Climate Investment Funds

SREP/SC.IS.1/2/Rev.2
August 19, 2011

Intersessional Meeting of the SREP Sub-Committee
Washington, D.C.
September 8, 2011

INVESTMENT PLAN
FOR KENYA

Proposed Decision by SREP Sub-Committee

The SREP Sub-Committee, having reviewed the *Investment Plan for Kenya*, (document SREP/SC.IS.1/2),

a) endorses the Investment Plan as a basis for the further development of the projects foreseen in the plan and takes note of the requested funding of USD50 million in SREP funding. The Sub-Committee reconfirms its decision on the allocation of resources, adopted at its meeting in November 2010, that a range of funding for the country should be used as a planning tool in the further development of project and program proposals to be submitted to the SREP Sub-Committee for SREP funding approval. The range of funding agreed for Kenya is USD25-50 million in SREP resources.

b) takes note of the estimated budget for project preparation and supervision services for the projects referenced below and approves a first tranche of funding for MDB preparation and supervision services as follows:

   i. USD175,000 for the project "*200 MW Geothermal (Phase A)*" (African Development Bank).
   ii. USD175,000 for the project "*200 MW Geothermal (Phase A)*" (World Bank).
   iii. USD210,000 for the project "Hybrid *Mini-Grid Systems Project*" (World Bank).

c) requests the Government of Kenya and the MDBs to take into account all written comments submitted by Sub-Committee members by September 30, 2011 in the further development of the projects.

REPUBLIC OF KENYA

SCALING-UP RENEWABLE ENERGY PROGRAM (SREP)

INVESTMENT PLAN FOR KENYA

July 2011

SREP Investment Plan for Kenya

Executive Summary

Introduction

1. The objective of the Scaling-Up Renewable Energy Program in Low Income Countries (SREP) is to demonstrate, through pilot operations in selected countries, the economic, social and environmental viability of low-carbon development pathway to increasing energy access using renewable energy and creating new economic opportunities. Kenya is one of the six pilot countries selected to benefit from the SREP.

2. SREP-funded activities will support scaling up of renewable energy development in Kenya by assuming more risks, addressing key barriers to renewable energy development, catalyzing additional financial resources, focusing on co-benefits that will be felt by the current generation in local communities, and providing opportunities to learn lessons from its operations.

3. This document is Kenya's Investment Plan (IP), which is a country-level and outcome-focused programmatic approach to scaling up renewable energy. This IP is prepared under the leadership of the Government of Kenya and is in line with national renewable energy development strategy. This IP brings together into a single cohesive document various power sector, renewable energy and climate change policies, programs and initiatives.

Country and Sector Context

4. Kenya envisions transforming itself into a newly-industrializing, middle-income country by 2030, with a globally competitive and prosperous economy and high quality of life in a clean and secure environment. This is envisioned in a long-term development strategy of the country, Vision 2030. To achieve this vision, energy is identified as one of the foundations and enablers of the socio-economic transformation envisaged in the country. However, the Government recognizes that climate change could hamper the ambitious development goals articulated in the Vision 2030.

5. Although Kenya's current contribution to global change is relatively small, its greenhouse gas emissions are expected to increase rapidly. Moreover, inadequate access to affordable energy is limiting social opportunities for the poor, women and children in particular. Gender disparities in access to energy are drawing back social development of families and communities.

6. Nonetheless, Kenya now has a unique opportunity to propel its future socio-economic development by following a low-carbon path. As one measure of mitigation and adaptation to climate change, the Government has developed the National Climate Change Response Strategy of 2010 that integrates climate change dimension into national policies and programs. The low-carbon development can be facilitated by a dynamic private sector in the country that is active also in renewable energy development. Exploitation of renewable energy has a great potential to contribute to this goal and to promote gender equity and access to energy services in Kenya.

7. The broad objective of the energy policy in Kenya is to ensure adequate, quality, cost effective and affordable supply of energy through use of indigenous energy resources in order to meet development needs, while protecting and conserving the environment. In line with global environmental concerns, a cross-cutting theme of the energy sector strategy is to promote the use of green (low-carbon emission) energy for electricity generation where feasible, along with improving efficiency in the supply and end use of electricity.

8. Major reforms in the Kenyan electricity sub-sector have resulted in unbundling of a vertically-integrated monopoly, establishment of an independent regulator, participation of several players, including private power producers, and an efficient and transparent institutional framework.

9. The electricity sub-sector is facing challenges of: rapidly growing demand for electricity, high dependence on hydroelectric power which has become unreliable, high cost of supply, low access rate, compounded by the additional risk of climate change. Against these challenges, the Government's strategy for expanding infrastructure in the sector is to promote equitable access to quality energy services at least cost while protecting the environment. Renewable energy development is expected to play an important role in these regards.

Renewable Energy Sector Context

10. Despite a huge potential of renewable energy resources in Kenya, including wind, solar, small hydro, biomass, and geothermal, their development has been rather slow. The Government is committed to expedite the uptake of renewable energy resources, and has introduced a number of policy measures to promote them, including: (i) a feed-in-tariff policy; (ii) a study aimed at developing feasible renewable electricity generation options, regulatory instruments and guidelines needed for their integration; (iii) setting up of a Green Energy Facility to pool donor contribution to help finance renewable energy projects; and (iv) incorporation of renewable energy integration into Least Cost Power Development Plan (LCPDP) process.

11. In terms of the potential capacity, geothermal, solar (thermal and PV), and wind are particularly abundant in Kenya. In terms of the unit generation cost, geothermal is the most cost effective, followed by biomass, biogas, and wind. Even though steady progress has been made to develop the resource potential, there remain several significant barriers affecting the exploitation of renewable energy resources in Kenya. These barriers include: (i) technical and human capacity, (ii) economic and financial, and (iii) social constraints. Removing these barriers, supported by SREP, will not only help the country meet its growing demand for electricity, enhance energy security, improve people's access to electricity, and reduce the cost of supply, but will also bring substantial economic, social, and environmental co-benefits particularly to local communities.

Program Description

12. In accordance with the objectives and criteria of SREP as well as additional screening criteria that were prepared in consultation with stakeholders, three projects are proposed to be funded by SREP: 200 MW geothermal development, hybrid mini-grid systems, and solar water heating. These projects to be funded by SREP are expected to bring transformative impacts on renewable energy development.

Geothermal Development

13. The LCPDP proposes the development of about 5,000 MW of electricity from geothermal by 2030. The development of 200 MW in Menengai Field is part of the programme. In the past, geothermal development in Kenya has been characterized by long gestation periods due to various constraints including financing and geothermal resource risks. The Geothermal Development Company (GDC) seeks to reduce project development period in Menengai to five years by accelerating the initial project activities which include detailed surface exploration, infrastructural development, drilling of exploratory and appraisal wells. Government and SREP funding will be utilized for drilling appraisal and production wells and power evacuation.

14. Electricity transmission for the proposed geothermal projects is planned in order to support the evacuation of the generated power. This transmission line project will specifically evacuate power from Menengai geothermal project to the national grid. This will improve power reliability, stability and reduce system losses on the national grid. It will also avail additional capacity that will facilitate extension of the grid to other areas.

15. Geothermal development is an important step towards exploiting the estimated resource potential of over 7,000MW. Even though there are 14 geothermal fields identified along the Rift Valley, only Olkaria field has been developed to date. The proposed Menengai geothermal field development will be the first field to be developed outside Olkaria, and hence the resource risks are substantial. SREP, along with other development partners, will help absorb these risks and prove the resource capacity in Menengai. Moreover, Menengai is also the first field that is being developed solely by the newly established GDC, which is responsible for the scale-up in geothermal development in Kenya. The proposed project will help GDC design and test out an investment and project structure with the help of development partners that could be replicated for developing the other fields. Furthermore, the capacity development to be supported by SREP will be important to make GDC a credible actor that will be able to develop other geothermal fields.

Hybrid Mini-grids

16. The Hybrid Mini-grid Project proposes to increase the proportion of renewable energy (solar and wind) in existing and planned mini-grids to 30 percent. The Government has initiated incorporation of solar PV and wind systems in existing off-grid diesel power plants in arid and semi-arid areas to substitute part of the generation provided through fossil fuel. The proposed project would result in increased renewable energy in the system as well as increased energy generation. SREP funds would enhance the ongoing and planned hybrid projects . The private sector will be invited to participate in the hybrid projects under the Feed-in-tariffs so as to complement Government efforts in the programme.

17. Hybrid mini-grids will replace the current operational model of unsustainable diesel-based mini-grid electricity supply, which is costly and not environmentally friendly. By implementing renewable hybrid systems, the proposed intervention will make electricity more affordable for the poor, increase generation capacity that will enable more connections and increase access. This project is expected to promote private sector participation in the isolated mini-grids, and hence a successful model will enable its replication in other parts of the country where rural populations remain far from the grid and without access to modern energy services. In addition, the transition from a case-by-case approach to mini-grids development to a standardized scale-up program will allow a systematic scaling-up of access to electricity.

Solar Water Heating Systems

18. The Government has developed Solar Water Heating Regulations to promote uptake and guide the incorporation of low temperature solar water heating systems in industrial, commercial and residential buildings. This has the potential to reduce both energy use and peak demand. The proposed solar water heating project involves the replacement of existing electrical water heaters with Solar Water Heating (SHW) systems. The project aims at removal of market barriers as a preparation for implementing of solar water heating regulations which are to be effected by the Government to reduce both energy use and peak demand. To successfully overcome these barriers, SREP intervention would enhance the engagement of the private sector in this market.

19. Solar water heating systems will transform Kenya's approach towards demand side management by effectively using renewable energy for peak load demand. By collaborating with private bank(s), this intervention will strengthen capacity and experience of the banking sector in Kenya to finance renewable energy development. Successful removal of barriers and implementation of the newly introduced Solar Water Heating Regulations will allow the Energy Regulatory Commission (ERC) to learn lessons and replicate the approach in other renewable energy initiatives. It would also build confidence in regulatory approach to renewable energy development.

Table E1: Financing Plan

	Activity	GoK	SREP	AfDB/ WBG	Development Partners / Commercial Loans	Private Investors	Total (MUS$)
SREP INITIAL ALLOCATION	**200 MW of Geothermal - Phase A**						
	Resource and infrastructure development and mobilization of private sector	126	40	234			**400**
	Hybrid Mini -Grid Systems	1	10	10	42	5	**68**
SREP RESERVES	**200 MW of Geothermal - Phase B**						
	Power Plant Construction		14.6	75	200	96	**385.6**
	Transmission & Substations	4	10.4				**14.4**
	Solar Water Heating Component	1	10	2		47	**60**
Total		**132**	**85**	**321**	**242**	**148**	**928**

Table E2: Results Framework for Kenya SREP Investment Plan

Results	Indicators	Baseline (year 2010)	Targets
Project Outputs and Outcomes			
1. Increase in number of women and men supplied with electricity	Number of customers connected to Main grid	1,441,139	2,200,000 (by 2015)
	Number of customers connected to Mini- grid	22,500	33,500 (by 2015)
2.Decrease in GHG emissions	Displaced amount of GHG emission in the Isolated Mini-Grid in tonnes per year	0	10
	Displaced amount of GHG emission in the Nation Grid in tonnes per year	0	1,061
3. Increased RE supply	a) Amount of energy in GWh from RE annually	3,525	5,167 (by 2015)
	b) Additional geothermal power connected to the national grid	0MW	200 MW by 2015
4. Decreased cost of electricity	Reduction in annual generation costs in the isolated mini-grids	TBC	TBC
	Reduction in annual generation costs in the main-grids		
5. Learning about demonstration, replication and transformation captured, shared in Kenya and to other countries in SSA especially in EAC.	Number and type of knowledge assets (e.g., publications, studies, knowledge sharing platforms, learning briefs, communities of practices, etc.) created	TBC	3
6. New and additional resources for renewable energy projects	Leverage factor of SREP funding; $ financing from other sources (contributions broken down by Donors (MDBs and Bilateral), Government of Kenya, CSOs, private sector) (USD Millions)	-	1:8
Catalytic Replication			
1. Increase in renewable energy generation investments	a) Percentage (%) of RE investment of total new energy investment	TBC	TBC
	b) Amount of RE generated by the private sector in new RE plants	TBC	TBC
2. Improved enabling environment for RE production and use	a) Adoption of and implementation of low carbon energy development plans	TBC	TBC
	b) Enactment of policies, laws and regulations for renewable energy	TBC	TBC
	c) Replication of the development model	0MW	5,110 MW by 2030
3. Increased economic viability of renewable energy sector	a) Percentage (%) of private sector RE investments of total new energy investments	TBC	TBC
	b) Change in percentage (%) of total energy sector employment working in RE (women/men)	TBC	TBC
Transformative Impacts in KENYA			

Results	Indicators	Baseline (year 2010)	Targets
Transformed energy supply and use by poor women and men in Kenya, to low carbon development pathways	a) Number of new households connected to electricity in the rural areas.	TBC	TBC
	b) Population (rural) consuming energy services from new hybrid RE systems	TBC	TBC
	c) Change in the energy development index - EDI (per capita electricity consumption)	TBC	TBC

Table of Contents

I. Introduction

1. The objective of the Scaling-Up Renewable Energy Program in Low Income Countries (SREP) is to demonstrate, through pilot operations in selected countries, the economic, social and environmental viability of a low-carbon development pathway to increasing energy access using renewable energy and creating new economic opportunities. Kenya is one of the six pilot countries selected to benefit from the SREP. The SREP operates under the Strategic Climate Fund (SCF) that supports programs with potential for scaled-up, transformational action aimed at a specific climate change challenge. SCF is part of the Climate Investment Funds (CIF), which promote international cooperation on climate change and support developing countries as they move toward climate resilient development that minimizes greenhouse gas (GHG) emissions and adapt to climate change. CIF resources are available through Multilateral Development Banks (MDBs), and in case of the SREP program for Kenya, the African Development Bank (AfDB) and the World Bank Group (WBG), including the International Finance Corporation (IFC), will jointly manage the SREP program, with the World Bank (WB) acting as the lead institution. SREP-funded activities will support scaling up of renewable energy development in Kenya by assuming more risks, addressing key barriers to renewable energy development, catalyzing additional financial resources, focusing on co-benefits that will be felt by the current generation in local communities, and providing opportunities to learn lessons from its operations.

2. This document is Kenya's Investment Plan (IP), which is a country-level and outcome-focused programmatic approach to scaling up renewable energy. This IP is prepared under the leadership of the Government of Kenya and is in line with national renewable energy development strategy as stipulated in: the Kenya Vision 2030 (the National Economic Development Blueprint); the Sessional Paper No. 4 of 2004 (The Energy Policy Document); the Energy Act of 2006; the Least Cost Power Development Plan (LCPDP); Rural Electrification Master Plan; the Feed-in Tariff (FiT) Policy, the Kenya National Climate Change Response Strategy; and Gender Audit of Energy Policies and Programmes in Kenya June 2007. This IP brings together into a single cohesive document various power sector, renewable energy and climate change policies, programs and initiatives.

3. The following sections will discuss: country and sector context (Ch.II); renewable energy sector context (Ch.III); description of proposed programs (Ch.IV); financing plan and instruments (Ch.V); additional development activities by other development partners (Ch.VI); implementation potential with risk assessment (Ch.VII); capacity building and learning (Ch.VIII); and monitoring and evaluation of the program (Ch.IX).

II. Country and Sector Context

4. Kenya, with an area of 582,646 km^2, is located on the East Coast of Africa, the capital being Nairobi. Its strategic location makes it one of the continent's regional hubs. It is also the gateway to the Eastern and Southern Africa. The population of the country was 38.6 million according to the 2009 Kenya Population and Housing Census, with an annual increment of one million. The country's GDP was US$30 billion (2010) with a growth rate of about 5.6 percent (Central Bank of Kenya). The GDP per capita in 2010 was approximately US$770.

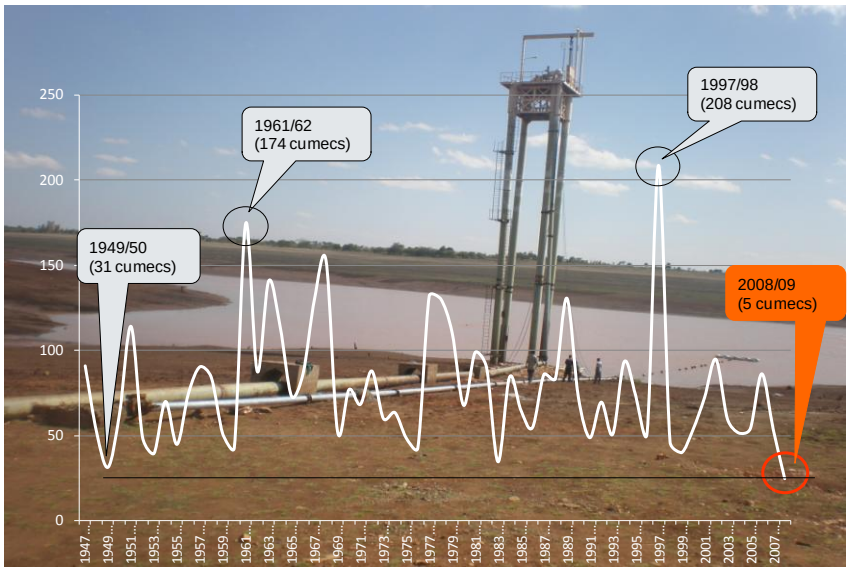
5. Kenya envisions transforming itself into a newly-industrializing, middle-income country by 2030, with a globally competitive and prosperous economy and high quality of life in a clean and secure environment. The Kenya Vision 2030, which is a long-term development strategy, aims to achieve this vision by initiating transformations in economic, social, and political pillars: an economic pillar that aims to achieve GDP growth of 10 percent per annum; a social pillar that aims to build a just society enjoying equitable social development in a clean and secure environment; and a political pillar that aims to build a people-centered, results-oriented, accountable democratic political system.

6. Energy is identified as one of the foundations and enablers of the socio-economic transformation envisaged in the country. The Government has prepared a Medium-Term Plan (MTP) to implement the first phase of the strategy, covering 2008 to 2012. A key element in attaining Vision 2030 is reaching an average annual economic growth rate of 10 percent between 2012 and 2030. This high economic growth will require modern, efficient infrastructure facilities to expand the productive sectors of the economy and improved access to markets. To upgrade the infrastructure platform, the MTP calls for rehabilitating the road network, upgrading the railways, improving urban public transport, and expanding access to electricity and safe water. In an effort to improve equity of opportunity, the overall program gives a special emphasis to expanding the access of the rural and urban poor to basic services such as electricity, water and sanitation.

7. However, the Government recognizes that climate change could hamper the ambitious development goals articulated in the Vision 2030. There is considerable evidence of extreme weather patterns including a warming trend in temperatures and increasing variability in rainfall. As a result, the country has faced a number of prolonged droughts in recent times. The changing weather patterns are significantly impacting the energy sector because Kenya's electricity mix is dominated by hydro generation (over 50 percent) and thus highly vulnerable to weather conditions and climate change. The climatic conditions of 1998 – 2000 and 2008 - 2009 curtailed hydropower generation and led to severe energy shortages which culminated into power rationing. This fluctuation in hydropower generation made the country appreciate the linkages between energy, environment and the country's socio-economic development. Figure 1 illustrates the fluctuations of the average annual inflows for Tana River that provides 80 percent of the county's hydropower generation.

Figure 1: Average Annual Tana River Inflows

(M^3 per second)

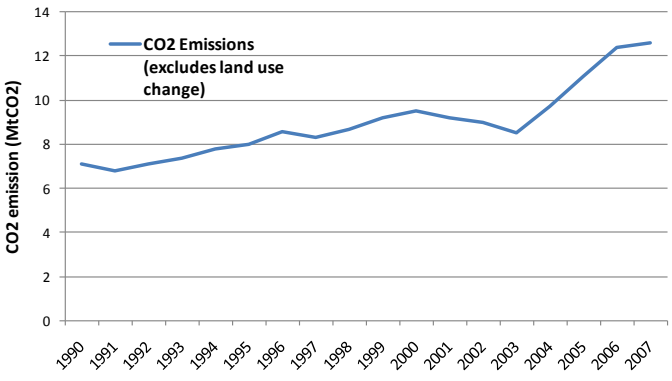


Source: KenGen

8. Although Kenya's current contribution to global climate change is relatively small, its greenhouse gas (GHG) emissions are expected to increase rapidly. A study conducted by the Stockholm Environment Institute (SEI) on the economic impacts of climate change in Kenya (2009) found the country's GHG emissions, both total and per capita to be relatively low. However, Kenya's GHG emissions are rising quickly (Figure 2) and the energy sector emissions are estimated to have increased by as much as 50 percent over the last decade. There is a strong correlation between the country's CO_2 intensity of the economy and the CO_2 intensity of the energy sector. Kenya's energy intensity is above one and therefore continued economic growth in a business-as-usual manner will increase the demand for energy and lead to increasing quantities of CO_2 emissions. Given the importance of energy to its economic growth and its ambitious development goals established, Kenya has little choice but to continue to expand its power generation capacity to meet growing demand.

Figure 2: CO_2 Emissions in Kenya

(1990 – 2007)



Source: World Resources Institute - Climate Analysis Indicators Tool

9. Moreover, inadequate access to affordable energy is limiting social opportunities for the poor, women and children in particular. It is estimated that in Kenya, 77 percent people do not have electricity connections. Over 85 percent of the population rely on traditional fuels such as wood, charcoal, dung, and agricultural residues for cooking and heating. Many urban and rural poor are not reached by grid-based electrical power nor is there adequate distribution of gas or other cooking and heating fuels: Firewood remains the predominant fuel for cooking, mainly in rural areas, followed by charcoal and kerosene, which are creating indoor pollution and health problems; and for lighting, over 79 percent of households use kerosene-based lamps. The lack of access to affordable energy has a number of implications for poor households, and for women in particular including:

    a. Women and children disproportionately suffer from health problems related to gathering and using traditional fuel and cooking in poorly ventilated indoor conditions. These include respiratory infections, cancer, and eye diseases;

    b. High opportunity costs related to time spent gathering fuel and water which limits their ability to engage in educational and income-generating activities resulting in dramatically different literacy rates and school enrolment levels between men and women; and

    c. Lack of electricity in rural areas is an added hindrance to women's access to useful media information such as market for their produce, health information and civic education.

10. Gender disparities in access to energy are drawing back social development of families and communities. There are disparities in energy use between female- and male-headed households: About 15 percent of male-headed households, compared to 11 percent of the female-headed ones, use electricity for lighting; a larger proportion of female-headed households (81 percent) use kerosene lamps or other unspecified sources as compared to male-headed (78 percent); and female headed households rely more on the fuel wood than the male headed households. These disparities negatively affect inclusive socio-economic development in the country.

11. Nonetheless, Kenya now has a unique opportunity to propel its future socio-economic development by following a low carbon path. As one measure of promoting mitigation and adaptation actions on climate change, the Government of Kenya has developed the National Climate Change Response Strategy (NCCRS) of 2010 that integrates climate change dimension into national policies and programs. The Government has been spearheading promotion of development and use of alternative sources of energy. Kenya is pursuing an energy mix that puts emphasis on carbon–neutral energy sources such as geothermal, wind, solar and renewable biomass. In addition, the country's building codes are being reviewed to

incorporate measures that will encourage climate–proofing and the construction of energy–efficient buildings.

12. Supported by the Government's commitment to create and maintain an enabling business environment, Kenya has a dynamic private sector that is also active in renewable energy development. Building on the conducive environment provided, the private sector has become a key contributor to economic growth particularly in the tourism, building and construction, transport and communication, agriculture, manufacturing, and financial sectors. Kenya's financial system includes a banking sector with more than 40 commercial banks that are, with support from development partners, increasingly looking at financing renewable energy and energy efficiency opportunities. In addition to independent power producers (IPPs) that are active in the energy sector, renewable energy developers are also vibrant in the country and a number of companies in the field are part of the private sector associations, such as Kenya Private Sector Alliance (KEPSA) and Kenya Renewable Energy Association (KEREA).

13. Exploitation of renewable energy has a great potential to contribute towards gender-equity and access to energy services in Kenya. Reduced drudgery for women and increased access to non-polluting power for lighting, cooking, and other household and productive purposes can have dramatic effects on women's levels of empowerment, education, literacy, nutrition, health, economic opportunities, and involvement in community activities. These improvements in women's lives can, in turn, have significant beneficial consequences for their families and communities through access to education; media and communications in schools and at home; and better medical facilities for maternal care, including refrigeration and sterilization.

