres.
            4. Motive power for productive use in rural communities.
        iii. The strategy generated the political goodwill under the EAC banner and was adopted by the EAC Energy Council of Ministers and Heads of State.
        iv. The respective countries of the EAC were then charged with developing their multi-sectoral national strategies comprising of government sectors, parastatals bodies, and private organisations.
        v. It was recognised that there was a great need to move from having a strategy paper to having a practical implementation plan.
        vi. There was need therefore to come up with an:
            1. implementation framework
            2. investment programme

            that would address several pilot projects to be run within a period of 24 months.
        vii. These pilot projects would then act as the foundation upon which the long-term investment programme would be built.

    - Following this brief by Daniel Theuri, Ashington then requested James Mureithi of the MOE to lead the meeting through the Baseline Energy situation in Kenya.

Minutes 2/20: Presentation by Mureithi

Baseline energy situation in Kenya

Mr. Mureithi of the Ministry of Energy made the presentation on baseline energy situation in Kenya. The comments were coming in as the presentation was continuing as highlighted below:

Electricity

- Peak local demand 1025MW (personal communication)
- Losses reduced to 14.5% by 2012

- Various initiatives are being undertaken in order to achieve an additional 1,000,000 customers in the next 5 years.
- Issue of high connection fees need to be addressed by the strategy?
- What is the relationship between the connection cost between Kenya and others?
- The current target for connections in the year 2008 still stands at 120,000 but as from 2009, it will be revised upward

Solar PV

- The growth in solar PV uptake has been growing at a rate of 20,000 units, a study was done in year 200,000 was done in 2000, need to revise?
- The issue of 4MW in solar need to be revised?
- The data capture in relation to solar is not comprehensive and up to date.
  ACTION: Data needs to be revised.

Thermal power

- Thermal diesels are owned by REA and not the KPLC, but are operated by KPLC
- KPLC operates and does not own the Thermal Diesel Stations. The Government own the thermal stations however KenGen owns Lamu and Garissa
- Tsavo is Thermal
- Thermal power effective installed capacity is about 420.7MW
- Need to break down on power generation:
  - Total
  - Exploited
  - Potential

Geothermal power

- Geothermal potential in Kenya?
  ACTION Jennifer Gachie of KenGen to update
- OrPower4 which is a geothermal station has been clarified as 13MW instead of 12MW
- GDC report gives 620MW-clarification from Kinyanjui and Jeniffer
- IPPs will have 35 MW by the end of the year 2008

Wind power

- The solar/wind capacity is likely to change soon after the SWERA mapping is completed
- Hybrid plants e.g. Marsabit need to be highlighted
- Pre-investment analysis are being done for Malindi, Ngong, Marsabit, Turkana and Kinangop...(Committed)

Co-generation

- Mumias feeding to the grid 2MW
- KENGEN is entering into an MOU with Chemilil for 20MW
- The Cogen from Mumias to KPLC will be completed by the end of year 2008
- Emergency power needs to be captured in the document

Electricity growth rates

- In 2006/07 the consumption of electricity grew by 8.7%

- Rural electrification grew by 33.9% in the year 2006/2007
- Need to bring the baseline in context of the EAC scale-up strategy to serve the underserved and unserved.
- The access rate is 22% but it is not documented anywhere instead of 15%
  NB: in low economic neighbourhood, there are many cases where one connection is serving a number of households
- Low income urban rate of 26% need to be qualified as many changes have taken place
- Columbia study done on electrification need to be revisited?

Solar Thermal Systems

- Solar thermal-heating applications need to be captured
- 1987 study by the world bank commissioned by the MOE 'solar water heater application in Kenya'
- Feasibility on solar water heaters
  ACTION: Paul Mbuthi to assist with the report

Kerosene and LPG

- Implication of kerosene for cooking and lighting? How can it be disaggregated?
- UNDP millennium group has given a broad based definition of modern energy services to be improved cooking technologies and any other tech that can concentrate… '*services*' is the key
- There is a dramatic growth of LPG and Kerosene over the last 3 years.
  ACTION: To obtain more information from PIEA.
- Desegregation of data in terms of years i.e. from 2003 to 2006.
- Qualify the lighting utilisation
- List of acronyms need to be reviewed and names made as complete as possible
- NB: Bio-diesel –instead talk about bio-fuel

Target 2:

- Remove the national figure and focus on the target

Target 3:

- No of health centres electrified
  ACTION: Martin Owino to provide more information
- Obtain Schools and Institutions that have access to modern energy studies ACTION: Charles Gitundu to provide data
- More information can be obtained from the Columbia study "electrification in Kenya'

Target 4:

- Was being driven by the UNDP under the MFP
- Central Bureau of statistics should provide data on the number of markets.
- Refer to the CBS definition of a 'market center'
- Need to tell the CBS what the lead agencies want for their purposes i.e. the users should participate in the process.