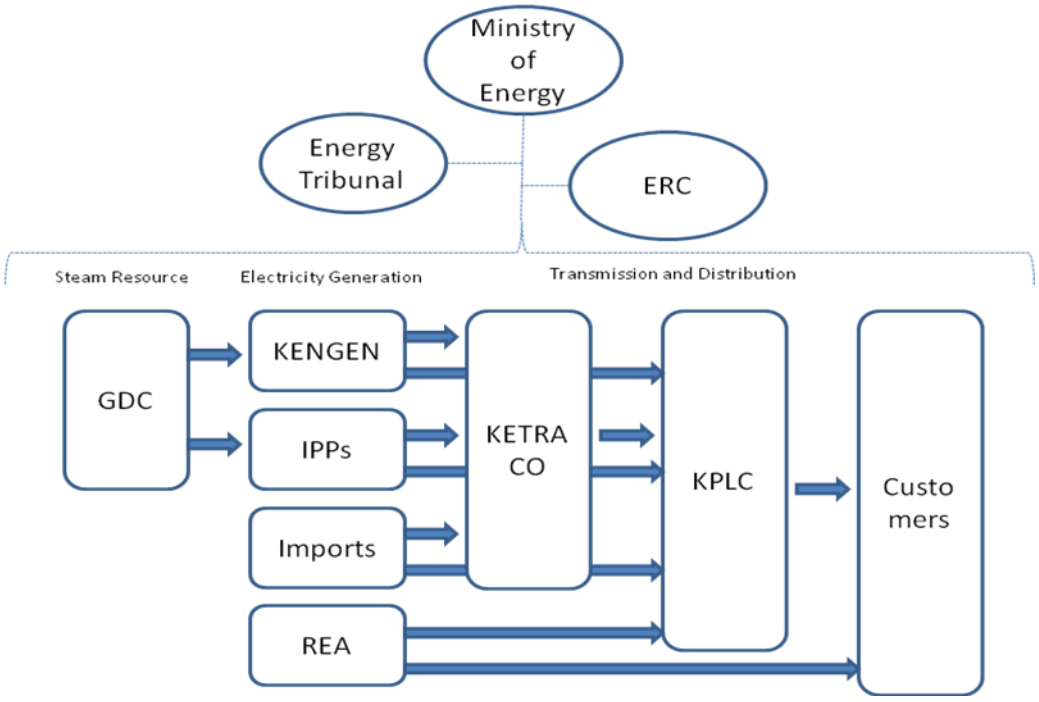
Energy Sector Strategies

14. The broad objective of the energy policy in Kenya is to ensure adequate, quality, cost effective and affordable supply of energy through use of indigenous energy resources in order to meet development needs, while protecting and conserving the environment. As mentioned earlier, Kenya's energy needs remain a key determinant of economic growth given its importance in the long term development goal as articulated in the Vision 2030. Energy has been identified as a key driver of growth in supporting productive sectors of the economy and a key input in both social and political pillars. In addition, energy is a key input in realization of the Millennium Development Goals (MDGs). Therefore, the Government is heavily investing in power generation expansion as well as putting in place adequate system support infrastructure including an extensive transmission and distribution network.

15. In line with global environmental concerns, a cross-cutting theme of the energy sector strategy is to promote the use of green (low-carbon emission) energy for electricity generation where feasible, along with improving efficiency in the supply and end use of electricity. This will mitigate the climate change effects associated with electricity

generation, help Kenya adapt to the impacts of climate change, especially the impacts of more intense and frequent droughts, and enhance energy security in the country.

Figure 3: Market Structure and Institutional Framework of the Electricity Sub-Sector



16. Major reforms in the Kenyan electricity sub-sector have resulted in unbundling of a vertically-integrated monopoly, establishment of an independent regulator, participation of several players in the sector, including private power producers, and an efficient and transparent institutional framework. The energy sector as a whole has been undergoing restructuring and reforms as articulated in the Sessional Paper No.4 of 2004 and the Energy Act No.12 of 2006. The institutions in the electricity sub-sector in Kenya comprise: the Ministry of Energy (MOE), Energy Regulatory Commission (ERC), Rural Electrification Authority (REA), Kenya Electricity Generating Company (KenGen), Kenyan Power and Lighting Company (KPLC), Kenya Electricity Transmission Company (KETRACO), Geothermal Development Company (GDC), Independent Power Producer (IPPs), and the Energy Tribunal. Figure 3 illustrates the interrelation of the energy sector players. Each institution's mandate is described below:

    a. The **Ministry of Energy** (MoE) is mandated by both the Policy and the Law for overall coordination of the Sector. It is also responsible for formulation and articulation of policies through which it provides an enabling environment to all operators and other stakeholders in the energy sector.

    b. The **Energy Regulatory Commission** (ERC) is an independent single sector regulatory agency established under the Energy Act, 2006 with the responsibility

for economic and technical regulation of electric power, renewable energy and down-stream petroleum sub-sector.

c. **Rural Electrification Authority** (REA) is an Authority established under the Energy Act, 2006 mandated to, inter alia, implement the rural electrification programme, develop and update the rural electrification master plan, and promote the use of renewable energy sources. The authority reports to the Ministry of Energy.

d. **Kenya Electricity Generating Company** (KenGen) is the leading electricity generator providing over 70 percent of the effective generating capacity to the national grid. The company is listed at the Nairobi Stock Exchange with 70 percent share holding in Government and 30 percent private.

e. **Kenya Power and Lighting Company** (KPLC) is the national power utility responsible electricity distribution and supply. It purchases power in bulk from KenGen and IPPs currently in operation through Power Purchase Agreements approved by the ERC.

f. **Kenya Electricity Transmission Company Ltd** (KETRACO) is a corporation wholly owned by the Government and mandated to plan, design, construct, own, operate and maintain high-voltage (132kV and above) electricity transmission infrastructure that will form the backbone of the national transmission grid and regional interconnection.

g. **Geothermal Development Company Limited** (GDC) is a special purpose vehicle company wholly owned by the Government established to accelerate geothermal development in the country.

h. **Independent Power Producers (IPPs)**: currently six IPPs are operating in the country contributing approximately 30 percent of the effective generating capacity to the national grid.

i. **The Energy Tribunal** arbitrates on disputes within the energy sector.

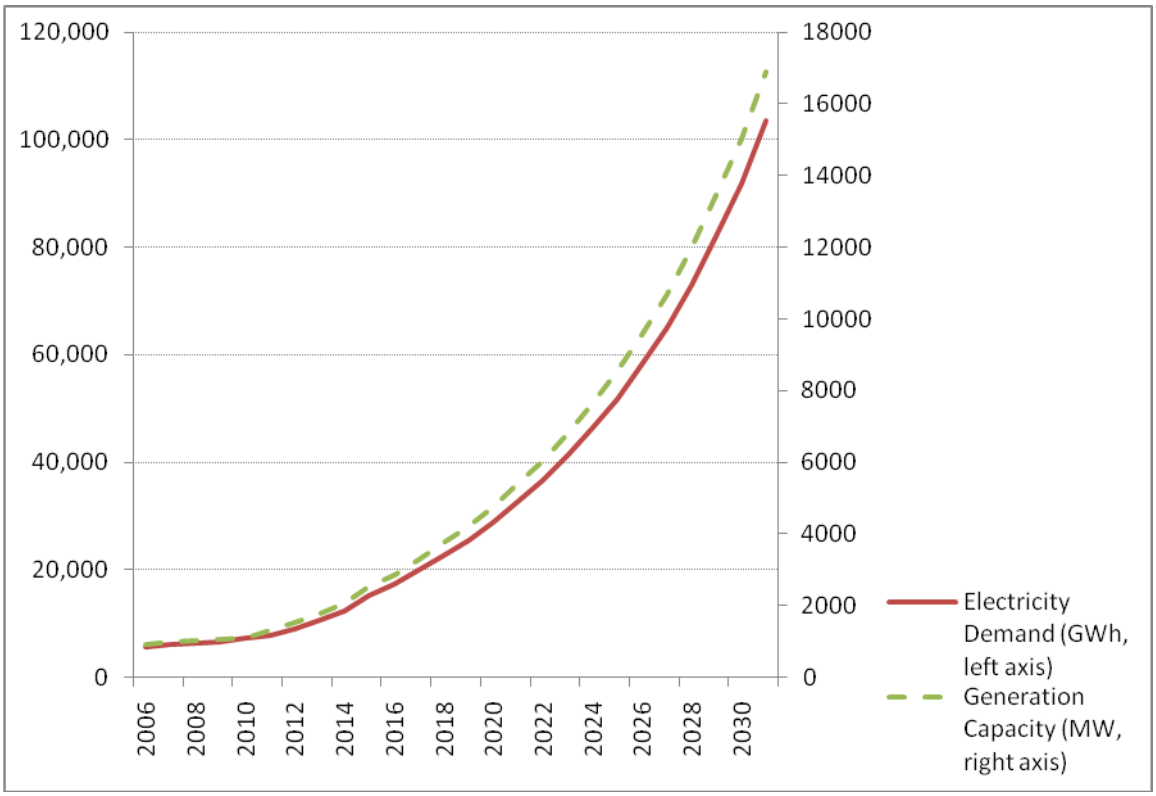
Electricity Demand and Supply

17. Generation capacity is urgently required in Kenya to meet its rapidly growing electricity demand, including during peak hours. Electricity demand in the country is increasing rapidly mainly due to the accelerated productive investment and increasing population. Historically, energy demand is positively correlated with economic and population growth rates. Currently the electricity demand is 1,302 MW against an effective supply of 1,429 MW under normal hydrology. This gives a reserve margin of 127 MW (9.7 percent). However, during low hydrology, the reserve margin diminishes and necessitates load shedding and procurement of expensive emergency power.

18. The electricity demand outlook through 2031 anticipates that significant amount of investments would be required to expand electricity generation, transmission and distribution to meet the projected demand. The Least Cost Power Development Plan (LCPDP) 2011 – 2031 envisions that Kenya's electricity peak demand will increase from the current 1,302

MW to 15,026 MW by 2030. This is in line with the Vision 2030 which envisages energy as a key enabler for economic growth across the country. To meet the increased electricity demand due to the enhanced economic activities, the LCPDP has identified various generation sources targeting 5,110 MW from geothermal, 1,039MW from hydro, 2,036 MW from wind, 3,615MW from fossil thermal, 2,000 MW from imports, 2,420 MW from coal and 3,000 MW from other sources. The investments required for generation, transmission and distribution to meet this demand are enormous. The historical and forecast demand as developed in the LCPDP is shown in Figure 4.

Figure 4: Electricity Demand Outlook 2006-2031



Energy Mix

19. Diversifying the energy mix in Kenya is a pressing issue that needs to be addressed to enhance the country's energy security. The main sources of grid-connected electricity generation are hydro, diesel thermal plants, and geothermal

Table 1: Current Installed and Effective Capacity Energy Mix

Category	*Capacity Installed (MW)*	*%*	*Effective*	*%*
Large Hydro	*749.2*	*48.5%*	*732.2*	*51.2%*
Small Hydro	*15.3*	*1.0%*	*12.8*	*0.9%*
Geothermal	*198*	*12.9%*	*189*	*13.2%*
Co-generation (biomass)	*26*	*1.7%*	*26*	*1.8%*
Wind	*5.1*	*0.3%*	*5.1*	*0.4%*
Thermal (Fossil)	*525*	*34.3%*	*448*	*31.4%*
Off Grid (Fossil)	*18.0*	*1.2%*	*15.6*	*1.1%*
	1,531	*100%*	*1,429*	*100%*

Source: LCPDP 2011-2031

plants, with more than 50 percent of effective capacity dependent on hydroelectric power (Table 1). There also is generation from biomass, wind and small hydro plants. The current energy mix is as tabulated.

20. Substituting baseload hydroelectric power, which is becoming increasingly unreliable, especially in face of changing weather patterns, with reliable base load power is crucial to ensure adequate supply of electricity. Due to changing weather patterns in the country, hydroelectric generation has become unreliable resulting in decrease in the hydro component of base load supply. Currently, the base load generation source for electricity is hydro and geothermal. However, most of hydro power is on one river system prone to drought and in 2009, nearly half of the hydro capacity was not available (see also Figure 1). This necessitated the country to extensively shed load and run expensive thermal power plants as base load, leading to high tariffs culminating in high inflation and consumer dissatisfaction. Kenya's abundant geothermal energy is a viable alternative to hydropower as the main source of power but most of the resource base remains undeveloped.

Cost of Electricity and Pricing

21. The cost of electricity in Kenya is high, placing a heavy burden on household and industrial consumers. The cost of household connection, paid up-front to KPLC, starts at approximately KES 35,000 (about USD 422). In addition, once connected, a modest amount of grid electricity (about 134 kWh per capita consumption) costs at about 15 US cents equivalent per kWh. The high cost of electricity service is a major obstacle to the expansion of electricity connection to low-income households, and in particular, female headed households. These electricity costs are high because of the substantial investments needed to build new generation, transmission and distribution facilities, as well as the high operating electricity supply cost. The consumer electricity tariff structure is such that there is cross-subsidy whereby the high electricity consumers subsidize the low consumers. The life-line consumers utilize less than 50 kWh/per month and pay the generation costs only. All the inbuilt costs in the current retail electricity tariff structure are as follows:

Table 2: Retail Electricity Tariff Structure

Tariff	Type of Customer	Supply Voltage (V)	Consumption (kWh/ month)	Fixed Charge (KES/ month)	Energy Charge (KES/ kWh)	Demand Charge (KES/ kVA/ month)
DC	Domestic Consumers	240 or 415	0-50	120.00	2.00	-
			51-1,500		8.10	
			Over 1,500		18.57	
SC	Small Commercial	240 or 415	Up to 15,000	120.00	8.96	-
CI1	Commercial/ Industrial	415-3 phase	Over 15,000 No limit	800.00	5.75	600.00
CI2		11,000		2,500.00	4.73	400.00
CI3		33,000/ 40,000		2,900.00	4.49	200.00
CI4		66,000		4,200.00	4.25	170.00
CI5		132,000		11,000.00	4.10	170.00
IT	Interruptible Off-Peak supplies	240 or 415	Up to 15,000	240.00 – when used with DC or SC	4.85	-
SL	Street Lighting	240	-	120.00	7.50	-
Source: ERC						

Approach in the Electricity Sub-sector

22. Against these challenges of rapidly growing demand, hydro-dependence, high cost of electricity, low access rate, compounded by the additional risk of climate change, the guiding principle of the Government's strategy for expanding infrastructure in the electricity sub-sector is to promote equitable access to quality energy services at least cost while protecting the environment. The strategy has three objectives, in which renewable energy development will play a key role:
    (a) to increase electricity generation capacity to eliminate supply shortages;
    (b) to expand and upgrade the transmission and distribution networks to enhance quality and reliability of supply; and,
    (c) to increase affordable household electricity access, with particular attention to reducing regional imbalances in the country. In particular, the Government target in the short term is to increase electricity connectivity level in rural areas from the current 15% to 22% by 2012. In the medium term, the rural areas connectivity target level is 65 % by 2022 while the long term target is 100% by 2030.

III. Renewable Energy Sector Context

23. Despite a huge potential of renewable energy resources as well as their expected key role in the energy policy in Kenya, including wind, solar, small hydro, biomass, and geothermal, their development has been rather slow. For example, geothermal resources, whose potential is estimated to be over 7,000 MW, is providing less than 200 MW of electricity to date since the first drilling started in 1955.

24. The Government is committed to expedite the uptake of renewable energy resources, and has introduced a number of policy measures to promote them. Through the Sessional Paper No. 4 of 2004 and the Energy Act of 2006, the Government is committed to promoting electricity generation from renewable energy sources. Under these policy frameworks, a number of initiatives are being undertaken:

    a. A Feed-in-Tariffs (FiT) Policy was formulated in 2008, and subsequently revised in 2010, to promote the generation of electricity using renewable energy resources and improve the business environment for fostering substantial private sector investment in renewable energy. Under the FiT system, investment security and market stability for investors in electricity generation from renewable energy sources is provided whilst encouraging private investors to operate their power plants prudently and efficiently to maximize returns.
    b. In order to effectively plan and implement the incorporation of electricity generated by small-scale renewable energy plants into the interconnected and isolated grids, the Government with the support from Development Partners, including the World Bank, is undertaking a study aimed at developing feasible renewable electricity generation options, regulatory instruments and guidelines needed for their integration. The study will involve review of the existing FiT policy and supporting frameworks, as well as projects proposed under the FiT policy, to determine challenges and constraints leading to low implementation of power projects under this policy and propose specific recommendations to address these weaknesses.
    c. The Government intends to set up a Green Energy Facility to pool donor contributions to help finance Government equity participation and loan contributions to help firms and other institutions to develop clean energy projects. The Facility will lend funds to viable projects at concessional rates. The facility will be established under the National Task Force on Accelerated Development of Green Energy whose mandate is to promote and fast-track the development of renewable energy projects.
    d. Annual update of the 20-Year rolling LCPDP, taking cognizance of new developments and changes. Through the LCPDP Committee, the Government has instituted an integrated power planning process, which seeks to increase the contribution of renewables to the national energy mix. The planning process

projects future energy requirements and identifies suitable least cost sources of energy to meet the forecast demand.

25. The following brief description of each renewable energy source and the actions taken by the Government shows that an incremental progress to exploit renewable energy resources has been made in Kenya.

Wind

- Kenya has a proven wind potential of as high as 346 W/m^2 in some parts of Nairobi, Rift Valley, Eastern North Eastern and Coast Provinces. The current installed capacity is 5.1 MW operated by KenGen at the Ngong site.
- The Government has undertaken several measures to promote wind energy:
    a. The Ministry of Energy developed a Wind Atlas in 2003 with indicative data to guide investors. To augment the information contained in the Wind Atlas, the Ministry, with the assistance of Development Partners, is installing Wind Masts and Data Loggers to collect site specific data countrywide.
    b. The low exploitation level of the resource prompted the Government to develop the Feed-in Tariff (FiT) Policy to attract private investment. The FiT policy provides for wind generated electricity a fixed tariff not exceeding US Cents 12.0 per kilowatt-hour of electrical energy supplied in bulk to the grid operator at the interconnection point. This tariff applies to individual wind power plants (wind farms) whose effective generation capacity is above 500 kW and does not exceed 100 MW.
    c. As a result of the publication of the FiT, there has been a lot of interest among potential investors to exploit the resource. The Government has given approval to 21 applications with a combined proposed capacity of 1,276 MW and a further 300 MW under negotiated terms. The proposed projects are at various stages of implementation with two having signed PPAs and others undertaking feasibility studies.
    d. The Government is introducing wind power generation in existing diesel isolated/off-grid power stations. One such station has been commissioned and is operational. SREP funds will be used expand and accelerate the programme.

Solar

- Kenya lies astride the equator and receives daily insolation of 4-6kWh/m^2. Sessional Paper No 4 of 2004 recognizes the need to promote the use of solar energy as an alternative source of energy. The Government is committed to implementing this policy by carrying out awareness and demonstration campaigns on the use of solar systems for domestic and industrial use, as well as undertaking direct installation in institutions.

a) Solar PV

- The solar PV systems around the country are mainly for domestic installations with the private sector playing a major role. The private sector has also been instrumental in the PV application in telecommunication, cathodic protection of pipelines, water pumping, and small commercial or non-commercial establishments. However, these efforts are mainly concentrated in areas where grid is within reach.
- The Government is undertaking the following:
    a. Efforts to provide lighting and water pumping PV installations to public institutions in arid and semi-arid lands where there is no access to the grid. These institutions are mainly primary and secondary schools, dispensaries, health centres, police and administration units and public water wells. The programme has provided quality lighting for students; extended medical services including maternity and refrigerated medicines; relieved women from the burden of drawing water from the wells; and provided security, especially to women and children who are the most vulnerable.
    b. Initially targeting the use of solar PV to supply the isolated/off-grid stations to partly displace the thermal generation. The current FiT Policy provides the private sector opportunities to supply solar power at a fixed tariff not exceeding US Cents 20.0 per kilowatt-hour and a non-firm power fixed tariff not exceeding US Cents 10.0 per kilowatt-hour of electrical energy supplied in bulk to the grid operator at the connection point.
    c. Preparing the Energy (Solar Photovoltaic Systems) Regulations, 2011. These regulations are expected to provide a licensing framework for the solar PV value chain and facilitate proper design, installation and use of Solar PV systems while avoiding supply of sub-standard components and installations, so as to improve distributed electricity service delivery and facilitate sustainability of the PV market in Kenya.

b) Solar Thermal

- Solar thermal is mainly used for drying and water heating. Utilization of solar water heaters (SWH) is mainly in households and institutions such as hotels and hospitals. The number of solar water heating units currently in use is estimated at over 140,000 and is projected to grow to more than 400,000 units by 2020. The uptake level of solar water heating systems in Kenya is extremely low despite the enormous potential provided by the abundant availability of the solar energy resource and the demand for low temperature water for both domestic and commercial applications. Solar dryers are widely used in the agricultural sector for drying of cereals and other farm produce such as coffee, pyrethrum and mangos. The private sector has introduced solar cooking to rural groups in various parts of the country albeit with limited success.
- The Government has developed the solar water heating regulations to promote uptake and guide the incorporation of low temperature solar water heating systems in industrial, commercial and residential buildings.

Small Hydro

- Kenya's drainage system consists of five major basins: Lake Victoria; Rift Valley; Athi/Sabaki River; Tana River; and Ewaso Ng'iro North River. These basins contain the bulk of the country's hydro resources for power generation. Kenya's total installed large hydropower capacity is 764.5 MW. The potential for small, mini and micro-hydro system (with capacities of less than 10 MW each) is estimated at 3,000MW nationwide. However, the installed grid connected small-scale hydro-electric projects contribute only about 15.3 MW. Nonetheless, there are several other small hydro schemes under private and community generation that are not connected to the grid, especially in the tea estates across the country.
- The Government is carrying out phased feasibility studies to establish the capacities as well as appraise the viability of various small hydro sites across the country. In 2009 a feasibility study for 12 sites was carried out and confirmed viable for providing a total capacity of 22MW at a cost of USD 53 million. Funding is being sourced from potential investors and developers. Another feasibility study is on-going for 14 other sites.
- The FiT policy provides for stepped fixed tariffs for electrical energy supplied in bulk to the grid operator at the interconnection point. The tariffs are as follows:

Table 3: Feed-in Tariff for Small Hydro Power

Power Plant Effective Generation Capacity (MW)	Firm Power Tariff (¢/kWh)	Non-Firm Power Tariff (¢/kWh)
< 1	12.0	10
1 – 5	10.0	8.0
5 – 10	8.0	6.0

As a result of this policy, private investors have submitted expressions of interest for 19 projects totaling to 111MW of which 16 projects with combined capacity of 81MW have been approved.

Biomass

- The contribution of biomass to Kenya's final energy demand is 70 percent and it provides for more than 85 percent of rural household energy needs. The main sources of biomass for Kenya include charcoal, wood fuel and agricultural waste. In particular, wood fuel has been utilized extensively across the country: over 70 percent of the country's fuel needs are met from wood fuel; there are approximately 20,000 institutions including prisons, schools, clinics and hospitals in Kenya each consuming about 270 tonnes of wood fuel per year; and a majority of small and medium enterprises such as hotels, food vendors and small scale processing facilities use biomass resources as the primary source of energy. The large scale utilization of biomass resources results in depletion of the major forest areas that are also the water catchment areas for the country. Kenya's forest cover currently stands at less than 3 percent, much lower than internationally recommended level of 10 percent, largely due to land use activities and over-dependence on wood fuel as a source of energy particularly in the rural setting. This is affecting hydrological cycles (increased runoff, flash flooding, reduced infiltration, soil erosion, siltation in the dams), causing water shortages across the country.
- The Government has identified the existence of 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. The total potential for cogeneration using sugarcane bagasse is about 193 MW. One sugar factory, Mumias Sugar Company (a private entity), generates 35 MW out of which 26 MW is dispatched to the grid. However, opportunities by other sugar factories have not been exploited.

- The FiT policy provides for biomass energy resource generated electricity with a firm power fixed tariff not exceeding US Cents 8.0 per Kilowatt-hour of electrical energy supplied in bulk to the grid operator at the interconnection point. Under this policy, 6 projects totaling 270MW have been approved which includes an 18 MW cogeneration project for use of cane bagasse in the coastal region of Kenya.

Geothermal

- Geothermal resources in Kenya are located within the Rift Valley with an estimated potential of between 7,000 MWe to 10,000 MWe spread over 14 prospective sites. Geothermal power has numerous advantages over other sources of power: it is not affected by drought and climatic variability; it has the highest availability factor at about 95 percent; it is green energy with no adverse effects on the environment; it is indigenous and readily available in Kenya unlike fossil thermal energy that relies on fuel imports. This makes geothermal the most suitable source for base load electricity generation in the country. Despite these advantages, the development of geothermal has been slow as highlighted below:
    - 45 MW Olkaria I Power Plant: Drilling started in 1955 and the last unit of the plant was commissioned in 1985. This was about 30 years after the initial drilling.
    - 105 MW Olkaria II Power Plant: Drilling using a rig owned by KenGen, started in 1986 and the plant was commissioned in 2003 (Unit 1 & 2) and 2010 (Unit 3). This was about 17 and 24 years after the initial drilling respectively.
    - 280 MW Olkaria IV and I (Unit 4&5): Exploration drilling by KenGen using own rig was done in 1998 to 1999. Appraisal and production drilling mainly through hired rigs started in 2006 and the plant is scheduled for commissioning by December 2013. This will be 15 years after the initial drilling.
    - 100 MW Olkaria III: Concessioned in 1998. By 2009 (11 years later), the IPP had developed only 48 MW and the additional 52 MW plant is scheduled for commissioning by 2013 which will be 13 years after the concession.
    - Other concessions for the undeveloped prospects in Suswa (2007) and Longonot (2009) have not registered any progress.

  The current installed capacity in the country is 198 MW with 150 MW operated by KenGen and 48 MW by OrPower 4, both in the Olkaria Block.

- The Government has introduced policies and measures in place to expedite and scale-up geothermal development in the country:
    a. The Government has opened up the industry for private sector participation with the first IPP, OrPower 4, operating in Olkaria III and generating 48 MW.

Additionally IPP's have been licensed to develop Suswa and Longonot geothermal prospects.

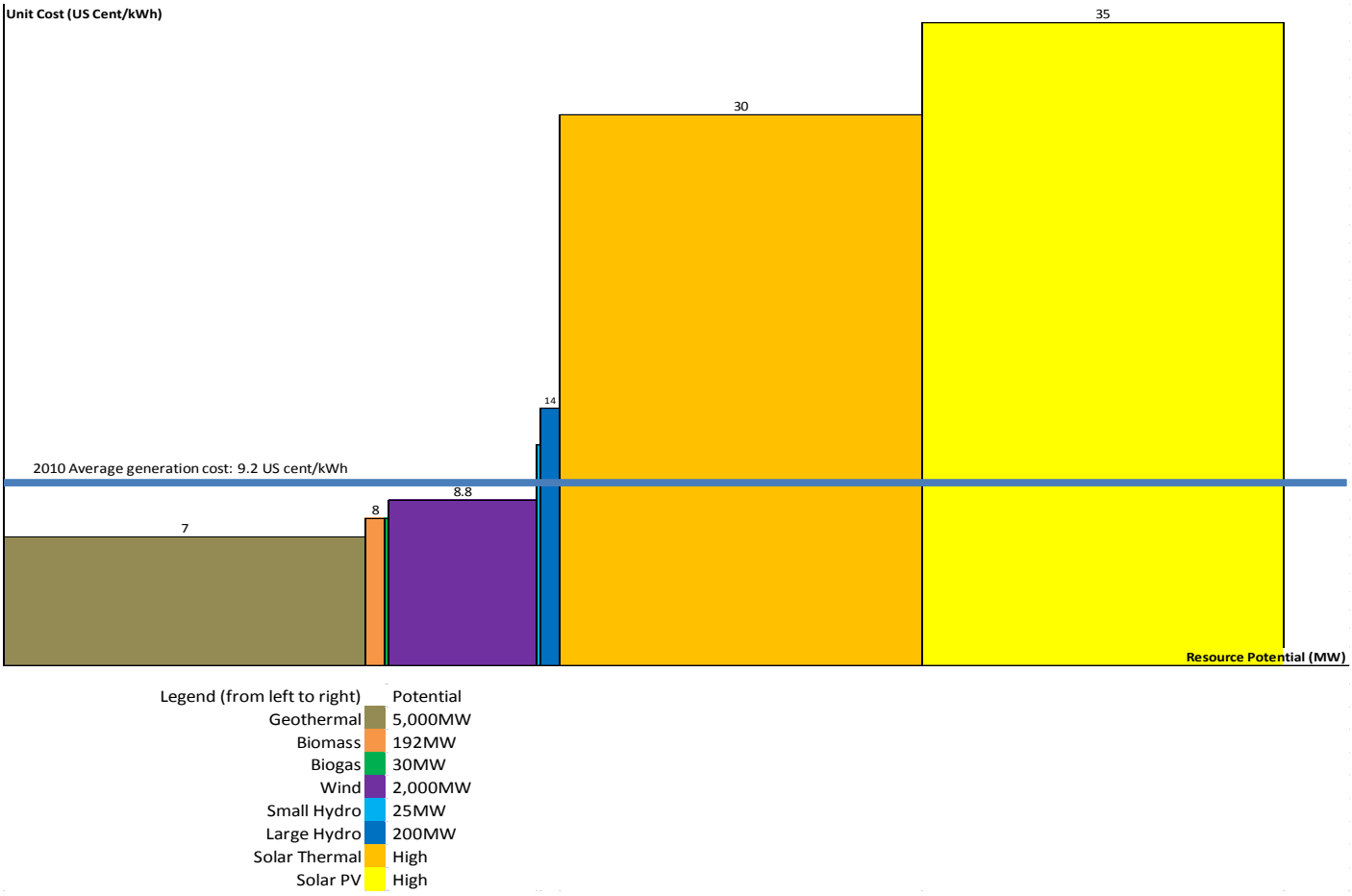
b. The Government set up the Geothermal Development Company (GDC) in 2008 to undertake integrated development of geothermal through initial exploration, drilling, resource assessment and promotion of direct utilization of geothermal. GDC is 100 percent owned by the Government. By undertaking the initial project activities, GDC will underwrite the attendant risks associated with geothermal development and therefore open up opportunities for both public and private sector participation.

c. The FiT Policy provides for a tariff not exceeding US Cents 8.5 per Kilowatt-hour of electrical energy supplied in bulk to the grid operator at the interconnection point for up to 70 MW geothermal.

- An additional 280 MW under development by KenGen in the Olkaria Block is scheduled for commissioning in 2013. In the Menengai Field with a potential of 1,600 MW GDC is undertaking drilling operations for Phase I development for 400 MW. The first exploratory well in Menengai has been successfully completed with a capacity to generate more than 8 MW. Initial project development activities have also commenced for the development of 800 MW in the Bogoria – Silali Block. This is geared towards meeting the Vision 2030 Medium Term target of 1,600 MW by 2016 and eventually 5,000 MW by 2030.

26. As shown in Figure 5, which presents a comparison of unit generation cost for the various renewable energy sources and their potential capacities in the country, geothermal has a substantial potential and is the most cost effective. In terms of the potential capacity, geothermal, solar (thermal and PV), and wind are particularly abundant. In terms of the unit generation cost, geothermal is the most cost effective followed by biomass, biogas, and wind.

Figure 5: Marginal Abatement Cost Curve (Renewable Energy Potential Capacity and Unit Generation Cost)



Barriers affecting renewable energy development

27. There remain, however, several significant barriers affecting the exploitation of renewable energy resources in Kenya. Removal of these barriers will be crucial to transform the country's renewable energy development. These barriers can be broadly grouped into: (i) technical and human capacity, (ii) economic and financial, and (iii) social, and are presented below with the mitigation measures being undertaken by the Government:

Table 4: Barriers for Renewable Energy Development

Barriers/ Constraints	Mitigation	Resources affected
Technical and Human Capacity		
Insufficient/inadequate data	• Installation of Wind Masts and Data Loggers for data collection to enrich the existing Wind Atlas. • Undertake feasibility studies and avail the reports to potential investors and developers	Wind, small hydro, biomass, Geothermal
Lack of adherence to system standards by suppliers and Poor after-sales service	• Development of standards by Kenya Bureau of Standards and regulations by ERC	Solar
Limited capacity for equipment acquisition/ supply	• Procurement of drilling rigs • Encourage manufacture of equipment locally	Solar, Small hydro, biomass, Geothermal
Human resources constraints	• Training of Human Resource	Solar, Small hydro, biomass, Geothermal
High resource risk	• GDC taking up the initial project preparation activities which have been a deterrent for geothermal development. These include infrastructure development, purchase of drilling rigs and materials, surface exploration and appraisal drilling	Geothermal
Renewable energy resource distribution relative to existing grid/load centres	• Strategic expansion of the transmission lines taking into consideration new areas with potential to generate electricity. • Creation of KETRACO to build new transmission lines	Wind, Geothermal
Climate change impact	• Re-afforestation	Small hydro
Economic and Financial		
High capital cost.	• Designed incentive packages to promote private sector investments by zero rating import Duties and Taxes on equipment and accessories. • Annual budget allocation of approximately USD 120 Million to develop geothermal • Partnering with Development Partners in funding geothermal development • Introduction of the Green Energy Facility.	Wind, Solar, Small Hydro, Geothermal
Challenges in reaching	• Introduction of the Green Energy Facility.	Wind, Solar, Geothermal, small

Barriers/ Constraints	Mitigation	Resources affected
financial closure.	• FiT Policy guarantees priority purchase, transmission and distribution of all electricity from renewable energy sources. • Periodic review of the FiT Policy • Partnering with Development Partners to help mobilizing private investments and provide guarantees to private investors	hydro
Lack of appropriate and affordable credit and financing mechanisms	• Introduction of the Green Energy Facility • Partnering with Development Partners to avail concessionary funding to private sector	Solar, biomass
High cost of resource assessment and feasibility studies	• Undertake resource assessment studies • Undertake feasibility studies and avail the reports to potential investors and developers	Small hydro, Geothermal, Wind
Social		
Low awareness of the potential opportunities and economic benefits	• awareness creation through sensitization and demonstrations • promoting planting of fast growing tree species • Introduction of the Green Energy Facility	Solar, wind, biomass

28. Removing these barriers, supported by SREP, will not only help the country meet its growing demand for electricity, enhance energy security, improve access to electricity, and reduce the cost of supply, but also bring substantial economic, social, and environmental co-benefits. Most of the renewable energy resources are located in under-developed areas of the country. Through the development of these resources, the benefits to be achieved will include: additional electricity generation; reduced indoor pollution; forest conservation; opening up of the areas through infrastructure development such as roads and water; opportunity for utilization of by-product heat and condensate for industrial and agricultural based activities in the case of geothermal development; employment creation and income generation; increased security in the areas as a result of the economic activities and social amenities. Provision of electricity as a source of energy, water, schools, roads and improved security will transform livelihoods in rural areas, as demonstrated in Olkaria (geothermal) and Sondu-Miriu (hydro) areas.

IV. Program Description

29. To address some of the barriers to scale-up renewable energy development in Kenya described in the previous section, the Government, in consultation with stakeholders including organizations from the private sector and the civil society, has identified the following 5 projects to be considered for SREP funding that meet the SREP investment criteria in relevant guidelines[1]:

- Hybrid Mini-Grid Systems
- Solar Water Heating
- Small Hydropower Development
- Scaling Up Improved Biomass Cook Stoves in Institutions
- Development of 200 MW of Geothermal in Kenya

Brief concepts of the five projects are described below:

Hybrid Mini-Grid Systems

30. **Background.** Electricity connection to trading centers has a higher negative correlation with poverty than off-grid connections to households, which makes it an effective option to overcome low access to electricity in rural areas[2]. Accordingly, the Government has been expanding electricity supply to administrative towns and upcoming commercial centers in remote locations in Kenya based on diesel power generation. However, the cost of generation from these diesel plants is high and unpredictable due the fluctuating international crude oil prices. Besides the high cost, the diesel plants contribute to local pollution and GHG emissions. For these reasons, the Government is currently incorporating solar PV and wind systems in isolated diesel thermal power plants in arid and semi-arid areas to substitute generation provided through fossil fuel. The target for this project is to increase the proportion of renewable energy in existing and planned mini-grids to 30 percent.

31. **Objective.** The project will support scale-up of the on-going program for the expansion of piloting hybrid mini-grids in rural areas, thereby increase access to electricity among

[1] These criteria include: increased installed capacity from renewable energy sources; increased access to energy through renewable energy sources; low emission development; affordability and competitiveness of renewable sources; productive use of energy; economic, social and environmental development impact; economic and financial viability; leveraging of additional resources; gender; and co-benefits of renewable energy scale-up.
[2] World Bank. (2011) "Infrastructure for Shared Growth in Kenya: A Bumpy Ride to Prosperity"

households and institutions in isolated areas and to reduce the cost of electricity generated as well as reduce the local pollution and GHG emissions.

32. **Scope.** The project proposes to install 3 MW of renewable systems (solar and wind) in hybrid with the existing diesel generators in 12 isolated mini-grids with a total installed capacity of 11MW. Further, the Government intends to construct 27 additional isolated mini-grids with an installed capacity of 13 MW. This project proposes that renewable energy be incorporated into these systems as a hybrid once they have been constructed.

33. **Expected Outcomes.** The private sector will be encouraged to participate in the project under a subsidizing scheme so as to complement Government efforts. Availability of clean energy in rural areas will reduce dependence on biomass and kerosene. New isolated mini-grids supplied through renewable energy would result in more village centres being supplied with electricity and rural commercial centres accessing clean energy for productive uses. Further, there will be increased security, access to medical services, education, and water services as well as reduced indoor air pollution. This will lead to improved livelihood in the target areas.

Solar Water Heating

34. **Background.** Growing electricity demand is putting a strain on the power infrastructure, especially during peak hours. The residential sector in Kenya consumes about 820 GWh of electricity annually for heating water, which typically occurs during the morning and evening, thereby increasing the overall peak load. This necessitates dispatch of expensive thermal power, which are used as peaking plants. Use of solar water heating systems can therefore reduce the peak demand arising from the need for water heating by domestic, institutional and commercial users. However, t**he uptake** of solar water heating systems in Kenya is extremely low compared to the enormous potential provided by the abundant solar energy resource and the demand for hot water for both domestic and commercial applications mainly due to capacity and financial barriers. The current cost of a typical 100 litre Solar Water Heating (SWH) System is USD 1,500 which is unaffordable to many households. The SWH market lacks a critical mass of trained contractors and technicians to install and maintain systems. In addition, there is a low awareness regarding the technology and its financial benefits.

35. To increase uptake of SWH, the Government has developed the Solar Water Heating Regulations. The regulations will make it mandatory for all premises within the jurisdiction of a local authority with hot water requirements exceeding 100 litres per day to install and use SWH. Existing facilities will also be required to comply within a period of five (5) years upon gazettement of the regulations. These regulations are in line with policy directions under Sessional Paper No. 4 of 2004 on Energy which support usage of SWH and natural

ventilation in all new buildings where technically feasible. In addition to the regulations, addressing the market barriers (finance, capacity and awareness) will be essential to facilitate increased uptake of SWH Systems and mitigation of power system peaks.

36. **Objective.** The goal of the proposed project is to develop market incentives to scale-up SWH systems for industrial, commercial, and residential buildings and to increase uptake of SWH and reduce peak demand.

37. **Scope.** The project will have three components, namely: a) financing scheme; b) capacity building targeted at enhancing installation techniques, quality control and follow up support for SWH technicians and contractors; and c) awareness creation. SREP funds will leverage other funds to buy down transaction costs, build capacity for SWH technicians and create awareness. The project targets a minimum of 50,000 solar water heating systems to catalyze the market.

38. **Expected Outcomes.** Development and utilization of indigenous energy resources; enhanced national energy security through diversification of energy supply mix and reduction in the over reliance on petroleum imports; reduced demand for expensive fuel fired peaking power plants resulting from grid electricity peak demand attributed to water heating; increased environmental conservation through reduction of GHG; and increased employment, capacity building and income generation resulting from the expanded solar water heating industry.

Small Hydropower Development

39. **Background.** Tea factories consume a substantial amount of energy, mainly from furnace oil, wood fuel and electricity, leading to adverse impact on the environment. Energy constitutes about 24 percent of their operating cost, out of which electricity accounts for 56 percent of the energy cost. This is considered expensive due to the high cost of power occasioned by intermittent supply leading to frequent use of the diesel-generated power whose cost is three times higher. The average annual cost of electricity per factory is about US$350,000. Thermal energy is also expensive due to the high cost of furnace oil. Annual costs are influenced by the risk of fluctuations in fuel prices, and frequency of use of standby diesel generated power. The increasing cost of energy makes the Kenyan tea industry uncompetitive in the international market. This denies the country foreign exchange necessary for economic growth. The continued high cost of production would lead to unsustainable operation of the factories on which the entire livelihoods of the small-scale farmers depends. There is an urgent need to address the increased production costs by coming up with sustainable and economically viable power generation.

40. In collaboration with the Kenya Tea Development Agency (KTDA), MoE has identified and earmarked for further evaluation 12 potential sites on which KTDA had undertaken pre-feasibility studies but could not conduct detailed feasibility studies due to financial constraints. MoE conducted studies on the sites which rated the total capacity at 22 MW for development at a total cost of US$ 53.43 million. KTDA has expressed interest to develop the sites under FiT Policy and sell surplus power to the national grid. Under the financing arrangement, KTDA will provide 35 percent of the project costs as equity while the balance of 65 percent will be sourced from financiers. Currently, KTDA has obtained EIA and water permits as well as 50 percent of the equity component for the 12 sites but has been unable to secure the 65 percent debt component that is critical for the development of the sites.

41. **Objective.** The proposed project aims to develop the 12 small hydro power sites so as to enable the factories to switch to cheaper power while releasing the surplus of 16MW to the national grid.

42. **Scope.** SREP Funds will provide the required critical co-financing for the implementation of the projects that will add 22 MW installed capacity of renewable energy to the National Energy Mix and also contribute to risk reduction measures. The sites identified will be run-of-the river schemes, hence ensuring minimal interference with natural habitats and productive farmlands, and no relocation of people nearby since no large reservoirs are required. This will ensure environmental sustainability and acceptance of the projects by the communities.

43. **Expected Outcomes.** The reduction in the cost of energy will improve the earnings of farmers facilitating them to acquire and service loans for grid connection as part of rural electrification as well as promoting the local economy. This will enhance access to electricity generated from renewable energy sources. The generated power will seek to address the emission of GHGs from thermal power stations and the emergency generators that are necessitated by outages.

Scaling Up Improved Biomass Cook Stoves in Institutions

44. **Background.** Use of traditional sources of energy coupled with the use of inefficient firewood and charcoal stoves pose the following threats: severe health risks especially to women and children, biomass depletion, deforestation, forest degradation and loss of biodiversity. Massive scale up of the cook stove technologies is needed to mitigate these risks.

45. Previous activities in the last two decades in Kenya began to remove market barriers to the adoption of sustainable biomass energy technologies by institutions, households, and SMEs in rural and urban areas of Kenya. The projects have promoted highly efficient improved

stoves, and established woodlots and contributed to reduction of GHGs. For example, a project implemented recently by the Ministry of Energy and UNDP GEF will deliver GHG reductions of between 400,000 and 960,000 tons of CO2e by 2020. Over a four year-period, the project installed about 2,000 institutional stoves in over 1,000 schools and supplied over 20 SMEs stoves and about 500 household stoves. More than 550,000 trees have been planted in several schools that had adopted the stoves. It is projected that up to 5 million trees will have been planted by households, SMEs and institutions over the first five year period. A National Wood Fuel Strategy and Action Plan drafted by the project is under consideration by the Ministry of Energy.

46. **Objective.** The proposed project aims to mitigate the social and financial barriers to the adoption of improved stoves in households, SMEs and institutions.

47. **Scope.** The project will enhance stove production capacities and increase awareness among policy makers, financial institutions, investors and end users regarding the benefits. It will also facilitate acquisition and installation of improved cook stoves and the establishment of biomass plantations in order to achieve sustainability.

48. **Expected Outcomes.** Increased adoption of efficient cook stoves and the establishment of biomass plantations will improve energy security and facilitate the recovery of degraded biomass resources, contributing to environmental conservation and climate change mitigation while promoting private sector investment in the biomass sub-sector. These will lead to increased job opportunities, improved livelihood and incomes.

Development of 200 MW of Geothermal in Kenya

49. **Background.** As discussed in the previous section, the pace of geothermal resource development in Kenya has been rather slow. This is partly due to the actual and perceived risks along different phases of geothermal development, including: resource exploration, resource assessment, power plant development, operations, and marketing and sales. In the development of 200 MW project at Menengai, GDC seeks to reduce project development period to about five years, down from the average historical development period of over 19 years, by undertaking the initial project activities which include detailed surface exploration, infrastructural development, and drilling of exploratory and appraisal wells. To expedite its development, the Government has also been undertaking the following activities in the Menengai field:
    a. Increased budgetary allocation to Geothermal Development Company (GDC), to cover initial project preparation activities, exploratory and appraisal drilling;
    b. Procurement of rigs and associated equipment;.
    c. Detailed surface exploration work is complete and reports available;

d. The Environmental and Social Impact Assessment (ESIA) for drilling has been completed and the National Environment Management Authority (NEMA) license obtained; and
e. Efforts to build geothermal capacity are underway with recruitment and training of drilling staff ongoing.

50. **Objective.** This project aims to accelerate the shift to geothermal-based power as the main source of baseload generation capacity.

51. **Scope.** The project consists of geothermal resource development, capacity building and construction of power plant, transmission lines and substations. Under the resource development component, the SREP funds will be directed to production drilling. By Gok undertaking both exploratory and appraisal drilling and SREP funding going into production drilling, the stage will be set for increased investor confidence and private sector participation. The power plant construction component will support the initial 200 MW generation from the geothermal resource. The proposed transmission line, Menengai – Rongai 220kV double circuit 20km transmission line, will specifically evacuate power from Menengai to a new sub-station at Rongai, and it will connect to the national grid by joining with the planned Olkaria-Lessos-Kisumu transmission line.

52. **Expected Outcomes.** The following results are expected to be achieved: reduction of perceived resource risks and mobilization of additional funding from the private sector; addition of 200 MW from geothermal to the national grid by 2015; replication of the development model to achieve the target 5,000MW geothermal capacity by 2030; increased private sector participation in power generation; Improved livelihoods to the communities around geothermal areas through direct use programmes from geothermal products by supplying water and process heat for farming, industrial use and social amenities; additional length (20 km) of electricity transmission line constructed; and new electricity transmission sub-stations constructed.

Selection of Projects for SREP Funding

53. Even though all of the five projects identified above are consistent with the objectives and criteria of SREP, this IP further refines the screening criteria to prioritize the projects to be supported under SREP, so as to strategically focus the SREP investments on the areas where they will be able to bring maximum impacts. Guided by the feedback from the Stakeholders' Consultation Workshop and high level strategic consultations within the Government, the GoK Task Force was able to refine the screening criteria for selecting the interventions that have the most potential to effect transformational change to a low carbon pathway in Kenya. The criteria developed to screen the proposed projects, which were broadly endorsed by

stakeholders at the Consultation Workshop held during the SREP Joint Mission in May 2011, are as follows:

a. Potential to scale up
b. Potential for new direct beneficiaries
c. Cost effectiveness (USc/KWh)
d. Contribution to base load/strategic relevance
e. Scale-up, leveraging for additional resources
f. Avoiding duplication/crowding out
g. Project readiness (e.g. availability of studies)

54. The screening criteria above were applied to investment proposals, in conjunction with a requirement that all SREP direct investments will need to be co-financed by at least one MDB. Additionally, the Government has made a conscious decision that to effectively use the SREP funds and also have widespread impacts in the country to promote inclusive development, there should be at least one project each for on-grid and off-grid areas. A conscious effort was made to keep the methodology and the evaluation relatively simple. Comprehensive diagnostic studies and forward looking analysis were used in applying the criteria. They included a Sectoral Environmental Impact Assessment and an updated Least-Cost Power Development Plan (March 2011). The latter contains key data on costs and potential of various renewable energy sources and technologies. For example, screening cost curves for candidate generation plants of different technologies were used in application of the cost effectiveness criterion.