General comments from the participants

After the presentation by Mureithi, the floor was opened for more comments to be made regarding the presentation and the following persons made the comments as shown below:

1. **Theuri**

- There is need to contextualise the baseline to the strategy
- Datas need to be dissagregated in order to be meaningful to the study
- Where the poor are needs to be captured clearly
- Sources of information –most recent and try to qualify
- Analysis of the percentages (e.g. graphs) should be done to augment the data.
- Revisit the economic survey reports in order to get the trend over the years i.e 2003-2007

2. **Dorris Murigi**

- Need to get more recent information and talk with more people
- The report looks to have been collated from several referenced sources
- Most of the data does not seem to be older than 2002 which is a plus

Following the comments, Ashington then requested Paul Mbuthi of the MOE to lead the meeting through the Policy Frameworks

Minutes 3/20: Mbuthi Presentation

Paul Mbuthi made a presentation on policies and institutional frameworks and the following comments were made:

Policies

- Recognize those that negate the policy to increase access, e.g. Investment policy, Agriculture policy, Trade and Industry Act etc in order to understand the gaps to be addressed.

Policy statements

Well captured in rural energy. However the same needs to be done for the others e.g. biomass.

Institutional Issues

- Bias has been on energy planning.
- Lack of adequate data has been a handicap. The MOE should organize itself to become a data resource centre.

Following the comments, Ashington then lead the meeting through the Financial Mechanisms

Minutes 4/20: Ashington Ngigi

Mr Ashington Ngigi made a presentation on financial mechanism and budget and the following comments were made:

Comments

- Target 3 and Target 4 could be combined.
- Leveraging of Government support in alignment with EAC
- Capacity building should be well defined for institutions. E.g. donors do not support hardware. Therefore it is a good idea that the project will take place around a pilot programme.
- Human capital resource should be looked at to ensure continuity of the project.

Minutes 5/20: Paul Kirai

He gave an overview of the strategy and the role of the ongoing work

- He highlighted on each target and gave a brief of each
- Main issues over the 24 months period:
    - To prepare the ground for full scale projects
    - Capacity in the whole chain of production, supply and delivery and the market
    - Need to have pilot projects in each target which can be scaled up or replicated –learning by doing
    - Donor conference to be held later in the year to sell the ideas and concepts
    - There is a part that will be coming from the national resources as well as external resources
    - Energy committee will be meeting in April that will have an opportunity to validate the document and take it over.

Closing comments

- Target 1: targeting 50% - using the cheapest technology
- Replacement of cooking stoves to LPG
- Combine target 3 and 4 as target 4 will be putting in MFP
- Formulation of investment programmes- access to the services supported by ongoing programmes
- Leveraging of fund-government and donors
- Capacity building- innovations is needed to be linked with gadgets for implementing the programmes. Balancing the *hardware* and *software –need to address on quality and the mix with the delivery*
- i.e capacity to be built around implementation
- Need to involve people from Kenya Bureau of Statistics.
- After the EAC Arusha meeting, it is recommended that the group meets to review the progress of the project.

A.O.B

There being no Any Other Business, the meeting was closed at 2.00 pm.

Minutes prepared by James Wafula and Daniel Macharia, reviewed and approved by Ashington Ngigi.

Annex 5: List of Individuals and Agencies Contacted

1.	Francis Kiptoo	KPLC.
2.	Martin Owino	Ministry of Health.
3.	Joseph Njuguna	Formerly of GEF-KAM Energy Efficiency Project.
4.	James Wakaba	Energy for Sustainable Development (ESDA).
5.	James Wafula	University of Nairobi.
6.	Eng. James Muriithi	Ministry of Energy.
7.	Jennifer Gache	KenGen.
8.	Doris Mwirigi	National Oil Corporation.
9.	Daniel Theuri	Practical Action.
10.	Foulata Kwena	UNDP-Kenya (on behalf of Chris Gakahu).
11.	Daniel Macharia	IT Power (EA).
12.	Paul Mbuthi	Ministry of Energy.
13.	Edwin Kibe	ITC Energy.
14.	Eng. Isaac Kiva	DRE, Ministry of Energy.
15.	P. Koome	Ministry of Energy.
16.	Kennedy Muzee	AFREPREN/FWD.
17.	Boniface Kinyanjui	KPLC.
18.	Charles Gitundu	RETAP.

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