55. The potential to scale up is high with solar and geothermal energy resources (Fiure 5). Given the vast unelectrified areas, the potential of hybrid mini-grid systems is also significant. Potential for new direct beneficiaries is high for geothermal energy, where grid-connected electricity supply can connect a large number of new customers, and biomass cook stoves, where over 90 percent of rural households use traditional biomass cook stoves. Cost effectiveness is particularly high for geothermal, biomass, biogas and wind energy resources (Figure 5). Contribution to base load is substantial for geothermal resources as well as hybrid mini-grids. Leverage of additional resources is expected to be high for geothermal energy and small hydropower development. In terms of avoiding duplication of efforts, hybrid mini-grid systems are presently receiving less support from development partners compared to other renewable energy sources, as shown in Annex 4. Except for small hydropower development, projects are being prepared and are ready to be implemented.. Table 5 presents the results of the evaluation based on the criteria:

Table 5: Evaluation of Investment Proposals

Criteria	Hybrid Mini-Grid Systems	Solar Water Heating	Small Hydropower Development	Scaling Up Improved Biomass Cook Stoves in Institutions	Development of 200 MW of Geothermal in Kenya
Potential to scale up	High	High	Medium	Low	High
Potential for new direct beneficiaries	Medium	Medium	Low	High	High
Cost effectiveness	High	Medium	Medium	High	High
Contribution to base load/Strategic relevance	High	Medium	Low	Low	High
Leveraging for additional resources	Medium	Medium	High	Low	High
Avoiding duplication/crowding out	High	Medium	Medium	Low	Medium
Project readiness (e.g. availability of studies	High	High	Medium	High	High

56. The following scores were used to rank the proposals: High =3, Medium =2 and Low = 1. The aggregated scores for the projects are as follows:

Table 6: Scoring of Investment Proposals

PROJECT	AGGREGATE SCORE
Hybrid Mini-Grid Systems	19
Solar Water Heating	16
Small Hydropower Development	13
Scaling Up Improved Biomass Cook Stoves in Institutions	13
Development of 200 MW of Geothermal in Kenya	20

As a result of this exercise, the development of 200 MW of geothermal scores the highest followed by the hybrid mini-grid systems and the solar water heating systems.

Expected Transformative Impacts of the Investment Proposals

57. These projects to be funded by SREP are expected to bring transformative impacts on renewable energy development.

    a. **Geothermal development** is an important step towards exploiting the estimated resource potential of over 7,000MW. Even though there are 14 geothermal fields identified along the Rift Valley, only Olkaria field has been developed to date. The proposed Menengai geothermal field development will be the first field to be developed outside Olkaria, and hence the resource risks are substantial. SREP, along with other development partners, will help absorb these risks and prove the resource capacity in Menengai. SREP funding will also help finance steam collection and associated infrastructure which will pave way for private sector to come in at subsequent stages of development. It is the first field that is being developed solely by the newly established GDC, which is responsible for the scale-up in geothermal development in Kenya. The proposed project will help GDC design and test out an investment and project structure with the help of development partners that could be replicated for developing the other fields. Furthermore, the capacity development to be supported by SREP will be important to make GDC a credible actor that will be able to develop other geothermal fields, to foster confidence by the private sector, and thereby to catalyze private sector investment in geothermal development. Accelerating geothermal power development and making it the primary generation source will help mitigate the hydropower uncertainty and to expand access to affordable electricity.

    b. **Hybrid mini-grids** will replace the current operational model of unsustainable diesel-based mini-grid electricity supply, which is costly and not environmentally friendly. By implementing renewable hybrid systems, the proposed intervention will make electricity more affordable for the poor, increase generation capacity that will enable more connections and increase access. This project is expected to promote private sector participation in the isolated mini-grids, and hence a successful model will enable its replication in other parts of the country where rural populations remain far from the grid and without access to modern energy services. In addition, the transition from a case-by-case approach to mini-grids development to a standardized scale-up program will allow a systematic scaling-up of access to electricity.

    c. **Solar water heating systems** will transform Kenya's approach towards demand side management by effectively using renewable energy for peak load demand. By collaborating with private bank(s), this intervention will strengthen capacity and

experience of the banking sector in Kenya to finance renewable energy development. Successful removal of barriers and implementation of the newly introduced Solar Water Heating Regulations will allow ERC to learn lessons and replicate the approach in other renewable energy initiatives. It would also build confidence in regulatory approach to renewable energy development.

V. Financing Plan and Instruments

58. Table 7 below sets out a financing plan for the investment proposals in this IP, including the three priority projects identified, which endeavors to leverage additional funding from the MDBs, other development partners, and the private sector. The total cost of the interventions is estimated to be US$928 million[3], of which SREP would finance between US$50-85 million. These funds would leverage additional financing from the MDBs, other development partners, including their commercial loans windows, and the private sector in a 1/8 ratio[4]. The table includes funding directly associated with the projects to be supported under the program and it does not include leveraging of additional private sector funding that is expected to take place after the completion of these projects.

59. The investment proposals are envisaged to be supported in two phases, in accordance with the allocation of SREP resources as they will become available from the initial and the reserve funds. The initial SREP allocation is US$50 million. This allocation would support (i) development of geothermal resources for grid-based power in Menengai in collaboration with development partners; and (ii) conversion of existing diesel power plants in rural areas into hybrid mini-grid systems using renewable energy and construction of new hybrid mini-grids. Both activities include capacity building and lessons learning. In addition, Kenya can apply for additional funds from the SREP Reserve. The allocation from the Reserve, if approved, would be used for (iii) the next phase of geothermal development and (iv) replacement of existing electric water heaters with solar water heating systems. The table below shows the proposed interventions under the initial allocation and US$35 million worth of activities under the Reserve, if it is approved for Kenya.

60. The financing modalities of the projects to be supported will likely include a combination of grant, concessional loans, and possibly guarantees. The modalities will be determined at the time of appraisal, in accordance with relevant SREP guidelines. This decision will take into consideration, inter alia: the barriers to the specific renewable energy to be supported, the country debt situation, and revenue generating prospects as well as the financial rate of return of the investment.

[3] The table does not show development partners' existing commitments to geothermal development. For example, AFD has agreed to finance two drilling rigs.
[4] GoK funding and SREP funding are excluded from the calculation of the leverage ratio.

Table 7: Financing Plan

SREP Allocation	Project Cost/ Estimated Cost		Financing (USD)							
		Cost (MUSD)	MoE/ REA/ KPLC	GDC/ MoE	KETRACO	SREP	MDBs	Development Partners/Commercial Loans	Private Sector/ Developers/ KenGen	Total (MUSD)
SREP Initial Allocation	***200 MW of Geothermal - Phase A***	***400.0***								
	Resource Development									
	Project Preparation	82.0	-	82.0	-	-	-	-	-	**82.0**
	Rig Procurement 2 @ MUSD 35	70.0	-	-	-	-	70.0	-	-	**70.0**
	Exploratory Program (3 Wells)	10.5	-	10.5	-	-	-	-	-	**10.5**
	Appraisal Program (Drill 6 Wells)	21.0	-	21.0	-	-	-	-	-	**21.0**
	Feasibility Study	2.0	-	-	-	-	2.0	-	-	**2.0**
	Production Drilling (35 Wells)	122.5	-	-	-	39.0	83.5	-	-	**122.5**
	Reinjection Wells (8 Wells)	28.0	12.5	-	-	-	15.5	-	-	**28.0**
	Steamfield Development	36.8	-	-	-	-	36.8	-	-	**36.8**
	Wellhead Equipment	22.3	-	-	-	-	22.3	-	-	**22.3**
	Capacity Building	5.0	-	-	-	1.0	4.0	-	-	**5.0**
	Sub Total	**400.0**	**12.5**	**113.5**	**-**	**40.0**	**234.0**	**-**	**-**	**400.0**
	Hybrid Mini-Grid Systems	***68.0***								
	Equipment	49.5	-	-	-	-	2.5	42.0	5.0	**49.5**
	Grid	16.5	-	-	-	9.0	7.5	-	-	**16.5**
	Supervision	0.7	0.7	-	-	-	-	-	-	**0.7**
	Transaction	0.1	0.1	-	-	-	-	-	-	**0.1**
	Studies /Design	0.2	0.2	-	-	-	-	-	-	**0.2**
	Capacity Building	1.0	-	-	-	1.0	-	-	-	**1.0**
	Sub Total	**68.0**	**1.0**	**-**	**-**	**10.0**	**10.0**	**42.0**	**5.0**	**68.0**
SREP Reserves	***200 MW of Geothermal - Phase B***	***400.0***								
	Power Plant Construction									
	Power Plant Construction	385.6	-	-	-	14.6	75.0	200.0	96.0	**385.6**
	Sub Total	**385.6**	**-**	**-**	**-**	**14.6**	**75.0**	**200.0**	**96.0**	**385.6**
	Transmission & Substations									
	Way Leave acquisition	2.0	-	-	2.0	-	-	-	-	**2.0**
	Design & Contract	2.0	-	-	2.0	-	-	-	-	**2.0**
	Transmission line (20 km)	5.4	-	-	-	5.4	-	-	-	**5.4**
	Sub-stations - 220kV (2 N0.)	5.0	-	-	-	5.0	-	-	-	**5.0**
	Sub Total	**14.4**	**-**	**-**	**4.0**	**10.4**	**-**	**-**	**-**	**14.4**
	Solar Water Heating Component	***60.0***								
	SWH Equipment & Installation	59.0	-	-	-	10.0	2.0	-	47.0	**59.0**
	Project Design & Market Review	0.2	0.2	-	-	-	-	-	-	**0.2**
	CDM Project Development	0.1	-	-	-	-	-	-	0.1	**0.1**

SREP Allocation	Project Cost/ Estimated Cost		Financing (USD)							
		Cost (MUSD)	MoE/ REA/ KPLC	GDC/ MoE	KETRACO	SREP	MDBs	Development Partners/Commercial Loans	Private Sector/ Developers/ KenGen	Total (MUSD)
	Capacity Building	0.6	0.6	-	-	-	-	-	-	**0.6**
	Awareness	0.2	0.2	-	-	-	-	-	-	**0.2**
	Sub Total	**60.0**	**1.0**	**-**	**-**	**10.0**	**2.0**	**-**	**47.0**	**60.0**
	Total	**928.0**	**14.5**	**113.5**	**4.0**	**85.0**	**321.0**	**242.0**	**148.1**	**928.0**

VI. Additional Development Activities

61. The Ministry of Energy has established a sector-working group (SWG) for the energy cluster of development partners. This group, currently chaired by the French Development Agency (AFD) and Japan International Cooperation Agency (JICA) includes the African Development Bank (AfDB), the European Investment Bank (EIB), the German Development Bank (KfW), the Swedish International Development Agency (SIDA), the Embassy of Spain, the United States Agency for International Development (USAID), United Nations Industrial Development Organization (UNIDO), United Nations Development Programme (UNDP), and other development partners. The objective of the SWG is to increase a programmatic flow of donor funds for the energy sector, consistent with the 2005 Paris Declaration on aid effectiveness, which calls for the harmonization of donor funding with a common results framework, to foster joint ownership and alignment with government programs, and mutual accountability.

62. This Investment Plan was prepared in close coordination with the energy sector development partners, incorporating their comments and suggestions. The SREP Scoping Mission and the Joint Mission had consultations with the development partners. During the Scoping Mission, the development partners saw SREP as an opportunity for Kenya to accelerate renewable energy development. Among many opportunities, they considered geothermal development to be of primary interest. The development partners noted that an optimal use of the SREP funds would be absorbing part of the exploration risk to facilitate private sector involvement in geothermal power. With regard to wind projects, the partners considered that GoK was better placed to support them. The partners emphasized the importance of building adequate energy transmission networks to expand the population's access to electricity. These suggestions are fully consistent with the proposed Investment Plan.

63. During the Joint Mission, the development partners emphasized that the SREP interventions should have a clear focus so as to avoid spreading too much across different activities. They noted that the IP should reflect the economic impact of the different interventions, with a particular focus on the beneficiaries. There was a suggestion that opportunity costs of supporting one specific renewable energy technology over another should be evaluated and that lessons learned from past projects should be incorporated in the IP. There was a consensus that capacity building and strengthening of the role of local financial institutions in scaling-up funding for renewable energy expansion was an important area to consider in the IP. In addition to these consultations, when the development partners meet quarterly for the Energy Sector Donor Coordination Meetings in Nairobi, the progress on SREP

preparation has been continuously reported and the development partners were invited to comment on the draft Investment Plan.

64. By selectively targeting greenfield geothermal development, hybrid mini-grid systems, and solar water heating systems, the SREP investments will minimize duplication and harness synergy with on-going and planned activities by development partners that are complementary. The following table illustrates initiatives by development partners on renewable energy in the country. As shown in the table, development partners' activities in this area cover a wide range of renewable energy technologies. However, there are some notable gaps, such as the support to hybrid mini-grid systems, which also scored high on the criterion "avoiding duplication/crowding out" in Section V. Moreover, given the large scale of risk mitigation needed in the entire geothermal development stages, SREP will focus on activities that are highly complementary to other development partners.

Table 8: Renewable Energy Initiatives of Development Partners

Hybrid Mini-Grid Systems	Solar	Small Hydropower	Wind	Biogas	Biomass	Geothermal
• AFD will support off-grid rural electrification.	• WBG supports market development of solar lighting. • EC supports solar pumps and improving the access of poor people to solar energy. • Government of Spain supports solar PV installations to public institutions.	• UNEP/GEF supports small hydro in tea factories in the region. • EC supports construction of 7 mini-hydro power plants. • IFC will provide advisory service on small hydro development.	• AFD supports wind feasibility studies • AFD/Proparco and AfDB will finance Lake Turkana Wind Farm. • EC supports wind pumps. • Government of Belgium and Spain support Ngong wind power expansion project.	• UNDP supports capacity building for sustainable energy services. • EC supports scaling the smaller biogas plants for agricultural producers and processors.	• UNDP and UNEP/GEF provide market transformation support for efficient biomass stoves for institutions and SMEs and cogeneration industry in the region. • EC supports improved cook stoves for households and institutions. • AFD supports bagasse cogeneration.	• UNEP and WB support technical assistance for exploration and utilization of geothermal energy through ARGeo. • AFD, Proparco, EIB, China EXIM Bank, WB, JICA, and KfW support Olkaria geothermal development.

VII. Implementation Potential with Risk Assessment

Implementation Potential

65. The Government is committed to scaling-up renewable energy in the country and is ready to implement the projects to be supported under the SREP. In addition to enabling policy and regulatory reforms, described in Section III, the GoK has also established key institutional mechanisms. The MoE has a dedicated Directorate focusing on renewable energy. In addition, during 2010, the GoK set up a "Green Energy Task-Force". The overall mandate of the Green Energy Task Force is to ensure the expansion of the generation of green/clean energy.

66. For the preparation and implementation of SREP-funded activities, the Government has established a Task Force, consisting of key institutions in the energy sector, as well as Consultative Group from a wide range of stakeholders associated with renewable energy. It is expected that this Task Force, which has been functioning effectively during the preparation of this Investment Plan, will continue to play an overall coordination role during the project implementation. The organizational arrangements for the SREP will be as follows:
    - Overall Responsible Agency: MoE
    - Focal Point Persons: Acting Director, Renewable Energy, MoE; and Deputy Manager, Corporate Planning and Strategy, GDC
    - Task Force: MoE, MoF, GDC, KETRACO, KPLC, KenGen, ERC, REA
    - Implementing Agencies for the Projects:
        - Geothermal development: GDC with KETRACO
        - Hybrid mini-grid systems: REA with KPLC
        - Solar water heating systems: Private Bank(s) with MoE
    - Consultative Group: NEMA, KEPSA, National Task Force on Accelerated Development of Clean Energy, KIPPRA, and CSOs.

67. While the Government understands that a detailed assessment of absorptive capacity will be carried out separately by the MDBs for their due diligence, a preliminary assessment of the implementing agencies suggests that their absorptive capacity of the entities involved is substantial.
    - **MoE**: MoE is staffed with qualified experts and has substantial experience working with MDBs. On-going activities supported by development partners have been providing training to enhance its capacity further.
    - **REA with KPLC**: REA is a relatively new entity and is going through various capacity building programs supported by development partners. REA will be working with KPLC in operating and maintaining the mini-grid systems in

isolated areas. KPLC is managing the 12 existing mini-grid systems. SREP will support part of capacity development programs for REA and KPLC.

- **GDC with KETRACO**: GDC is also a relatively new entity and it has successfully started drilling the Menengai geothermal field. KETRACO is also a newly established entity embarking on constructing new high voltage transmission lines. SREP will support part of capacity development programs for GDC and KETRACO.
- **Private Bank(s) with MoE**: The private sector in Kenya is very active in renewable energy development. IFC has been working closely with private banks in Kenya in renewable energy development.

Risk Assessment

68. **The overall implementation risk is assessed as moderate.** The following section looks into the institutional, technology, environmental, social, and financial risks involved.

Table 9: Risk Assessment of the Program

RISK	DESCRIPTION / MITIGATION	RESIDUAL RISK
Institutional Risks (risks related to policy and regulatory environment and/or institutional capacity)	Institutional risks of the electricity sector as a whole are low because: (i) The regulatory framework is robust and resistant to interference; (ii) the ERC has the authority to regulate, has adequate technical capacity, is monitored through a performance contract with the Government, and is operationally independent; and (iii) the negotiations for tariff-setting and power purchase agreements are transparent and ensure the pass-through of non-controllable costs, such as fuel costs, inflation and foreign exchange fluctuations, to ensure financial sustainability. Institutional capacity of the implementing agencies, including their capacity to handle procurement, financial management, and environmental and social safeguards, will be assessed before project appraisal and, where necessary, capacity development will be provided.	Low
Technology Risks (risks related to technological complexity)	While technology to be adopted for hybrid mini-grids and solar water heating are proven and less complex to handle, technology related to the geothermal development will require significant investment in technical expertise. This risk will be partly mitigated by the capacity building component to be supported under SREP and also by other development partners.	Moderate
Environmental Risks (risks related to environmental	With a view to implementing energy sector investment programs in a sustainable and environmentally friendly manner, the Government carried out a Sectoral Environmental Impact Assessment (SEIA) for the energy sector investments in 2009, which identified environmental policies that will be	Low

concerns)	triggered by various investments in the sector. It also specified potential cumulative environmental and social impacts as well as possible mitigation measures. The SEIA identifies the following main impacts associated with future geothermal power developments: loss of vegetation during construction, air pollution due to H_2S emissions, over abstraction of water during drilling, and noise and interference with wildlife. For transmission and substations, the main impacts identifies are deforestation due to clearing of vegetation along the right of ways, interference with wildlife, loss of land and crop production due to wayleave. In both cases, the SEIA finds the significance of impacts is generally moderate. Appropriate environmental management measures will be incorporated into project design.	
Social Risks (risks related to social issues)	By providing affordable electricity to more people and improving the quality of supply the Project will promote greater economic growth and equity. Public consultations are mandatory part of Environmental Impact Assessments, which would also include social impact assessment, as per the Kenya Environmental Management and Co-ordination Act 1999. The National Environmental Management Authority makes available all draft EAs and provides the public 40 days for feedback. The addressing of the feedback by the project proponent is generally included as a condition for approval of the EA. Appropriate social development measures will be incorporated into project design.	Low
Financial Risks (risks related to financial viability of the sector/entities)	The electricity sector in Kenya is to a large extent financially self-sustainable due to sound regulatory policies that are applied to the terms of power purchase agreements between power generators and KPLC as well as to the design of the retail tariffs charged by KPLC. However, making new business models for geothermal development, managing hybrid mini-grids and solar water heating systems financially sustainable would require regulatory measures (e.g. steam supply) and market research. Additional capacity development will be considered.	Moderate

VIII. Capacity Building and Learning

69. SREP will support capacity building activities that will: (i) ensure that knowledge management processes provide learning opportunities for similar programs within the country and region, (ii) enhance the enabling environment for renewable energy production and use, and (iii) increase renewable energy investment (both private and public). This will be an important part of SREP in linking the proposed investments with the development of local renewable energy expertise and capabilities. Overall, the capacity building component will aim to strengthen governance and institutional capacity that can help replication of the projects supported under SREP while advisory services will seek to address select barriers to renewable energy uptake. Lessons-learning is closely linked to monitoring and reporting on results and outcomes of programs.

70. A brief outline of the proposed Information Sharing and Lessons Learning (ISL) activities is as follows:

a. **Objective**: To draw lessons from the new business models to be adopted in the pilot projects supported under the SREP so that similar models can be replicated in other parts of the country and/or other countries
b. **Broad scope and main activities***:* The scope of the ISL activities will cover: analysis of major barriers to renewable energy development and how they were addressed by the projects; interview of key officials involved in the projects supported under SREP; assessment of key factors that have contributed to success/failure; quantifying some of the co-benefits of renewable energy development; and lessons-learning for future projects from the experience.
c. **Institutional and implementation arrangements**: The Government and the implementing agencies will facilitate consultant(s) to work on the ISL activities. The Government will provide general oversight, coordination and supervision as well as accountability while the implementation agencies including the private sector will focus on specific implementation activities assigned and carry out the monitoring of the same.
d. **Capacity strengthening***:* presentation skills, exchange programmes and technical visits shall enhance the knowledge sharing capabilities of the project team.

IX. Monitoring and Evaluation

71. To establish a basis for future monitoring and evaluation of the results of SREP-funded activities, a results framework for Kenya SREP Investment Plan is prepared. The catalytic replication effect of the Program will come from: (a) investments resources that SREP will leverage; (b) learning and demonstration; and (c) impetus to policy development.

    a. Leverage of resources: SREP resources will leverage investments resources from AfDB, IDA, the other development partners and the private sector for renewable energy development in a ration of 1 to 8. The investment mobilized by SREP for geothermal resource development will catalyze downstream geothermal IPPs. Geothermal IPPs – representing approximately US$100 million in private financing - by themselves will have transformative impact due to their scale.

    b. Learning and Demonstration: In addition, the catalytic replication effect of the Program will come from the capacity building and knowledge creation that the program will leverage. For example the learning in geothermal resource development including participation of IPPs will be shared in Kenya and in other countries with significant geothermal resource development potential such as Uganda, Rwanda and Ethiopia. Similarly the interventions in hybrid mini-grid systems will have significant demonstration effect in the region.

    c. Policy Development: The IP will give impetus and help sustain the policy, institutional and regulatory environment, being supported by other MDB operations including the Kenya Electricity Expansion Project (KEEP of IDA). Specific technical assistance under KEEP, for example, will elaborate regulations for grid connected renewable energy. Technical assistance intervention under the IP will catalyze private sector.

72. The following objectives and indicators have been used to develop the Results Framework:

    a) Objectives:
    - Increase in number of women and men supplied with electricity
    - Additional resources leveraged for geothermal and off-grid systems investments
    - Improved enabling environment for renewable energy production and use

    b) Indicators:
    - Leverage factor of SREP funding; financing from other sources (contributions broken down by development partners (MDBs and Bilateral), Government of Kenya, CSOs, private sector) for geothermal and mini-grids using renewable energy sources

- Percentage (%) change in number of project beneficiaries with access to energy services from geothermal and mini-grids using renewable energy sources (women/men)
- Enactment of policies, laws and regulations for renewable energy

73. Results framework for Kenya SREP Investment Plan

NB: RE in the table refers to hybrid (wind/solar) mini grids and geothermal energy for grid supply - the main focus of SREP program intervention in Kenya

Table 10: Results Framework of the Program

Results	Indicators	Baseline (year 2010)	Targets	Responsibility for collection	Data Source	Data availability (Yes/No)
Project Outputs and Outcomes						
1. Increase in number of women and men supplied with electricity	**Number of customers connected to Main grid**	1,441,139	2,200,000 (by 2015)	KPLC	Project M&E	
	Number of customers connected to Mini- grid	22,500	33,500 (by 2015)	KPLC	Project M&E	
2.Decrease in GHG emissions	**Displaced amount of GHG emission in the Isolated Mini-Grid in tonnes per year**	0	10	REA	Project M&E	The amount of CO2 equivalent mitigated and the $ cost per ton in Kenya IP projects
	Displaced amount of GHG emission in the National Grid in tonnes per year	0	1,061	MoE	Project M&E	
3. Increased RE supply	**a) Amount of energy in GWh from RE annually**	3,525	5,167 (by 2015)	KPLC	Project M&E	Yes (KPLC Annual Reports)
	b) Additional geothermal power connected to the national grid	0 MW	200 MW by 2015	KPLC	Project M&E	
4. Decreased cost of electricity	**Reduction in annual generation costs in the isolated mini-grids**	TBC	TBC	MoE	Project M&E (Household Surveys)	
	Reduction in annual generation costs in the main-grids			KPLC	Project M&E	

Results	Indicators	Baseline (year 2010)	Targets	Responsibility for collection	Data Source	Data availability (Yes/No)
5. Learning about demonstration, replication and transformation captured, shared in Kenya and to other countries in SSA especially in EAC.	**Number and type of knowledge assets (e.g., publications, studies, knowledge sharing platforms, learning briefs, communities of practices, etc.) created**	TBC	3	GDC, REA	Project M&E (Entity reporting)	
6. New and additional resources for renewable energy projects	**Leverage factor of SREP funding; financing from other sources (contributions broken down by Donors (MDBs and Bilateral), Government of Kenya, CSOs, private sector) (USD Millions)**	-	1:8	MoE, GDC, REA	Project M&E (Entity reporting)	
Catalytic Replication						
1. Increase in renewable energy generation investments	**a) Percentage (%) of RE investment of total new energy investment**	TBC	TBC	MoE		
	b) Amount of RE generated by the private sector in new RE plants	TBC	TBC	MoE		
2. Improved enabling environment for RE production and use	**a) Adoption of and implementation of low carbon energy development plans**	TBC	TBC	MoE		
	b) Enactment of policies, laws and regulations for renewable energy	TBC	TBC	Energy Regulatory Commission		
	c) Replication of the development model	0MW	5,110 MW by 2030	GDC	Project M&E	
3. Increased economic viability of renewable energy sector	**a) Percentage (%) of private sector RE investments of total new energy investments**	TBC	TBC	MoE		
	b) Change in percentage (%) of total energy sector employment working in RE (women/men)	TBC	TBC	MoE		
Transformative Impacts in KENYA						
Transformed energy supply and use by poor women and men in Kenya, to low carbon development pathways	**c) Number of new households connected to electricity in the rural areas.**	TBC	TBC	REA		The amount of total electricity supply (GWh) coming from RE sources in KENYA.

Results	Indicators	Baseline (year 2010)	Targets	Responsibility for collection	Data Source	Data availability (Yes/No)
	d) Population (rural) consuming energy services from new hybrid RE systems	TBC	TBC	REA		
	e) Change in the energy development index - EDI (per capita electricity consumption)	TBC	TBC	MoE	Household surveys	

Annexes:

Annex 1: Assessment of Country's Absorptive Capacity

Kenya has sufficient absorptive capacity to implement the projects to be supported under SREP, including the resources to be leveraged. This Annex describes the macroeconomic, institutional and technical, and managerial dimensions of the country's absorptive capacity.

Macroeconomic Aspects. The country's macroeconomic management has been sound in 2010. The latest Joint IMF/World Bank Debt Sustainability Analysis of Kenya, released in January 2011, noted that Kenya's reliance on external borrowing is limited and concluded that there is a low risk of the country facing external debt distress. However, the country is now experiencing a series of shocks, which could dampen its growth prospects. In 2010, the economy grew at 5.6 percent, driven by strong growth in agriculture (6.3 percent), and the inflation rate was kept low (4.1 percent); in 2011, Kenya has been hit by global increase in food and fuel prices as well as drought, leading to higher inflation (CPI rising by 12 percent in four months) and depreciation of the currency (nominal effective exchange rate depreciating by 24 percent since 2008). Increases in fuel prices could widen Kenya's current account deficit, which had already increased from 5.5 percent of GDP in 2009 to 7.9 percent in 2010.

To curb the inflationary pressures, the central bank tightened its monetary policy in March 2011. The fiscal policy has also switched from stimulating the economy, focusing on development expenditures largely financed through costly domestic borrowing, to creating fiscal buffers. A new public financial management law is expected to strengthen expenditure control and enhance accountability. The Government is balancing debt target and implementing planned investment in infrastructure, and grant/concessional loan financing would ease the pressure on financial cost from domestic borrowings.

Institutional Aspects. Major reforms in the electricity sector have established an efficient and transparent institutional framework. The reform of the electricity sector in Kenya has progressed much farther than in most other Sub-Saharan countries. The 2004 Energy Policy and the 2006 Energy Act were two milestones in sector development that established an effective framework for enabling the commercial viability of electricity companies and opened the door for competition in the electricity market. The elimination of the Government's monopoly on the power industry in the late 1990s led to the creation of the Kenya Electricity Generating Company, Ltd. (KenGen) for power generation and leaving the Kenya Power and Lighting Company, Ltd. (KPLC) for electricity transmission and distribution. These listed companies, operate on a commercial basis and have private share capital, although the Government is the majority shareholder in both. A further separation of functions led to the creation of the Rural Electrification Authority (REA) in 2006 with a mandate for planning and implementing rural

electrification, the Kenya Electricity Transmission Company (KETRACO) in 2008 with a mandate to plan, build, and operate new transmission assets, and the Geothermal Development Company (GDC) in 2008 as a special purpose vehicle company wholly owned by the Government to accelerate geothermal development in the country. Five Independent Power Producers (IPPs) provide 25% of electricity supply.

Regulation is at arm's-length from direct government interference. The Energy Regulatory Commission (ERC), created in 2007, regulates wholesale and retail tariffs and issues licenses. A separate Energy Tribunal hears appeals to the decisions of the ERC. The Commission has a successful track record on contested issues including approval of PPAs and tariff reform, as described below:

The Energy Regulatory Commission (ERC) has the authority to regulate. This mandate was established through an Act of Parliament. Its specific mandate is defined in the Energy Act, 2006. Its jurisdiction with regard to setting KenGen's generation prices was challenged by KenGen in mid-2008 in the Energy Tribunal when it made its first tariff ruling. Following an initial ruling by the Tribunal, the matter was resolved amicably and KenGen and KPLC negotiated Power Purchase Agreements, which were subsequently reviewed and approved by ERC.

The ERC has adequate technical capacity. ERC's technical staff are professionally qualified. The Chairman is a former general manager of an electric utility abroad and has the requisite stature to exercise authority. The required qualifications of the Chairman and the General Manager are stated in the Energy Act 2006. The Chairman: (a) must be a holder of an university degree in engineering, energy, economics, law, finance or physical sciences; and (b) must have at least seven years of experience, five of which at a senior managerial level.

ERC's performance is monitored through a performance contract with the Government. ERC also participates in the regulatory peer review of African electricity entities led by experts from the Cape Town university. The latest review in 2009 concluded favorably and identified areas for improvement. ERC also carries out annual satisfaction surveys of its clients, the regulated entities.

The ERC is operationally independent. The ERC finances its activities from a levy in electricity tariffs, license fees, the petroleum levy and appropriations by Parliament. The Commission's Chairman is appointed by the President for four years with a possibility of reappointment for another four years. The President may terminate the appointment of the Chairman on the advice of the Commission for specific reasons stated in the Energy Act 2006.

Technical and Managerial Aspects. The implementing agencies of the SREP-funded activities are sufficiently equipped in terms of technical and managerial capacity.

MoE: MoE has a dedicated directorate for promoting renewable energy and is staffed with qualified experts. It has substantial working experience with MDBs. On-going activities supported by development partners have been providing training to enhance its capacity further.

REA with KPLC: REA is a relatively new entity and is going through various capacity building programs supported by development partners. REA will be working with KPLC in operating and maintaining the mini-grid systems in isolated areas. KPLC has been managing the 12 existing mini-grid systems.

GDC: GDC is also a relatively new entity and it has successfully started drilling the Menengai geothermal field. SREP will support part of capacity development programs for GDC.

Private Bank(s) with MoE: The private sector in Kenya is very active in renewable energy development. Several development partners have been working closely with private banks in Kenya in renewable energy development.

Annex 2: Stakeholder Consultations

The preparation of this Investment Plan benefitted greatly from a number of stakeholder consultations held: (i) consultation with the private sector, civil society organizations and development partners during the SREP Scoping Mission; (ii) consultation workshops and meetings with development partners during the SREP Joint Mission; and (iii) public comments on the draft Investment Plan. In addition, there have been continuous interactions with stakeholders throughout the preparation process.

Scoping Mission:

During the Scoping Mission, the MDBs team met with private sector organizations, civil society organization, and development partners. They welcomed the initiative and requested the team to consider a wide range of renewable energy sources in addition to geothermal. Comments received are summarized below:

Private Sector. Representatives of Kenya Private Sector Alliance (KEPSA), which represents 75% of Kenya‟s private sector enterprises, emphasized that Kenya's renewable energy development plan should be more ambitious and, in addition to geothermal, it should include other sources of power, such as wind, solar, biomass, biogas, cogeneration, small hydro and waste. Several representatives considered that if external benefits from developing a renewable energy were considered in the preparation of the Least-Cost Power Development Plan, more renewable energy sources could become competitive. The representatives also stressed that the existing feed-in-tariff levels are still too low to scale-up investment in renewable energy development. Given the significant uncertainty in the capital expenditures required for renewable energy development, some representatives felt the formulae for determining the levels of feed-in-tariffs should be established in the regulation, with incentives to minimize costs of renewable energy development. KEPSA expressed its strong wish to be engaged upfront in the IP preparation process and be part of an IP consultation group.

Representatives from Kenya Association of Manufacturers (KAM) explained to the Mission that it is currently focusing on energy efficiency of private companies. As for renewable energy deployment, KAM representatives pointed out the issues of low feed-in-tariffs and guaranteed off-take. They suggested to the Mission to contact Mumias Sugar Company and learn from their experience.

Civil Society. Representatives from Kenya Institute for Public Policy Research and Analysis (KIPPRA) highlighted that their research on energy consumption pattern shows that household consumers are generally more satisfied with renewable energy, such as solar, wind, and biogas, than fossil fuels and biomass. The representatives mentioned that some of the barriers to scaling up renewable energy deployment in Kenya are regulatory constraints and incentive regimes, high

initial cost, limited pool of trained technicians to undertake operations and maintenance of equipment, as well as insufficient public awareness.

Development Partners. The development partners saw SREP as an opportunity for Kenya to accelerate renewable energy development. Among many opportunities, they considered geothermal development to be of primary interest. The development partners noted that an optimal use of the SREP funds would be absorbing part of the exploration risk to facilitate private sector involvement in geothermal power. In addition, partners suggested the use of SREP funds in a clearly defined guarantee fund could encourage the development of small hydropower plants. Co-generation plants were also mentioned as a potential target area along with bio-energy (biogas, etc) production. With regard to wind projects (such as Lake Turkana Wind Farm) the partners considered that GoK was better placed to support them. The partners emphasized the importance of building adequate energy transmission networks to expand the population‟s access to electricity.

Joint Mission

During the Joint Mission, Stakeholders' Consultation Workshop (attended by more than sixty people), Technical Workshop with national energy entities, and a meeting with development partners were held. Their comments and inputs are reflected in this Investment Plan.

Stakeholders' Consultation Workshop. In the Stakeholders' Consultation Workshop organized by the MoE on May 6, 2011, consultations were held with key stakeholders in the country, including national institutions/ authorities, development partners, civil society organizations (CSOs), local communities and the private sector. The workshop was aimed at supporting GoK to develop its investment plan through a wide consultation and dialogue process with all stakeholders. During the workshop, the GoK Task Force presented the draft IP and a proposed set of criteria for selecting the individual projects to be supported by SREP. Workshop participants welcomed the SREP program, the array of activities included in the draft IP, and generally validated the proposed selection criteria. In addition to a number of comments on the IP and suggestions for additional activities to be included in the IP, the participants also had a number of suggestions for improving the selection criteria. The GoK SREP Task Force has reviewed all the comments received and will take them into consideration in finalizing the IP.

Technical Workshop. Following the Stakeholders' Consultation Workshop, the GoK organized a Technical Workshop with the SREP Task Force members on May 8, 2011. During this workshop, the Task Force together with the Mission reflected on the outcomes of the stakeholders' consultation and discussed and agreed on the screening criteria to be used to prioritize the interventions under the IP. The technical workshop was an occasion for the Mission to stress the importance of the expected transformational impact of SREP and its expected leveraging effect. SREP funds should be used to mitigate additional risks associated with renewable energy technologies and remove financial and institutional barriers.

Consultations with Development Partners. The Mission met with the Development Partners involved in the renewable energy sector in Kenya (AFD, EIB, JICA, UNDP, and UNEP) to discuss the draft IP with a view of building synergies with other programs in the field of renewable energy. The Development Partners emphasized that the SREP interventions should have a clear focus so as to avoid spreading too much across different activities. They noted that the IP should reflect the economic impact of the different interventions, with a particular focus on the beneficiaries. There was a suggestion that opportunity costs of supporting one specific renewable energy technology over another should be evaluated and that lessons learned from past projects should be incorporated in the IP. There was a consensus that capacity building and strengthening of the role of local financial institutions in scaling-up funding for renewable energy expansion was an important area to consider in the IP.

The Development Partners are actively supporting renewable energy and are keen to support the SREP program. Areas currently receiving support include geothermal, rural electrification, wind, mini-hydro and cook stoves. The Mission concluded that the Partners' activities had a lot of synergies with the SREP and it was agreed that all Development Partners would keep each other updated on their activities so that support was coordinated. Some specific activities that the Development partners are supporting include the following: The AFD has increased its financing for geothermal, is launching a credit line for renewable energy financing, and is interested in co-financing the proposed hybrid mini-grid project under SREP. IFC and EIB are currently working on a credit line and related advisory service instrument for financing and supporting renewable energy projects by the private sector, including small hydro, biomass, and the development of mini-grid systems. UNDP has expertise in energy access, wind risk assessment, small hydro standards, solar water heater development, and development of household cook stoves. UNEP is working on cook stoves development, geothermal development, and capacity development on Clean Development Mechanism (CDM) for KenGen. DFID is working on creating a Climate Innovation Center (with Danida and WB), Renewable Energy Challenge Fund in East Africa (with Danida), and an Output-Based Aid (OBA) activity on mini-grids (with the Dutch and the German).

Public Comments

In April, before the Joint Mission, the SREP Task Force has circulated the draft Investment Plan to stakeholders for their comments. Comments were received from three stakeholder groups: KREA, UNDP and MDBs.

After the Joint Mission, the revised draft Investment Plan was disclosed on the Ministry of Energy's website for public comments on 23rd May, 2011.

Annex 3: Co-Benefits

Renewable energy development is an integral part of the energy policy in Kenya, whose broad objective is to ensure adequate, quality, cost effective and affordable supply of energy through use of indigenous energy resources in order to meet development needs, while protecting and conserving the environment. Renewable energy can contribute to several dimensions of these energy sector challenges, including enhancing the energy security, making energy affordable, improving people's access to energy services, and protecting the environment. This implies that there are co-benefits by scaling-up renewable energy resources.

Developing renewable energy in Kenya will not only help address global climate change mitigation and national energy challenges but also bring co-benefits more often felt by the current generation in local communities. Most of the renewable energy resources are located in under-developed areas of the country. For example, it is estimated that abundant geothermal resources are available along the Rift Valley; high wind resources potentials are found in some parts of Nairobi, Rift Valley, Eastern, North Eastern, and Coast Provinces; small hydro potentials are also found along river basins in remote areas; and existing mini-grid systems managed by KPLC to be made hybrid with renewables under SREP, are also located in remote commercial centers in Rift Valley, Eastern, North Eastern, Coast, and Nyanza Provinces. SREP-funded activities will bring the following co-benefits to local communities, in addition to the primary benefits of enhancing energy security and improving people's access to energy services:

- **Enhanced Energy Security**: Scaling up geothermal energy supply in the national grid will help reduce the country's dependence on hydroelectric power, which has increasingly become unreliable under changing weather patterns, as well as on imported fossil fuels to run thermal power plants. It would diversify the energy supply mix prevailing in the country and hence enhance the security of energy supply in the country.

- **Improved Access to Electricity**: On-grid geothermal electricity supply would help increase the number of connection to the national grid and achieve KPLC's target of connecting 200,000 customers per year. Installing additional hybrid mini-grid systems in the country will contribute to increase access to electricity among people and institutions in isolated areas in Kenya.

- **Reduced Indoor Pollution**: Hybrid mini-grids will displace/reduce kerosene and wood fuel consumed by households in rural areas by increasing access to electricity.

- **Forest Conservation**: Displacement of biomass fuel consumption by enhanced access to electricity will contribute to conserve forests that are also serving as water catchment areas. GDC will help conserve catchment areas by afforestation activities to protect ground water resources for geothermal generation.

- **Local Economic Development**: Geothermal development will open up of the areas through infrastructure development such as roads and water. The opportunities for utilization of by-product heat and condensate would support industrial and agricultural activities (e.g. horticulture).

- **Job Creation and Income Generation**: Hybrid mini-grids will support provision of infrastructure services, such as clean water, health care, and information and communication technology. Solar water heating systems will create jobs along the supply chain.

- **Increased Security**: Geothermal development and hybrid mini-grids will enhance security in the areas as a result of the economic activities and social amenities. Transformation of livelihoods in rural areas is demonstrated in Sondu-Miriu (hydro) and Olkaria (geothermal) areas.

- **Reduced electricity tariffs**: geothermal power and hybrid mini-grids will displace expensive fossil oil thermal power and thereby save foreign exchange and reduce pass through fuel costs.

Annex 4: Existing Activities in Renewable Energy

Development partners' activities in renewable energy development in Kenya cover a wide range of technologies. By selectively targeting greenfield geothermal development, hybrid mini-grid systems, and solar water heating systems, the SREP investments will minimize duplication and harness synergy with on-going and planned activities by development partners that are complementary. There are, for example, some notable gaps in on-going activities, such as the support to hybrid mini-grid systems, which also scored high on the criterion "avoiding duplication/crowding out" in Section V. Moreover, given the large scale of risk mitigation needed throughout the entire stages of geothermal development, SREP will focus on activities that are highly complementary to other development partners.

- **Hybrid Mini-grid**. **AFD** will support conversion of diesel generators into hybrid generators (wind, solar, biomass) and construction of new generators and associated mini-grids in rural areas. SREP-funded activities will scale-up and complement the investments to be supported by AFD.

- **Solar**. **EC** is supporting installation of solar and wind pumps in Wajir District. **EC** is also supporting solar energy for lighting in rural areas in Kenya. **Government of Spain** is supporting the installation of solar PV to 380 public institutions, such as schools, health facilities in arid and semi-arid land. **IFC/World Bank** are supporting innovative solar lanterns through Lighting Africa initiative.

- **Small Hydro**. **EC** is supporting community-based mini hydropower development in upper Tana river basin by constructing 7 mini-hydro power plants with total capacity of 3,185 kW, with distribution lines to 23,538 households, 28 market centers, 59 schools, 3 tertiary institutions, 12 health centers, 8 factories, 33 churches, and 7 tree nurseries. **IFC** is providing advisory services on small/mini-hydro power development as well as risk mitigation schemes to commercial banks investing in small hydro power plants. **UNEP/GEF** is supporting a regional project installing small hydro power to tea factories in Kenya, Tanzania, Uganda, Rwanda, and Malawi.

- **Wind**. **AFD/PROPARCO** and **AfDB** are providing partial financing of 300MW Lake Turkana Wind Farm. **AFD** is supporting preparation of feasibility studies for 12 wind sites. **Government of Belgium** and **Government of Spain** are supporting Ngong wind power project expansion, which is expected to inject 15 MW power to the grid.

- **Biogas**. **EC** is upscaling the smaller biogas plants for agricultural producers and processors. **UNDP** is supporting capacity building for sustainable energy services.

- **Biomass**. **AFD/PROPARCO** are supporting co-generation by Mumias Sugar. **EC** is supporting an initiative for the improved cook stoves for households and institutions. **UNDP** and **UNEP/GEF** are supporting market transformations initiative for efficient biomass stoves for institutions and SMEs. In addition, UNEP is providing support for cogeneration market in Eastern and Southern Africa. **UNDP** is promoting public-private partnerships in sustainable charcoal production.

- **Geothermal**. **AFD/PROPARCO** are supporting Olkaria I, II, and III expansion projects. **EIB** is supporting Olkaria II extension project. **Government of China** is supporting drilling services for Olkaria I and IV fields. **World Bank Group** is supporting Olkaria I, II, III, and IV expansion projects. **JICA** is supporting Olkaria I development. **KfW** is supporting Olkaria I and IV development. **UNEP** is providing technical assistance for surface exploration of geothermal energy through African Rift Geothermal Development Facility (ARGeo).

Annex 5: Investment Concept Briefs

1. Hybrid Mini Grids Systems

Problem Statement

1. Electricity access in rural Kenya is low despite the Government's target to increase electricity connectivity from the current 15 percent to at least 65 percent by the year 2022. The rural electrification program involves expansion of both renewable and non-renewable sources of energy in remote parts of rural area. However, the funds available can only enable roll out to a limited number of areas, leaving out other equally needy towns. The Government has been expanding electricity supply to administrative towns and upcoming commercial centers in remote locations in Kenya based on diesel power generation. However, the cost of generation from these diesel plants is high and unpredictable due to the fluctuating international crude oil prices. Besides the high cost, the diesel plants contribute to local pollution and GHG emissions. For these reasons, the Government is currently incorporating solar PV and wind systems in isolated diesel thermal power plants in arid and semi-arid areas to substitute generation provided through fossil fuel.

2. The Government's near-term targets for scaling-up electrification are defined in the Medium Term Plan (MTP). The MTP is the first of a series of five-year plans aimed at achieving the objectives of the Government's long-term national development plan "Vision 2030". The MTP describes two programmes aimed specifically at increasing access to electricity. These programmes are:

    - **The Energy Access Scale-Up Programme.** This programme aims to connect one million new households, roughly doubling the current number of connected customers
    - **The Rural Electrification Programme.** This programme aims to connect all **"**priority loads". Priority loads are defined as district headquarters, secondary schools, health facilities, and trading centres.

Proposed Contribution to Initiating Transformation

3. Electricity connection to trading centers has a higher negative correlation with poverty than connections to households, which makes it an effective option for rural electrification[5]. The Government's initiative of scaling up hybrid mini grids in rural areas in arid and semi-arid areas can be expanded to reach out to more rural markets and also to enable displacement of part of generation provided through fossil fuels.

4. The program will transform and positively impact livelihoods and bring co-benefits to local communities. It will lead to higher access to energy and low GHG emissions and less indoor air pollution in homes that previously used kerosene for lighting. The overall cost of electricity will be reduced since fuel costs are shared by all electricity consumers. Increased connectivity would further eliminate health risks to women and children arising from use of kerosene and wood fuel. Experience has shown that established mini-grids have attracted development of other related infrastructure that include clean water, quality health care, job creation, information and communication technology among others. These have impacted positively on the rural women and youth who can easily access relevant information.

[5] World Bank. (2011) "Infrastructure for Shared Growth in Kenya: A Bumpy Ride to Prosperity"

Implementation Readiness

5. It is anticipated that the implementation of the new constitution will result in requirement for more mini-grids targeting areas where grid extension would be highly uneconomic. The Rural Electrification Master Plan has a list of some small rural towns that are targeted for mini-grids and grid extension. It is proposed that solar PV and wind systems be installed in identified market centres in order to meet the demand requirement and reduce the generation by thermal source.

6. The GoK program is currently in progress involving introduction of renewable energy in existing and proposed mini grids in rural areas of the country. So far five projects for supply, installation and commissioning solar PV systems and two for wind have been tendered and awarded. The proposal is to increase renewable in the existing off-grid power stations and gradually expand the project. The first phase of the project would involve installation of a total of 2,800 kW solar PV and wind systems into the existing and new off-grid thermal stations, so as to have 30 percent of generation capacity coming from renewable energy sources.

Rationale for SREP Financing

7. SREP funds would complement and scale-up the ongoing Government funded hybrid mini-grid projects in the country. It will install 3MW of renewable systems (solar and wind) in hybrid with the existing diesel generators in 12 isolated mini-grids with a total installed capacity of 11MW and construct 27 additional isolated mini-grids with an installed capacity of 13MW. This would enhance access to electricity among households and institutions in isolated areas in the country. The private sector would be encouraged to participate in the solar/wind projects under the FiT so as to complement government efforts in the programme. Availability of clean energy in rural areas would bring co-benefits, such as reduced dependence on biomass in domestic use. This would also reduce pressure on biomass resources which provide most of the energy requirements in the rural areas. The project will also explore the possibility of piloting innovative business models such as private sector participation in mini-grid electricity supply and results-based financing schemes.

Results Indicators

8. The results indicators for this project are as follows:

    a. Number of customers connected to mini-grid

    b. Displaced amount of GHG emission in the isolated mini-grid in tonnes per year

    c. Amount of energy in GWh from renewable energy annually

    d. Reduction in annual generation costs in the isolated mini-grids

Financing Plan

9. The government would contribute part of the capital for rural electrification programme while other willing donors/financiers are invited to provide the funding. SREP funds shall be used to scale-up and complement the investment in hybrid mini-grids in isolated areas and is expected to catalyze additional financial resources from development partners.. The table below gives a summary of the financing plan for implementation of the hybrid mini grid systems project.

TableA1: Financing Plan

Description	Total Cost USD	GOK	MDBs	Development Partners	Private Sector	SREP
Studies / Design	200,000	200,000				
Generation equipment	49,500,000		2,500,000	42,000,000	5,000.000	
Mini grid distribution network	16,500,000		7,500,000			9,000,000
Supervision	800,000	800,000				
Capacity Building	1,000,000					1,000,000
Total (US$)	**68,000,000**	**1,000,000**	**10,000,000**	**42,000,000**	**5,000,000**	**10,000,000**

Project Implementation Timetable

10. Table A2 shows the proposed implementation plan for the two proposed project components involving solar PV systems for the rural mini-grids.

TableA2: Project Implementation Plan

Description	*2012(1/2)*	*2012(2/2)*	*2013(1/2)*	*2013(2/2)*	*2014(1/2)*	*2014(2/2)*	*2015(1/2)*	*2015(2/2)*
Ongoing projects								
Tendering (Turnkey)								
Construction								
Commissioning								
Proposed New Projects								
Project Preparation /Preliminary Design								
Tendering (Turnkey)								
Construction								
Commissioning								

Requests for Investment Preparation Funding

11. SREP funds will be required to develop the detailed design, purchase of materials, transportation, construction and other implementation activities of the proposed hybrid mini grids..

12.

2. Solar Water Heating

Problem Statement

1. The residential sector in Kenya consumes about 820 GWh of electricity annually for heating water. Growing electricity demand is putting a strain on the power infrastructure. Demand for water heating occurs especially during the morning and evening thus increasing the overall peak load. This necessitates dispatch of expensive thermal power used for peaking. Use of Solar Water Heating Systems can reduce the peak demand arising from the need for water heating by domestic, institutional and commercial users. However, the uptake of solar water heating systems in Kenya is extremely low compared to the enormous potential provided by the abundant solar energy resource and the demand for hot water for both domestic and commercial applications mainly due to capacity and financial barriers. The current cost of a typical 100 litre Solar Water Heating System is USD 1,500 which is unaffordable to many households. The SWH market lacks a critical mass of trained contractors and technicians to install and maintain systems. In addition, there is a low awareness regarding the technology and its financial benefits.
2. To facilitate increased uptake of SWH, the Government has developed the Solar Water Heating Regulations. These Regulations will make it mandatory for all premises within the jurisdiction of a local authority and with hot water requirements exceeding 100 litres per day to install and use SWH. Existing facilities will also be required to comply within a period of five (5) years upon gazettement of the regulations. These regulations are in line with policy directions under Sessional Paper No. 4 of 2004 on Energy which support usage of SWH and natural ventilation among other measures in all new buildings where technically feasible.
3. In addition to the regulations, addressing key market barriers - finance, capacity and awareness - is essential to accelerate uptake of Solar Water Heating Systems and mitigation of power system peaks. The goal of the proposed project is to increase uptake of SWH through removal of these market barriers.

Proposed Contribution to Initiating Transformation

4. SREP funds will leverage private sector funds to buy down transaction costs, build capacity and create awareness among industry stakeholders and end users. The project targets a minimum of 50,000 SWH systems to catalyze the market transformation.
5. In order to share the benefits of the power system peak reduction, KPLC will implement a CDM project whose carbon revenues will be channeled back to electricity consumers through a tariff adjustment or a delayed upward tariff review. Consumers will therefore benefit from reduced power costs, while the utility will benefit from reduced systems stress and the delivery of improved services. Consequently KPLC will monitor the reduction in power consumption as well as develop and manage the SWH CDM component arising from the project.

Implementation Readiness

6. The Government through the Energy Regulatory Commission (ERC) has finalized the development of the Solar Water Heating Regulation which are awaiting gazettement. These regulations make it mandatory for all domestic, institutional and commercial premises within the jurisdiction of a local authority with hot water requirements of a capacity

exceeding 100 litres per day to install and use SWH. Existing facilities must comply within a period of five (5) years upon gazettement of these regulations. These regulations a legal and timely basis for the implementation of the project.

Rationale for SREP Financing

7. Energy demand side management by using domestic solar water heaters can reduce the energy demand by up to 820 GWh per year from the grid, the equivalent of building a 94 MW power station. Use of Solar Water Heating Systems can reduce the peak demand arising from the need for water heating by domestic, institutional and commercial users.

8. Unlocking the financing barriers arising from high installation cost of SWH will lead to scale up of uptake resulting in reduced unit costs arising from increased economies of scale. Increasing awareness will open the market further. This spiral effect will make SWH more affordable. Addressing the capacity barriers will ensure delivery of quality SWH systems and improved consumer and financier confidence. Thus through the multiplier effect the use of SREP funds to remove the barriers will catalyze and transform the SWH market.

Results Indicators

13. The results indicators for this project are as follows:

    a. Number of customers equipped with solar water heating systems.

    b. Displaced amount of GHG emission in tonnes per year.

    c. Amount of energy in GWh displaced by renewable energy annually.

Financing Plan

9. The total indicative costs for SWH programme are USD 60,000,000 with USD 10,000,000 from the SREP. The SREP contribution is expected to leverage about USD 50,000,000 from MDBs, Development Partners and the private sector.

Table A3: Indicative Financing Plan for SWH Programme (Figures in USD)

Activity	Total	GoK	SREP	MDBs	Private Sector
Project design and market reviews	200,000	200,000			
CDM Project development	50,000				50,000
Capacity building	600,000	600,000			
Awareness Creation	200,000	200,000			
SWH Equipment and installation Costs	58,950,000		10,000,000	2,000,000	46,950,000
Total	**60,000,000**	**1,000,000**	**10,000,000**	**2,000,000**	**47,000,000**

Project Implementation Timetable

Table A4: Project Implementation Plan

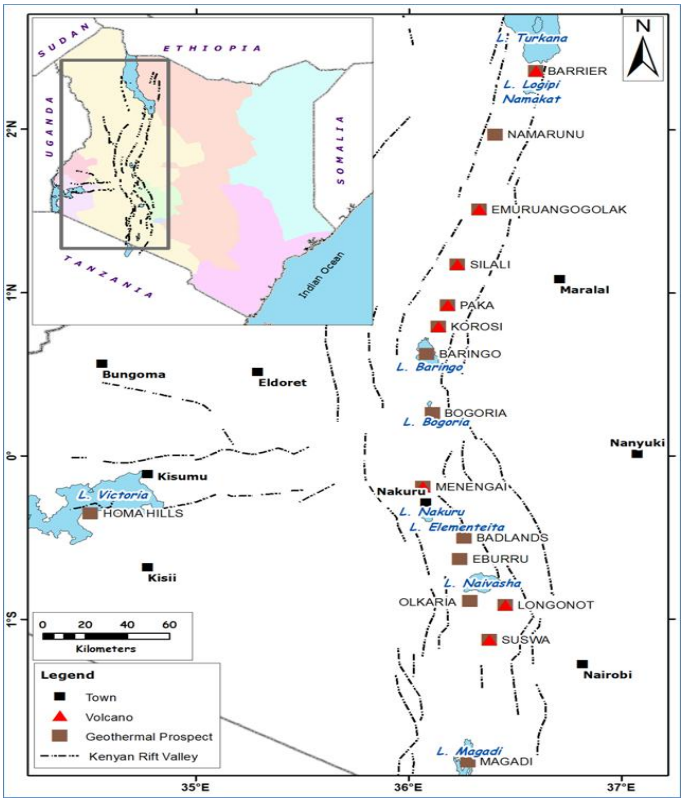
	Y1				Y2				Y3			
Activity	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
Project design and market reviews												
CDM Project Development												
Capacity building												
Awareness Creation												
SWH marketing and installation												

3. Development of 200 MW of Geothermal in Kenya

Problem Statement

1. The Least Cost Power Development Plan (LCPDP) projects that Kenya's demand for electricity by 2030 will be 15,000 MW. In addition, the Government's Vision 2030 recognizes that one of the corners stones to achieve the Vision's objectives is adequate, reliable, quality and competitively priced electric power. To meet this projected demand, the GoK targets to generate 1,600 MW of geothermal by 2016 and 5,000 MW by 2030. Further, the GoK strategy is to change the base load electricity supply from hydro, which is affected by droughts, to geothermal that is reliable and cost effective. The Kenyan Rift Valley offers vast geothermal potential of between 7,000 MWe to 10,000 MWe that is largely untapped. However, currently, there are only 198 MW generation capacity and 332 MW is under development in the Olkaria Block. Slow pace of growth is manifested by its low installed capacity of 198 MW in 30 years.

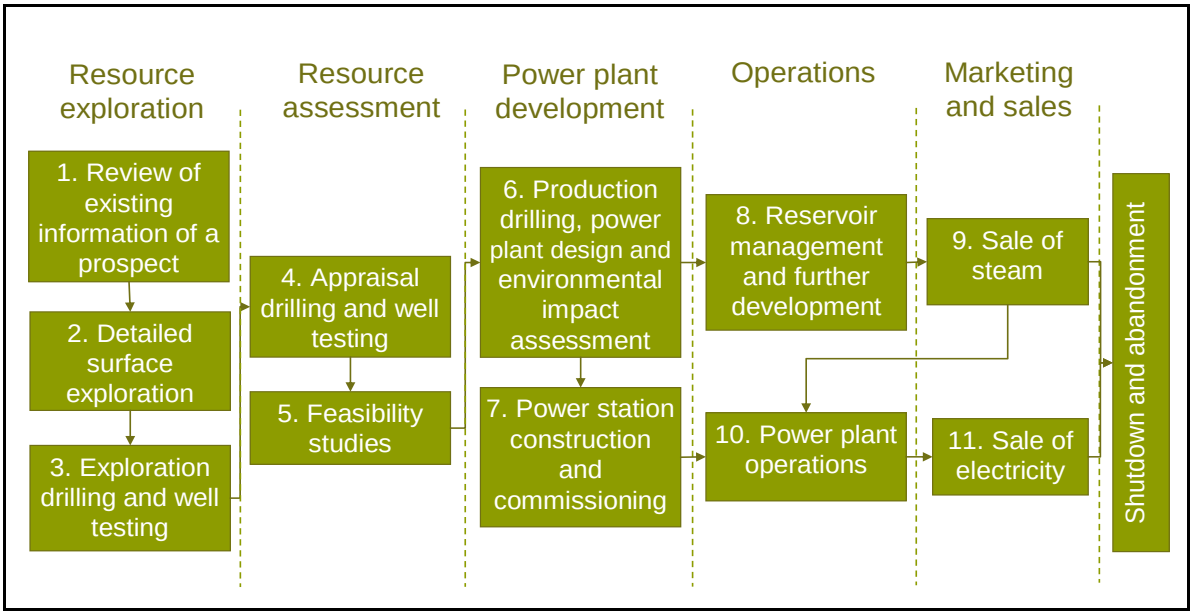
Fig 1: Location of geothermal prospects within the Kenyan Rift valley



2. The GoK strategy for geothermal development is to address the perceived risks at the nascent stages of geothermal development which deter the private sector and funding institutions from participating. This project is designed to eliminate these perceived risks and prove the existence of the geothermal resource, which will build the investors' confidence for eventual participation in the development.

Phases of Geothermal Development

Figure A2: Geothermal Process Mapping



3. **Resource Exploration**: This phase consists of review and analysis of available data. The total cost of resource exploration ranges from USD385,000-USD1M per well on a timeframe of 3-6 months and involves the following activities.

   (i) Detailed Surface Exploration: The actual exploration must be driven by experience and the understanding of the local geological framework reducing the risk of resource wastage.

   (ii) Exploration Drilling and Well Testing: At this stage, three wells are normally drilled to confirm the existence of the required conditions for a geothermal resource namely: temperature, pressure and fluids capacity.

4. **Resource Assessment**: This phase involves the appraisal of the geothermal prospect to determine suitability for exploitation and has the following activities:

   (i) Appraisal Drilling and Well Testing: The aim of this stage is to estimate the size of the reservoir (in MWe of fluid equivalent) that can be commercially exploited for at least 25 years. About 6 (six) wells are drilled stepping from the three exploratory wells to determine the extent of the reservoir. At the end of this stage, there is more potential to attract partners, investors or developers to a project since the risk associated with confirmation drilling has been drastically lowered than at the field discovery stage. Initial negotiations for Power Purchase Agreements (PPA) or steam sales agreements are normally made at this stage.

   (ii) Feasibility Studies and Environmental Impact Assessment: A feasibility study is conducted to establish the commercial exploitability of the resource and to match the available power generating technology with the resource characteristics.

5. **Power Plant Development**: This stage involves the design of an appropriate drilling program, steam filed system, power plant construction and evacuation of power.

(i) Production Drilling and Power Plant Design: Once the field has been appraised and feasibility study shown favourable results, production drilling is undertaken to provide steam for the construction of the power plant. The data from the production wells is used for power plant design.

(ii) Power Plant Construction and Commissioning: Power plant construction can be undertaken through various forms of project packaging such as an Engineering-Procurement-Construction (EPC) contractor overseen by an "Owner's Engineer" under control of the entity responsible for generation.

(iii) Transmission Lines and Substations: These are constructed to evacuate the power from the power plant to the national grid and load centres.

6. **Operations**: Upon completion of the power plant construction, operations of the power plant and the steam field are undertaken to ensure sustainable generation of power.

   (i) Reservoir management is undertaken to ensure consistent steam supply to the power station and to monitor the field characteristics to forestall adverse developments within the reservoir.

   (ii) Power Plant Operations: This stage involves the generation aspects of the power plant.

7. **Marketing and Sales**: This has the aspect of sale of steam for the steam field operator and the sale of electricity for the power plant operator.

   (i) Sale of Steam: Depending on the development model, once the steam is generated from the ground, it can be sold either for power generation, or for alternative uses. At this point, other by-products of geothermal resource development can be sold such as water, sulphur, and carbon dioxide etc. The sales take place under a contractual agreement or steam supply agreement.

   (ii) Sale of Electricity: The electricity generated by the power plant is sold through a power purchase agreement to the transmission/distribution company – in the case of Kenya, to KPLC (and perhaps other private companies in the future).

8. **Shutdown and Abandonment**: As a geothermal reservoir is exploited, it declines in pressure and steam output. In addition, surface equipment may start failing to an extent that it is no longer economical to run the plant and as such required to shut down and abandoned. However, since geothermal resources are renewable, so far no geothermal field in the world has been abandoned. The Lardarello field in Italy has been in operation since 1913, the Wairakei field in New Zealand since 1958 while the Geysers field in California since 1960. In Kenya, the Olkaria field has been in operation since 1982.

There is a dramatic increase in the value of a geothermal project as progress is made from one stage to another. However, while the Government through GDC is addressing the risks in early stages of geothermal development, it is resource constrained to make successful transition from one stage to another.

9. Each stages in geothermal development has activities and constraints unique to every stage as highlighted on the Table A5 below:

Table A5: Activities and Constraints in geothermal development		
Development Stage	**Activities**	**Constraints**
Reconnaissance & Surface Studies	• Desktop Data Research & Analysis • Regional Reconnaissance • Geology & Geochemistry resource studies • Historical drilling data	• High Capital Outlay • Lack of funding • Procurement of technical expertise-long and tedious
Initial Project Preparation	• Infrastructure Development – Civil Works • Land Acquisition & Land Use Laws • Contact Local Authorities • Water Rights • Geothermal licensing • ESIA	• Location of resource in undeveloped areas • Acquisition of licensing and land rights to project sites. • Competition for limited resources e.g land, water with the locals, tourism & forestry activities.
Exploration Drilling	• Geochemical Analysis • Geophysical Survey • Resource Measurement • Exploratory Temperature Gradient Drilling	• Low funding due to high risks associated-No traditional lending • Well success rate
Appraisal Drilling & Feasibility Study	• Design characteristics • Geological structure • Predicted drilling curve • Extent of engineering requirements • Drilling permits • Reservoir management • Drilling Crew	• Feasibility Study outcome • Upfront activities producing positive resource assessment & feasibility
Production Drilling	• Project Feasibility • Initial Delineation • Drilling • Production Drilling • Drilling staff	• Probability of success-well success & good production capacity • Capacity building in terms of human capital and equipment for geothermal development
Steam Field Development	• Steam Gathering Facilities • Reservoir management • Casings, pumps	
Power Plant Construction	• Completed Power Purchase Agreement • Bankable geothermal reservoir report	External factors can bring constraints e.g • environmental and social issues • competition of resources e.g water with the local communities
Electricity Transmission	• Way Leave acquisition • Resettlement Action Plan (RAP) • Engineering Design & Contract preparation • Construction of the transmission line and sub-stations	• Long procurement procedures • High capital outlay • Way leave acquisition challenges

10. The development of geothermal has been slow as highlighted below:

    i. **45 MW Olkaria I Power Plant:** Drilling started in 1955 and the last unit of the plant was commissioned in 1985. This was about **30 years**.

ii. **105 MW Olkaria II Power Plant:** Drilling using a rig owned by KenGen, started in 1986 and the plant was commissioned in 2003 (Unit 1 & 2) and 2010 (Unit 3). This was about **17 and 24 years** after the initial drilling.

iii. **280 MW Olkaria IV and I (Unit 4&5):** Exploration drilling through own rig was done in 1998 to 1999. Appraisal and production drilling mainly through hired rigs started in 2006 and the plant is scheduled for commissioning by December 2013. This will be **15 years** after the initial drilling.

iv. **100 MW Olkaria III: Concessioned in 1998.** By 2009 (**11 years** after the initial drilling), the IPP had developed only 48 MW and the additional 52 MW plant is scheduled for commissioning by 2013 which will be **13 years** after concession. Similarly, concessions for the undeveloped prospects in Suswa (2007) and Longonot (2009) have not registered any progress.

11. Realizing the need to reduce the long gestation periods in the development of geothermal, the Government has set up the Geothermal Development Company (GDC) to undertake integrated development of geothermal through initial exploration, drilling, resource assessment and promotion of direct utilization of geothermal. GDC is 100 percent owned by the Government.

Proposed Contribution to Initiating Transformation

12. By accelerating geothermal development, the ratio of contribution from renewable energy sources to the national grid will dramatically increase. This will translate to lower electricity tariffs given that expensive emergency power from thermal will be replaced by geothermal energy.

13. Most of the geothermal resources are located in under-developed areas. Through the development of this resource, various co-benefits will be available for local communities: electricity generation; opening up of the areas through infrastructure development such as roads and water; opportunity for direct utilization of geothermal heat and condensate for industrial and agricultural based activities leading to employment creation and income generation; increased security in the areas as a result of the economic activities and social amenities. These activities transform the life of women (e.g water supply from geothermal development will lift the burden of searching for water from long distances, improve farming activities through irrigation leading to food security thereby boosting overall psychological and physical health for women). Moreover, by world average, geothermal development is estimated to require 1 MW/employee and one support staff at a power plant. This means that geothermal development would directly create employment by two employees per MW.

Implementation Readiness

14. The following activities are being undertaken by GoK for the implementation of the project:

a) Increased budgetary allocation to Geothermal Development Company (GDC) to undertake project preparation activities such as detailed surface studies, ESIA, infrastructural development, acquisition of licenses, permits and rights of access are at various stages of completion.

b) Procurement of rigs and associated equipment. A total of six drilling rigs are to be deployed to this project.

- GoK, through its own funding has procured two rigs which are currently drilling in the Menengai Field. The first exploration well has been completed whilst the second well is near completion.
- Two other rigs funded by the French Development Agency (AFD) are expected by December, 2011 and will be deployed in Menengai.
- The African Development Bank is extending funding to GDC for procurement of two additional rigs and materials for drilling 40 wells.

c) Infrastructural development of the project site is ongoing. The main access roads, establishment of drilling water including electricity for powering the pumping system, well pads and drilling fluid recirculation ponds.

d) Detailed surface exploration work is complete and reports available.

e) The ESIA for drilling has been completed and the NEMA license obtained.

f) Efforts to build geothermal capacity underway with recruitment and training of drilling staff ongoing.

g) By Kenya being nominated as a Pilot SREP Country and the funding opportunity envisaged from this, initiatives are being undertaken to mobilize funding to leverage on the SREP. This has generated interest from development partners namely; AFD, AfDB, China Eximbank, World Bank, JBIC, EIB, and USTDA.

h) KETRACO is currently undertaking preparatory activities to construct Olkaria-Lessos-Kisumu 220kV double circuit line expected to be complete by 2015. It is expected that feasibility study and environmental and socio-economic impact assessment for the proposed Menengai – Rongai line will be undertaken together with the feasibility study for the 400MW Menengai geothermal project.

15. In order to support the geothermal generation efforts and evacuate the generated power, transmission lines are necessary. Some specific areas/projects have been identified for geothermal generation such as the Menengai Field in the Rift Valley. Therefore, the proposed transmission line i.e. Menengai – Rongai 220kV double circuit 20km transmission line, will specifically evacuate the power from Menengai to a new sub-station at Rongai. This line will connect to the national grid by joining with the planned Olkaria-Lessos-Kisumu transmission line.

    Construction of the proposed transmission line will depend on the following:

    (i) Feasibility study;
    (ii) Environmental and social impact assessment and resettlement action plan (RAP);
    (iii) Acquisition of way leave; and
    (iv) Detailed design and contract preparation.

16. KETRACO, a 100 percent government-owned company dealing with electricity transmission, is currently undertaking preparatory activities to construct Olkaria-Lessos-

Kisumu 220kV double circuit line expected to be complete by 2015. It is expected that feasibility study and environmental and socio-economic impact assessment for the proposed Menengai – Rongai line will be undertaken together with the feasibility study for the 400MW Menengai geothermal project.

Rationale for SREP Financing

17. As described above, geothermal development in Kenya will contribute to increase energy security of the country, enhance firm and reliable base load generation capacity, and promote low-carbon development. The Government's long term plan is to develop the entire Menengai Geothermal Prospect in three phases. The first phase is targeting the development of 400 MW in units of 100 MW over the next 5 years. SREP funding is being sought for the development of the first two units of the greenfield Menengai Phase 1 project. This is a critical juncture of the field development because the development model undertaken by GDC has not yet been tested in Kenya. The project will increase the installed electricity capacity and energy from renewable energy sources by an additional 200 MW, and result in a replication of the model to achieve the Government's long term commitment of 5,000 MW geothermal capacity by 2030. Evacuation of the generated power will require extensions and new constructions on the existing transmission systems resulting in increased access to energy from renewable energy sources.

18. Under drilling component, the SREP funds will be directed to production drilling. Even after drilling of exploration wells is done by the Government with the aim of proving steam existence, there remain several challenges to promote investment in steam field development. For example, financing steam collection infrastructure and other associated infrastructure is a major challenge as the Government is resource-constrained. Private sector confidence in investing in concessioned areas also face challenges because of the relatively new regulatory environment of the country and the development model is new. Also, the capacity development component of the SREP will enhance private sector's confidence in doing business with GDC, which is a relatively new organization embarking on a different business model in the sector that can benefit from SREP's support. By GoK undertaking both exploratory and appraisal drilling and SREP funding going into production drilling and capacity development, the stage will be set for increased investor confidence and private sector participation.

19. There is a need to fast-track the construction of the transmission line and thus the proposal aims at supporting the Government to raise counterpart funds. It is expected that multiple development partners will support the project once the counterpart funds are guaranteed.

Results Indicators

20. The following results indicators will be used to monitor the achievements:

    a) Number of customers connected to the main grid.

    b) Displaced amount of GHG emissions in the national grid in tones per year.

    c) Additional geothermal power connected to tha national grid.

    d) Replication of the development model.

    e) Length (km) of electricity transmission line constructed.

    f) Number of electricity trarnsmission sub-stations constructed.

g) Reduction in annual generation costs in the main grids.

Financing Plan

21. The total project cost is USD 800 million. This is the cost towards project preparation; rig acquisition; drilling for exploration, appraisal and production wells; steam field development; power generation; and the construction of transmission lines and substations. These costs will be financed from SREP, GoK, MDBs and the Private Sector as shown in Table A6 below.

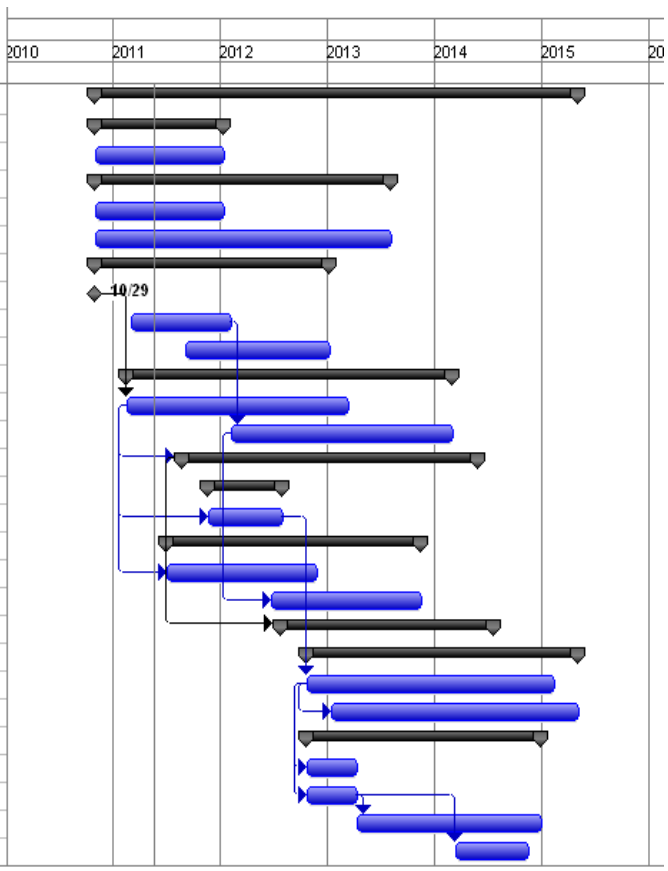
Table A6: Financing Plan

Activity	GoK	SREP	AfDB/ WBG	Development Partners / Commercial Loans	Private Investors	Total (MUS$)
200 MW of Geothermal - Phase A						
Resource Development						0
Project Preparation	82					82
Rig Procurement			70			70
Exploratory Program	11					11
Appraisal Program	21					21
Feasibility Study			2			2
Production Drilling		39	84			123
Reinjection Wells	13		16			28
Steamfield Development			37			37
Wellhead Equipment			22			22
Capacity Building		1	4			5
Sub-Total	126	40	234	0	0	400
200MW of Geothermal – Phase B						
Power Plant Construction		15	75	200	96	386
Transmission & Substations						0
Way Leave Acquisition	2					2
Design & Contract	2					2
Transmission Line (20km)		5				5
Substations (220kV x 2)		5				5
Sub-Total	4	25	75	200	96	400
Total	130	65	309	200	96	800

Project Implementation Timetable

Table A7: Project Implementation Plan

Task Name	Duration	Start	Finish
400 MW Menengai Project	**1176 days**	**Fri 10/29/10**	**Thu 4/30/15**
Project Preparation	**315 days**	**Fri 10/29/10**	**Wed 1/11/12**
Water reticulation system	315 days	Fri 10/29/10	Wed 1/11/12
Civil Works	**720 days**	**Fri 10/29/10**	**Wed 7/31/13**
Access roads	315 days	Fri 10/29/10	Wed 1/11/12
Drill Sites Preparation	720 days	Fri 10/29/10	Wed 7/31/13
Rig Procurement	**570 days**	**Fri 10/29/10**	**Thu 1/3/13**
Rig 1&2, GoK Funded	0 days	Fri 10/29/10	Fri 10/29/10
Rig 3&4, AFD Funded	240 days	Wed 3/2/11	Tue 1/31/12
Rig 5&6, AfDB Funded	351 days	Thu 9/1/11	Thu 1/3/13
Drilling	**793 days**	**Sat 2/12/11**	**Tue 2/25/14**
Menengai I	540 days	Sat 2/12/11	Thu 3/7/13
Menengai II	540 days	Wed 2/1/12	Tue 2/25/14
Well testing	720 days	Mon 8/22/11	Fri 5/23/14
Feasibility Studies	**180 days**	**Fri 11/18/11**	**Thu 7/26/12**
Menengai I	180 days	Fri 11/18/11	Thu 7/26/12
Wellhead Generation	**618 days**	**Fri 7/1/11**	**Tue 11/12/13**
Menengai I	365 days	Fri 7/1/11	Thu 11/22/12
Menengai II	365 days	Wed 6/20/12	Tue 11/12/13
Steam Field Development	520 days	Mon 7/23/12	Fri 7/18/14
Power Plant Construction	**660 days**	**Fri 10/19/12**	**Thu 4/30/15**
Menengai I	600 days	Fri 10/19/12	Thu 2/5/15
Menengai II	600 days	Fri 1/11/13	Thu 4/30/15
Transmission Line	**570 days**	**Fri 10/19/12**	**Thu 12/25/14**
Way Leave acquisition	120 days	Fri 10/19/12	Thu 4/4/13
Design & Contract	120 days	Fri 10/19/12	Thu 4/4/13
Transmission line (20 km)	450 days	Fri 4/5/13	Thu 12/25/14
Sub-stations - 220kV (2 NO.)	180 days	Fri 3/7/14	Thu 11/13/14



Requests, if any, for investment preparation funding

22. The initial project activities include detailed surface exploration; civil infrastructural development such as construction of main access roads; establishment of drilling water and electricity for powering the pumping system; well pads and drilling fluid recirculation ponds; and well siting. GoK through GDC is funding the initial project activities as well as exploration drilling and appraisal drilling.

Annex 6: MDB Request for Payment of Implementation Services Cost

SCALING-UP RENEWABLE ENERGY PROGRAM (SREP) **MDB Request for Payment of Implementation Services Costs**			
1. ***Country/Region:***	*Kenya*	2. ***CIF Project ID#:***	*(Trustee will assign ID)*
3. ***Project Title:***	***Hybrid Mini-Grid Systems Project***		
4. ***Request for project funding (US$ million)[6]:***	*At time of country program submission (tentative):* *US$ 10 million*	*At time of project approval:*	
5. ***Estimated costs for MDB project implementation services (US$ million)[7]:***	*Initial estimate - at time of Country program submission:* *US$ $420,000* *Final estimate - at time of project approval: TBD*	*MDB: World Bank Group* *Date: August 3, 2011*	
6. ***Request for payment of MDB Implementation Services Costs (US$ million):***	☒ First tranche: US$ 210,000 ☐ Second tranche: TBD at time of project approval		
7. ***Project/program financing category:***	a - Investment financing - additional to ongoing MDB project ☐ b- Investment financing - blended with proposed MDB project ☒ c - Investment financing - stand-alone ☐ d - Capacity building - stand alone ☐		
8. ***Expected project duration*** *(no. of years):*	5 years		
9. ***Explanation of final estimate of MDB costs for implementation services:***	***If final estimate in 5 above exceeds the relevant benchmark range****, explain the exceptional circumstances and reasons:*		
10. **Justification for proposed stand-alone financing in cases of above 6 c or d[8]:**			

[6] *Including the preparation grant request*

[7] *If the final MDB cost estimate exceeds the relevant benchmark, it needs to be supported by (i) a breakdown of costs of inputs required (staff/consultant time, travel, number of missions, etc) and (ii) by an explanation of the particular aspects of project design and implementation that drive MDB costs to exceed the benchmark (Item 9 in template).*

SCALING-UP RENEWABLE ENERGY PROGRAM (SREP) **MDB Request for Payment of Implementation Services Costs**			
11. ***Country/Region:***	*Kenya*	12. ***CIF Project ID#:***	*(Trustee will assign ID)*
13. ***Project Title:***	***200 MW Geothermal (Phase A)***		
14. ***Request for project funding (US$ million)[9]:***	*At time of country program submission (tentative):* *US$ 25 million*	*At time of project approval:*	
15. ***Estimated costs for MDB project implementation services (US$ million)[10]:***	*Initial estimate - at time of Country program submission:* *US$ 350,000* *Final estimate - at time of project approval: TBD*	*MDB: African Development Bank* *Date: August 3, 2011*	
16. ***Request for payment of MDB Implementation Services Costs (US$ million):***	☒ First tranche: US$ 175,000 ☐ Second tranche: TBD at time of project approval		
17. ***Project/program financing category:***	a - Investment financing - additional to ongoing MDB project ☐ b- Investment financing - blended with proposed MDB project ☒ c - Investment financing - stand-alone ☐ d - Capacity building - stand alone ☐		
18. ***Expected project duration*** *(no. of years):*	5 years		
19. ***Explanation of final estimate of MDB costs for implementation services:***	***If final estimate in 5 above exceeds the relevant benchmark range****, explain the exceptional circumstances and reasons:* This project will be implemented jointly by the African Development Bank (AfDB) and the World Bank Group (WBG), with the MDBs co-financing different components of the project which have different timetables. The MPIS costs for each MDB (i.e., AfDB and WBG) are estimated at US$ 350,000.		
20. **Justification for proposed stand-alone financing in cases of above 6 c or d[11]:**			

[8] The justification should include an explanation of (i) why no linkages to ongoing or planned MDB financing have been possible or pursued, and (ii) the expected effectiveness of the proposed stand-alone SCF project in addressing the objectives and priorities of the country investment plan/strategy; and a confirmation that the proposed project forms part of the MDB's agreed country assistance strategy.

[9] *Including the preparation grant request*

[10] *If the final MDB cost estimate exceeds the relevant benchmark, it needs to be supported by (i) a breakdown of costs of inputs required (staff/consultant time, travel, number of missions, etc) and (ii) by an explanation of the particular aspects of project design and implementation that drive MDB costs to exceed the benchmark (Item 9 in template).*

SCALING-UP RENEWABLE ENERGY PROGRAM (SREP) **MDB Request for Payment of Implementation Services Costs**			
21. ***Country/Region:***	*Kenya*	22. ***CIF Project ID#:***	*(Trustee will assign ID)*
23. ***Project Title:***	***200 MW Geothermal (Phase A)***		
24. ***Request for project funding (US$ million)[12]:***	*At time of country program submission (tentative):* *US$ 15 million*	*At time of project approval:*	
25. ***Estimated costs for MDB project implementation services (US$ million)[13]:***	*Initial estimate - at time of Country program submission:* *US$ 350,000* *Final estimate - at time of project approval: TBD*	*MDB: World Bank Group* *Date: August 3, 2011*	
26. ***Request for payment of MDB Implementation Services Costs (US$ million):***	☒ First tranche: US$ 175,000 ☐ Second tranche: TBD at time of project approval		
27. ***Project/program financing category:***	a - Investment financing - additional to ongoing MDB project ☐ b- Investment financing - blended with proposed MDB project ☒ c - Investment financing - stand-alone ☐ d - Capacity building - stand alone ☐		
28. ***Expected project duration*** *(no. of years):*	5 years		

[11] The justification should include an explanation of (i) why no linkages to ongoing or planned MDB financing have been possible or pursued, and (ii) the expected effectiveness of the proposed stand-alone SCF project in addressing the objectives and priorities of the country investment plan/strategy; and a confirmation that the proposed project forms part of the MDB's agreed country assistance strategy.

[12] *Including the preparation grant request*

[13] *If the final MDB cost estimate exceeds the relevant benchmark, it needs to be supported by (i) a breakdown of costs of inputs required (staff/consultant time, travel, number of missions, etc) and (ii) by an explanation of the particular aspects of project design and implementation that drive MDB costs to exceed the benchmark (Item 9 in template).*

29. ***Explanation of final estimate of MDB costs for implementation services:***	***If final estimate in 5 above exceeds the relevant benchmark range****, explain the exceptional circumstances and reasons:* This project will be implemented jointly by the African Development Bank (AfDB) and the World Bank Group (WBG), with the MDBs co-financing different components of the project which have different timetables. The MPIS costs for each MDB (i.e., AfDB and WBG) are estimated at US$ 350,000.
30. **Justification for proposed stand-alone financing in cases of above 6 c or d[14]:**	

[14] The justification should include an explanation of (i) why no linkages to ongoing or planned MDB financing have been possible or pursued, and (ii) the expected effectiveness of the proposed stand-alone SCF project in addressing the objectives and priorities of the country investment plan/strategy; and a confirmation that the proposed project forms part of the MDB's agreed country assistance strategy.

Annex 7: Kenya Investment Plan Technical Review

1. Title of the investment plan: SREP Investment Plan for Kenya
2. Program under the SCF: Scaling-Up Renewable Energy
3. Name of the reviewer: Lennart Bangens
4. Date of submission: June 3rd, 2011
5. Part I: General criteria

The Kenya SREP investment proposal is well written and captures rationale, problem areas, key intervention areas in an adequate way. The proposal boils down to three projects selected for funding and implementation; Geothermal, hybrid mini-grids, and SWH systems. In the evaluation process improved cook stoves and small hydro projects scored far less than the three selected projects. One of the key objectives of the SCF is to provide incentives for increased diffusion (short term) and at the same time transforming the societies towards preserving and building climate resilient eco systems (long term). The challenge for any decision maker in the targeted countries is to find a development path that allows for GDP growth, reduction of poverty, etc and at the same time does not contribute to climate change. The SERP in particular stresses the need to bring the private sector on board for any action proposed. Renewable energy must – in the long run – become a financially viable option in order to attract private sector investment.

Main issues: 1) the country's capacity to drive the uptake of renewable energy in a sustainable way. There are few if any country that can build sustainable RE sectors solely based on domestic resources, which is not a goal in itself. The challenge is rather to strike a balance between technology transfer (imports) and locally available resources to enable a swift adoption and adaptation of technologies. E.g. the Government of Kenya's decision to establish the GDC draw from the vision to lessen the dependence on foreign firms but also to have a better control of the development process and speeding up project implementation. Hence, the capacity of GDC is and will be critical for the roll out of geothermal plants in Kenya. However, GDC's capacity is assumed rather than discussed in the proposal.

2) Rationale for and use of SREP funding: SREP funding is mainly complementary and additive to already ongoing efforts. However, the link to existing activities should have been explained more to understand the synergy and role of SREP fund in reaching targets. The actual use of SREP funds is actually not well presented. E.g. for mini grids it is found in table 3 on financing that USD 9 million are earmarked for –mini grid' whereas in the text capacity building and preparatory work are only mentioned. SWH systems may seem a top priority for cutting down your electricity bill but diffusion has been slow in Kenya. A smart financing scheme may attract certain market segments but it all depends on how attractive the deal is. Further, how the USD 10 million will be used for exactly what activities is not obvious in the IP. The SREP geothermal

funding focuses on drilling and power plant construction. The reason given is to shorten time from initial preparation to production of electricity. The role of SREP and other donors are to fill the GoK financing gap. That GoK decision to establish the GDC will minimize commercial risk but not the technical risk per se.

3) Risk analysis: Since most SREP funded activities are not 'stand-alone', program outcome depends significantly on the delivery of other stakeholders. We may use GDC as an example. The reasons for slow gestation periods in the geothermal sector are not discussed at length. The assumption made is that if GDC does the initial stages such as feasibility, drilling, etc the private sector will be more interested in investing and building the actual power plant. The GDC is a government owned agency which is quite new in the geo market and still heavily dependent on foreign expertise such as Chinese expatriates. Likewise for the SWH program, the success relies on how the SWH private sector responds and also the users' view of the financing scheme (until the new law forces SWH procurement). Hence, for all three selected projects there is need to conduct thorough risk analyses and what if scenarios.

4) Private sector's interest and willingness to invest. One of key tenets of the SCF is the engagement of the private sector. The major weakness of the IP is how this should be organized. An illustration from geothermal: Normally, high capital costs for constructing the power plant and the associated electricity tariff required remain core problems. Uncertainty in the PPAs also contribute to investors' (un) willingness to seize the business opportunity. The long-term financial capacity of Kenyan Power and Lighting Company (KPLC) to settle the bills from the power plant must be sustained and payments honored. The pricing of steam and electricity may turn out to be the main obstacle to the development of geothermal energy in Kenya. The price (read feed in tariff) needs to be competitive with other energy alternatives, and at the same time offer the contractor or producer an attractive rate of return.

5) Poverty reduction strategies not clear for geothermal and SWH systems. There is a more straight forward link in building hybrid mini grids. Will a better supply of electricity necessarily spill over to the poor? Geothermal energy is a base for economic development – like any source of electricity – but the role of electricity in triggering economic growth goes beyond this particular program.

6) The selection of projects: The IP simply states, "This program proposes the development of solar, wind, hydro, biomass, geothermal and transmission line projects." How these five areas were chosen is not disclosed; in a consultative manner with key stakeholders including private sector? These are five highly relevant projects but the IP should list the criteria for this initial selection. Out of these, three were selected according to seven criteria. The criteria and assessment seems sound though some of the ratings appear arbitrary e.g. mini grids impact on base load is viewed as 'high', potential of small hydro for new beneficiaries is low, etc.

7) M&E etc: Some of the indicators are outside the scope of SREP funding (but within the overall program) but I interpreted that IP focuses on the specific SREP funding of USD 85 million not the USD 928 million.

8) Presentation of SREP program vs SREP funding: The IP must be very transparent and pedagogic in presenting the overall program (928 million) vs the USD 85 million comprising SREP funds. There is confusion in some sections that solely bring up the SREP funded project components whereas other sections, e.g. results framework include the overall program. There should be a specific results framework for the three SREP projects. E.g. the number of new connections is not controlled under the SREP funding, similarly diffusion of lesson learned, enabling environment, are not explicitly SREP funded activities (but under the SREP program).
9) From a cost effectiveness and technical point of view, both SWH and Geothermal are appropriate investments from a societal perspective. Mini grids depend on the selected energy source. Equipping the grids with 150kW PV systems at commercial conditions will surely lead to extremely high tariffs. However, interpreting the IP the investment in the equipment is a sunk cost covered by grant funds. Are the tariffs expected to contribute to paying back the capital cost? The IP only discusses O&M costs that for sure will go down but it is not sustainable as long as depreciation and capital costs are not included in the LCC.

Part II: compliance with the investment criteria or business model of the relevant program
General comment on IP: limited description of the subcomponents makes it difficult to evaluate whether the IP will comply with the criteria or not.

1. Catalyze increased investments in renewable energy in total investment: It is not clear what investments will act as a catalyst to other investors, or vice versa. It is however evident that the MDB and other development partners are willing to invest in Kenya's green path. To conclude to what extent the SREP funding is the trigger for additional funding is maybe not a critical issue. What is more worrying is the relatively (projected) minor share of private sector engagement. The private sector can for good reasons not guarantee its co-funding which depends on future business opportunities. For SREP as a whole private
sector funding is estimated to around 15 per cent which in the end comes down to the number of successful IPPs in geothermal sector and the growth of the SWH market.

2. Enabling environment: The enabling environment is not explicitly elaborated on in the document. Though the results framework defines it in two dimensions; i) adoption of low carbon development plans, ii) Enactment of policies and regulations for RE. First, an enabling environment involves more than the 'policy environment' and should address e.g. the rules for private sector engagement, access to knowledge, R&D, etc. Secondly, the SERP does not fund any of these dimensions so there are two indicators out of the control of the program. Thirdly,

there are activities that promotes the enabling environment such as the financing scheme under the SWH program, capacity building of mini grid system and SWH installation companies that are not being measured in the results framework.

3. Increase energy access: The SERP directly expands access in the mini grid project but for Geothermal and SWH the link to access is indirect. Geothermal is basically a generation project as there is activities that increase access. These fall under other GoK programs. Indirectly, SREP can claim that the expanded RE generation will enable further expansion of the grid. The main obstacle for poor households; i.e. the high connection fee is not addressed.

4. Implementation capacity: Who will host and own the SREP? The organizational design of the program is not presented at all. It is stated in the IP that the MDB will jointly manage the SREP which must mean that the MDB will prepare the documents for approval but the actual implementation and ownership is handed over to Kenya. The counterpart is probably MoE whose main responsibility is policy and not implementation. First, to straighten out, who owns the program? Second, do this or these agencies have the required capacity? The SCF will surely need some answers on these questions. Thirdly, as I will come back to later are the models for engaging the private sector. For all three subcomponents this must be explained more in detail as it is simply stated that the 'private sector will be encouraged to participate'. But how do you provide incentives and encourage private companies to build RE markets? There are no models in the IP.

5. Improve the long-term economic viability of the renewable energy sector: The long term viability hinges on the creation of sound energy markets in which private sector companies play a dominant role though guided by government policy and regulations. There is no thorough analysis and way forward to how the private sector should work in these projects but more importantly how private sector should continue investing in the energy sector with diminishing foreign aid. Is there a post-program, non-aid scenario where the private sector is the engine of growth? For PV there is already a case for pursuing a market-driven models as Kenya is one of the most successful PV markets in the world. The emerging wind and SWH markets could soon follow suit with the proper incentives. For Geothermal the GoK has decided to intervene in order to facilitate for private investment in power generation only. The IP lacks substantial detailed information and approaches on how GoK (plus the intl donor community) should team up with private companies.

6. Transformative impact: The real challenge is to find a model for large-scale replication that depends less on foreign grants or loans. Transformative impact comprises building an energy sector that is sustainable on its own with decreasing subsidies as a driver being replaced by market opportunities. The transformative impact as defined in the IP comprises only whether RE

is increasing or not. The transformative impact of RE on economic development and poverty reduction are not considered. Though the SREP does contribute to a
transformation as such but whether this transformation is self-sustained in the post program period is not focused on.

Part III. Recommendations and additional comments

1. The Kenya SREP is a step forward to building a greener energy system. The three selected components will surely contribute to accelerate the generation and use of electricity from renewable energy in Kenya. The main weakness of the IP comprises the generality and use of anticipated outcomes and lack of specific information on how to implement in a way that overcomes existent barriers and challenges. Hence, problems that the investment plan claims to address are not adequately described and discussed. This stems from an overly 'what to do' character of the IP providing less insights on how to implement and more importantly who is going to do it. This is in particular obvious for how the cooperation with private sector should be designed.

2. The role of SREP: Although the SREP is only one program out of several in the identified project areas, the investment plan must convincingly present how (and who) these issues will be addressed. More specific issues will be discussed below.:
i) Diffusion and investment in renewable has been slow in Kenya for decades so how could the SREP succeed where other programs have failed? There is very little risk analysis in the document.
ii) The views and 'readiness' of private sectors not clear. The incentives for private sector involvement not properly discussed. There has to be renewable energy targets for the private sector to act on.
iii) Feed-in tariffs and setting the right energy price are key to private investment to allow for a return on investment. Further, the contracts, PPAs for private IPPs are as important for sustainability. Secondly, Presenting a clear road map for private investors would also contribute to an investment climate that goes beyond a particular project.

3. The national capacity in Kenya should be analyzed in terms of innovation systems that would provide the proper platform for Kenya to take charge of the development in the renewable energy sectors selected. Academia, R&D institutes, training institutions, private sector, etc must all become part of a concerted and purposive action to transform the energy system. Rather than national capacity it is more pertinent to evaluate the overall capacity of the national innovation system to sustain a 'green' and climate change resilient development path. Local R&D capabilities are instrumental to support the transformation towards a 'greener' society.
4. The SREP approach: The methodology for designing, preparing, and implementing project activities should be as consultative and interactive with key stakeholder as possible. The long-

term impact of projects will in the end increasingly draw on how things are done rather that what is done. E.g. the private sector must be on board early in the process, not just for installing equipment and O&M. To use the private sector for advisory services in early preparatory stages will add value to design but also lessons learned for participating firms.

5. The link and synergy to other projects should be highlighted such as AFD's mini grid project, support to GDC, credit lines for RE, etc. The IFC's funded advisory services on barriers for the private sector is another example.

6. Specific design and implementation issues for the three projects:
i) Mini grids: The organization of the mini grids is lacking in the project description. Ownership and billing in the mini grids depends on the business model; community-, utility, or private operator based. It sounds like a donor-driven model – with heavily subsidized mini grids - where the private sector comes in marginally in later stages. In many countries, the tariffs are set on case-by-case basis for isolated mini grids.
Energy price for the renewables in relation to the required investment, Does the FiT apply to mini grids? If so, US cents 20 are probably not enough for PV. Mini grids are prone to fail unless ownership, O&M, billing systems, etc are transparent and well organized.
Cost of PV and wind vs diesel generators. Are subsidies necessary to fuel the transition?
ii) SWH systems: The proposed financing mechanism is a very delicate system in the sense that it does not address the prevalent attitude to bank loans. There must be a link between e.g. KPLC and the user on how set up repayments. Repayment can be done thru the electricity bill as in the case of Tunisia (This model is right now used in Rwanda for a SWH program , SolaRwanda). The proposed model does not address the handling of defaulters and make sure payments are done promptly. No payment no electricity! Unless there is a safety mechanism in the financing scheme, very few local banks would be interested. Further, this scheme doesn't have a subsidy component for the SWH system. The Rwanda program includes a voucher scheme. How will the anticipated USD 47 million earmarked as financing gap/private sector be managed?
The market is fairly well developed with 5-6 larger suppliers that import most system components. Can these 5-6 suppliers handle a 100% growth rate? Are there any supplier credits in the design or this is left to the importers? Most probably the majority of importers do not have the required liquidity to import more than one container at a time
The market so far has been for the wealthy segments of society and private and tourist lodges, missions, etc. Hence, in the middle class and poor segments of society the uptake is extremely low. To reach wider segments to program must – at least initially – offer a financially attractive loan/credit scheme for users as well as suppliers. To rely on the new regulations will take time which once in place depends on how strict the enforcement will be to measure consumption and force the house owner to install SWH system. From a pure technical viewpoint it is not easy to measure hot water consumption as the water meter measures total consumption of cold water. This means, hot water will be estimated based on total consumption.

iii) Geothermal: FiT cap is set at US cent 8.5 per Kwh which is marginally higher than the production cost. However, the cost presented in the IP of US c 7/kWh includes all stages before plant installation which means that for an IPP only covering the plant (surface equipment) will land at a much lower cost. Hence, having set the FiT may seem a bit rushed before having the total cost picture. E.g. currently the Indonesian utility PLN is trying to renegotiate the FiT down to US c 4/kWh. The challenge is to determine a FiT which favors KPLC as well as the IPP. Hence the PPAs and contracts crucial for private sector engagement and these must be flexible to cater for conditions that will have an impact on the cost such as steam characteristics (e.g. temperature and chemistry), depth of well.

7. Project organization: A specific unit must be established within MoE for overseeing the implementation of the SREP program. Each project will need at least a coordinator, procurement staff, and additional project implementers. This unit will work closely with other stakeholders such as KPLC, GDC, REA, private sector.

SREP Investment Plan for Kenya

Questions and Comments Received from External Reviewer and GoK Responses

August 2011

Topic	*Comments by*	*Questions/Comments*	*Response/Comments**
I. Overall / General			
1.	*External Reviewer*	*The Kenya SREP investment proposal is well written and captures rationale, problem areas, key intervention areas in an adequate way. The proposal boils down to three projects selected for funding and implementation; Geothermal, hybrid mini-grids, and SWH systems. In the evaluation process improved cook stoves and small hydro projects scored far less than the three selected projects. One of the key objectives of the SCF is to provide incentives for increased diffusion (short term) and at the same time transforming the societies towards preserving and building climate resilient eco systems (long term). The challenge for any decision maker in the targeted countries is to find a development path that allows for GDP growth, reduction of poverty, etc and at the same time does not contribute to climate change. The SREP in particular stresses the need to bring the private sector on board for any action proposed. Renewable energy must – in the long run – become a financially viable option in order to attract private sector investment.*	

Topic	*Comments by*	*Questions/Comments*	*Response/Comments**
2.	*External Reviewer*	*The IP must be very transparent and pedagogic in presenting the overall program (928 million) vs the USD 85 million comprising SREP funds. There is confusion in some sections that solely bring up the SREP funded project components whereas other sections, e.g. results framework include the overall program. There should be a specific results framework for the three SREP projects. E.g. the number of new connections is not controlled under the SREP funding, similarly diffusion of lesson learned, enabling environment, are not explicitly SREP funded activities (but under the SREP program).*	*The results framework for the individual projects will be prepared during project preparation phase after the approval of the IP.*

II. Country and Sector Context			
3. Enabling environment	*External Reviewer*	*Enabling environment: The enabling environment is not explicitly elaborated on in the document. Though the results framework defines it in two dimensions; i) adoption of low carbon development plans, ii) Enactment of policies and regulations for RE. First, an enabling environment involves more than the 'policy environment' and should address e.g. the rules for private sector engagement, access to knowledge, R&D, etc. Secondly, the SREP does not fund any of these dimensions so there are two indicators out of the control of the program. Thirdly, there are activities that promotes the enabling environment such as the financing scheme under the SWH program, capacity building of mini grid system and SWH installation companies that are not being measured in the results framework.*	*(i) The revised Section "II. Country and Sector Context" addresses not only the policy environment but also the enabling environment for the private sector to operate in the country as well as in the renewable energy sub-sector. (ii) On the controllability of the results framework, the indicators are taken from the Guidelines on SREP Results Framework and we understand these indicators are mandatory. (iii) On the project-level results framework, this will be prepared as part of the MDBs project processing procedures that will follow the approval of the IP.*
4. Private sector participation	*External Reviewer*	*Private sector's interest and willingness to invest. One of key tenets of the SCF is the engagement of the private sector. The major weakness of the IP is how this should be organized. An illustration from geothermal: Normally, high capital costs for constructing the power plant and the associated electricity tariff required remain core problems. Uncertainty in the PPAs also contribute to investors' (un) willingness to seize the business opportunity. The long-term financial capacity of Kenyan Power and Lighting Company (KPLC) to settle the bills from the power plant must be sustained and payments honored. The pricing of steam and electricity may turn out to be the main obstacle to the development of geothermal energy in Kenya. The price (read feed in tariff) needs to be competitive with other energy alternatives, and at the same time offer the contractor or producer an attractive rate of return.*	*The revised IP addresses a number of issues to promote private sector participation in the sector including: the country risks, clear policy targets, financing of upfront investment cost, tariff regimes, off-take risks, fuel supply risks, and so on. The GoK has been moving in this direction. It has been promoting the private investment in electricity generation since 1990s. The FiT policy is intended to mitigate revenue risks for investors by setting targeted capacity expansion in renewable energy as well as the maximum tariffs applied*

		The views and 'readiness' of private sectors not clear. The incentives for private sector involvement not properly discussed. There has to be renewable energy targets for the private sector to act on. *Feed-in tariffs and setting the right energy price are key to private investment to allow for a return on investment. Further, the contracts, PPAs for private IPPs are as important for sustainability. Secondly, Presenting a clear road map for private investors would also contribute to an investment climate that goes beyond a particular project.*	*depending on technology types. These aspects have been expanded in sections "II. Country and Sector Context" and "III. Renewable Energy Sector Context". For example, description of renewable energy technologies in Section III shows the interest expressed by the private sector under the FiT policy (e.g. wind). And sets the target for of generation capacities being promoted.*
IV. Program Description			
5. Project description	*External Reviewer*	*General comment on IP: limited description of the subcomponents makes it difficult to evaluate whether the IP will comply with the criteria or not.*	*Investment Concept Briefs are revised to be consistent with the format subscribed by the "SREP Programming Modalities and Operational Guidelines". Detailed project design will be undertaken after the approval of the IP.*
6. Project details and barriers	*External Reviewer*	*The Kenya SREP is a step forward to building a greener energy system. The three selected components will surely contribute to accelerate the generation and use of electricity from renewable energy in Kenya. The main weakness of the IP comprises the generality and use of anticipated outcomes and lack of specific information on how to implement in a way that overcomes existent barriers and challenges. Hence, problems that the investment plan claims to address are not adequately described and discussed. This stems from an overly 'what to do' character of the IP providing less insights on how to implement and more importantly who is going to do it. This is in particular*	*Paragraphs on the implementation arrangements of the IP-supported projects have been expanded (section VII). The barriers identified for each technology type have been categorized into (i) technical and human capacity, (ii) economic and financial, and (iii) social to present clearer the type of barriers addressed by this program (section III).*

		obvious for how the cooperation with private sector should be designed.	
7. Project selection process	*External Reviewer*	*The selection of projects: The IP simply states, "This program proposes the development of solar, wind, hydro, biomass, geothermal and transmission line projects." How these five areas were chosen is not disclosed; in a consultative manner with key stakeholders including private sector? These are five highly relevant projects but the IP should list the criteria for this initial selection. Out of these, three were selected according to seven criteria. The criteria and assessment seems sound though some of the ratings appear arbitrary e.g. mini grids impact on base load is viewed as 'high', potential of small hydro for new beneficiaries is low, etc.*	*In the revised IP, the selection of the initial five projects as well as further screening to narrow them down to three are described in section "IV. Program Description". The scoring system focuses on the criteria that are particularly relevant to the SREP design principles while trying not to make the process overly complicated.*
8. Increasing access and poverty reduction	*External Reviewer*	*Increase energy access: The SREP directly expands access in the mini grid project but for Geothermal and SWH the link to access is indirect. Geothermal is basically a generation project as there is activities that increase access. These fall under other GoK programs. Indirectly, SREP can claim that the expanded RE generation will enable further expansion of the grid. The main obstacle for poor households; i.e. the high connection fee is not addressed.* *Poverty reduction strategies not clear for geothermal and SWH systems. There is a more straight forward link in building hybrid mini grids. Will a better supply of electricity necessarily spill over to the poor? Geothermal energy is a base for economic development – like*	*The on-grid supply of geothermal power and reducing peak demand (by installing SWHs) will help KPLC connect new customers to the grid and thereby enhance access. This aspect will be expanded during project preparation. The issue of connection fee is at least in part addressed by a revolving fund, which helps to finance deferred payments of connection fees. This initiative is funded by AFD.* *Other co-benefits, which will be important part of the program, are described in Annex 3.*

		any source of electricity – but the role of electricity in triggering economic growth goes beyond this particular program.	
9. Long-term sustainability	*External Reviewer*	*Improve the long-term economic viability of the renewable energy sector: The long term viability hinges on the creation of sound energy markets in which private sector companies play a dominant role though guided by government policy and regulations. There is no thorough analysis and way forward to how the private sector should work in these projects but more importantly how private sector should continue investing in the energy sector with diminishing foreign aid. Is there a post-program, non-aid scenario where the private sector is the engine of growth? For PV there is already a case for pursuing a market-driven models as Kenya is one of the most successful PV markets in the world. The emerging wind and SWH markets could soon follow suit with the proper incentives. For Geothermal the GoK has decided to intervene in order to facilitate for private investment in power generation only. The IP lacks substantial detailed information and approaches on how GoK (plus the intl donor community) should team up with private companies.*	*As pointed out above, the feed-in tariff policy is a step in improving the environment more conducive for private sector investment in renewable energy. The GoK, in collaboration with the World Bank and other development partners, is conducting a study that will look into this aspect and make recommendations. This would help strengthen the environment conducive for private sector investment in the renewable energy sub-sector. Project-level sustainability and private sector engagement will be analyzed further during project preparation.* *The teaming up with the private sector has been described in Annex 5: (a) Mini-grids through the FiT, (b) SWH through the regulations developed, and (c) Geothermal through eliminating perceived risks at the nascent stages and proving existence of geothermal resource.*
10. Transformative impacts	*External Reviewer*	*The real challenge is to find a model for large-scale replication that depends less on foreign grants or loans. Transformative impact comprises building an energy sector that is sustainable on its own with decreasing subsidies as a driver being replaced by market*	*The IP now includes paragraphs on SREP's transformative impacts in section IV. Sustainability and replicability are among the key dimensions of such transformative*

		opportunities. The transformative impact as defined in the IP comprises only whether RE is increasing or not. The transformative impact of RE on economic development and poverty reduction are not considered. Though the SREP does contribute to a transformation as such but whether this transformation is self-sustained in the post program period is not focused on.	*impacts. The section describes that by removing barriers and piloting new business models, the SREP-funded activities will address these issues.*
11. Hybrid mini-grids project	*External Reviewer*	*The organization of the mini grids is lacking in the project description. Ownership and billing in the mini grids depends on the business model; community-, utility, or private operator based. It sounds like a donor-driven model – with heavily subsidized mini grids - where the private sector comes in marginally in later stages. In many countries, the tariffs are set on case-by-case basis for isolated mini grids.* *Energy price for the renewables in relation to the required investment, Does the FiT apply to mini grids? If so, US cents 20 are probably not enough for PV. Mini grids are prone to fail unless ownership, O&M, billing systems, etc are transparent and well organized.* *Cost of PV and wind vs diesel generators. Are subsidies necessary to fuel the transition?*	*The revised IP includes an expanded project description. REA will own mini-grids and KPLC will manage them. The project will also explore the possibility of a private sector participation in this segment. In Kenya, a uniform tariff is applied for the national grid and mini-grids in isolated areas, thereby allowing cross-subsidizing mechanism from densely populated urban centers to sparsely populated rural areas. This is an approach to enhance financial viability. The project will examine if alternative business models are possible. Details of the scheme will be worked out during the project processing.*
12. Solar water heating systems project	*External Reviewer*	*The proposed financing mechanism is a very delicate system in the sense that it does not address the prevalent attitude to bank loans. There must be a link between e.g. KPLC and the user on how set up repayments. Repayment can be done thru the electricity bill as in the case of Tunisia (This model is right now used in Rwanda for a SWH program , SolaRwanda). The proposed model does not address the handling of defaulters and make sure payments are done promptly. No payment no electricity! Unless there is a safety mechanism in the*	*We agree that the issues of finance and collection are crucial for successful business models. These comments will be taken into consideration during project preparation phase.*

		financing scheme, very few local banks would be interested. Further, this scheme doesn't have a subsidy component for the SWH system. The Rwanda program includes a voucher scheme. How will the anticipated USD 47 million earmarked as financing gap/private sector be managed? *The market is fairly well developed with 5-6 larger suppliers that import most system components. Can these 5-6 suppliers handle a 100% growth rate? Are there any supplier credits in the design or this is left to the importers? Most probably the majority of importers do not have the required liquidity to import more than one container at a time* *The market so far has been for the wealthy segments of society and private and tourist lodges, missions, etc. Hence, in the middle class and poor segments of society the uptake is extremely low. To reach wider segments to program must – at least initially – offer a financially attractive loan/credit scheme for users as well as suppliers. To rely on the new regulations will take time which once in place depends on how strict the enforcement will be to measure consumption and force the house owner to install SWH system. From a pure technical viewpoint it is not easy to measure hot water consumption as the water meter measures total consumption of cold water. This means, hot water will be estimated based on total consumption.*	
13. Geothermal project	*External Reviewer*	*FiT cap is set at US cent 8.5 per Kwh which is marginally higher than the production cost. However, the cost presented in the IP of US c 7/kWh includes all stages before plant installation which means that for an IPP only covering the plant (surface equipment) will land at a much lower cost. Hence, having set the FiT may seem a bit rushed*	*The GoK, in collaboration with the World Bank and other development partners, is conducting a study that will look into FiT and make recommendations.*

		before having the total cost picture. E.g. currently the Indonesian utility PLN is trying to renegotiate the FiT down to US c 4/kWh. The challenge is to determine a FiT which favors KPLC as well as the IPP. Hence the PPAs and contracts crucial for private sector engagement and these must be flexible to cater for conditions that will have an impact on the cost such as steam characteristics (e.g. temperature and chemistry), depth of well.	

V. Financing Plan and Instruments			
14. Financial plans for the SWH project	*External Reviewer*	*From a cost effectiveness and technical point of view, both SWH and Geothermal are appropriate investments from a societal perspective. Mini grids depend on the selected energy source. Equipping the grids with 150kW PV systems at commercial conditions will surely lead to extremely high tariffs. However, interpreting the IP the investment in the equipment is a sunk cost covered by grant funds. Are the tariffs expected to contribute to paying back the capital cost? The IP only discusses O&M costs that for sure will go down but it is not sustainable as long as depreciation and capital costs are not included in the LCC.*	*The tariff will be uniform for both the grid-based and the off-grid mini-grid electricity supply. The revenue requirement in tariff calculation includes capital expenditures across the country (i.e. the grid-connected and mini-grids expenses). Therefore, the capital expenditures and other costs are borne by electricity consumers in general. This allows cross-subsidizing mechanism from densely populated urban centers to sparsely populated rural areas and enhance financial viability of mini-grid schemes. The project will examine if alternative business models are feasible.*
15. Leveraging of additional funding	*External Reviewer*	*Catalyze increased investments in renewable energy in total investment: It is not clear what investments will act as a catalyst to other investors, or vice versa. It is however evident that the MDB and other development partners are willing to invest in Kenya's green path. To conclude to what extent the SREP funding is the trigger for additional funding is maybe not a critical issue. What is more worrying is the relatively (projected) minor share of private sector engagement. The private sector can for good reasons not guarantee its co-funding which depends on future business opportunities. For SREP as a whole private sector funding is estimated to around 15 per cent which in the end comes down to the number of successful IPPs in*	*This is an important aspect of the program. Please note that the previous draft did not explicitly mention that some of the development partners' funding is expected to include commercial loans (e.g. export credit). This is made explicit in the current draft. Also, SREP funding will address some of the key barriers or upstream risks which are associated with renewable energy development. The mini-grids to be supported under the project will be located in isolated areas where overcoming logistically*

		geothermal sector and the growth of the SWH market.	*challenges could be a significant barrier. The project will encourage private sector participation in mini-grids electricity supply. The SWH project will address high upfront cost and financing challenge, which would open scope for private sector participation. The geothermal development project will help develop the first field outside Olkaria, based on a new business model with the newly established GDC. Even though this project only consists of the very first 200MW of geothermal power development, the successful implementation of this project could lead way to subsequent development of the field (cf. Menengai field alone is estimated to have 1,600MW capacity).*
VII. Implementation Potential with Risk Assessment			
16. Risk analysis	*External Reviewer*	*Since most SREP funded activities are not 'stand-alone', program outcome depends significantly on the delivery of other stakeholders. We may use GDC as an example. The reasons for slow gestation periods in the geothermal sector are not discussed at length. The assumption made is that if GDC does the initial stages such as feasibility, drilling, etc the private sector will be more interested in investing and building the actual power plant. The GDC is a government owned agency which is quite new in the geo market and still heavily dependent on foreign expertise such as Chinese expatriates. Likewise for the SWH program, the success relies on how the SWH private sector responds and also the users' view of the financing scheme (until the new law forces SWH procurement). Hence,*	*A section on risk assessment at the program level has been added to the IP (section VII).*

		for all three selected projects there is need to conduct thorough risk analyses and what if scenarios.	
17. Implementation arrangements	*External Reviewer*	*A specific unit must be established within MoE for overseeing the implementation of the SREP program. Each project will need at least a coordinator, procurement staff, and additional project implementers. This unit will work closely with other stakeholders such as KPLC, GDC, REA, private sector.* *Who will host and own the SREP? The organizational design of the program is not presented at all. It is stated in the IP that the MDB will jointly manage the SREP which must mean that the MDB will prepare the documents for approval but the actual implementation and ownership is handed over to Kenya. The counterpart is probably MoE whose main responsibility is policy and not implementation. First, to straighten out, who owns the program? Second, do this or these agencies have the required capacity? The SCF will surely need some answers on these questions. Thirdly, as I will come back to later are the models for engaging the private sector. For all three subcomponents this must be explained more in detail as it is simply stated that the 'private sector will be encouraged to participate'. But how do you provide incentives and encourage private companies to build RE markets? There are no models in the IP.*	*The implementation arrangements are described in Section VII. There is SREP Task Force consisting of key organizations in the energy sector. Implementing agencies for each project are also identified in the section. The SREP is a Government-owned program. The capacity assessment is provided in Annex 1. On the incentives to encourage private sector participation in the sub-sector, please see our response on "Private sector participation" above.*
VIII. Capacity Building and Learning / Annex 1: Assessment of Country's Absorptive Capacity			
18. Capacity constraints	*External Reviewer*	*The country's capacity to drive the uptake of renewable energy in a sustainable way. There are few if any country that can build sustainable RE sectors solely based on domestic resources, which is not a goal in itself. The challenge is rather to strike a balance between*	*Revised IP includes a section on capacity building and learning (Section VIII) as well as an assessment of the country's absorptive capacity. The "SREP Programming Modalities*

		technology transfer (imports) and locally available resources to enable a swift adoption and adaptation of technologies. E.g. the Government of Kenya's decision to establish the GDC draw from the vision to lessen the dependence on foreign firms but also to have a better control of the development process and speeding up project implementation. Hence, the capacity of GDC is and will be critical for the roll out of geothermal plants in Kenya. However, GDC's capacity is assumed rather than discussed in the proposal. *The national capacity in Kenya should be analyzed in terms of innovation systems that would provide the proper platform for Kenya to take charge of the development in the renewable energy sectors selected. Academia, R&D institutes, training institutions, private sector, etc must all become part of a concerted and purposive action to transform the energy system. Rather than national capacity it is more pertinent to evaluate the overall capacity of the national innovation system to sustain a 'green' and climate change resilient development path. Local R&D capabilities are instrumental to support the transformation towards a 'greener' society.*	*and Operational Guidelines" require the IP to conduct an analysis on country's absorptive capacity. The approach adopted in the IP is to focus on macroeconomic, institutional, and technical and managerial aspects.*
IX. Monitoring and Evaluation			
19. M&E indicators	*External Reviewer*	*Some of the indicators are outside the scope of SREP funding (but within the overall program) but I interpreted that IP focuses on the specific SREP funding of USD 85 million not the USD 928 million.*	*We understand that the indicators included in the results framework are mandatory, according to the guidelines on SREP Results Framework. If, however, we can simplify the framework by, for example, removing the ones for which baseline data is not available, we would be happy to follow the advice.*

Annex 2 Stakeholder Consultations			
20. Consultative approach	*External Reviewer*	*The methodology for designing, preparing, and implementing project activities should be as consultative and interactive with key stakeholder as possible. The long-term impact of projects will in the end increasingly draw on how things are done rather that what is done. E.g. the private sector must be on board early in the process, not just for installing equipment and O&M. To use the private sector for advisory services in early preparatory stages will add value to design but also lessons learned for participating firms.*	*Revised IP includes Annex 2 on stakeholder consultations.*
Annex 4 & 5 Existing Activities in Renewable Energy & Investment Concept Briefs			
21. Links to existing activities	*External Reviewer*	*Rationale for and use of SREP funding: SREP funding is mainly complementary and additive to already ongoing efforts. However, the link to existing activities should have been explained more to understand the synergy and role of SREP fund in reaching targets. The actual use of SREP funds is actually not well presented. E.g. for mini grids it is found in table 3 on financing that USD 9 million are earmarked for –mini grid' whereas in the text capacity building and preparatory work are only mentioned. SWH systems may seem a top priority for cutting down your electricity bill but diffusion has been slow in Kenya. A smart financing scheme may attract certain market segments but it all depends on how attractive the deal is. Further, how the USD 10 million will be used for exactly what activities is not obvious in the IP. The SREP geothermal funding focuses on drilling and power plant construction. The reason given is to shorten time from initial preparation to production of electricity. The role of SREP and other donors are to fill the GoK financing gap. That GoK decision to establish the GDC will minimize commercial risk but not the technical*	*The rationale for using SREP funding is described in Section IV (transformative impacts) as well as in individual Investment Concept Briefs. As shown, the role of SREP-funded activities is not to fill the GoK financing gap but to support scaling up of renewable energy development in Kenya by assuming more risks, addressing key barriers to renewable energy development, catalyzing additional financial resources, focusing on co-benefits that will be felt by the current generation in local communities, and providing opportunities to learn lessons from its operations. The existing activities in the renewable energy sub-sector have been summarized in Annex 4. SREP programs focus on the areas where the program can benefit*

		risk per se. *The link and synergy to other projects should be highlighted such as AFD's mini grid project, support to GDC, credit lines for RE, etc. The IFC's funded advisory services on barriers for the private sector is another example.*	*from potential synergy while avoiding duplication with on-going activities.*

** Sections correspond to those in the latest draft Investment Plan (July version).*

Kenya SREP IP: Q&A, August 2011.