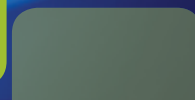




SUSTAINABLE ENERGY FOR ALL KENYA ACTION AGENDA



*Pathways for Concerted Action toward
Sustainable Energy for All by 2030*





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Units of Measurements

GJ	Gigajoule	MW	Megawatt
GWh	Gigawatt hour	MWh	Megawatt hour
GWp	Gigawatt peak	MWp	Megawatt peak
Koe	Kilogramme of oil equivalent	Toe	Tonnes of oil equivalent
Kw	Kilowatt	W	Watt
KWh	Kilowatt hour	Wp	Watt peak
kWp	Kilowatt peak		

Exchange Rate: 105.68 Kenya Shillings = 1 US\$ (September 2015)

Acronyms and Abbreviations

AA	Action Agenda	KenGen	Kenya Electricity Generation Company
AFD	Agence Française de Développement	KETRACO	Kenya Electricity Transmission Company
AfDB	African Development Bank	KfW	Kreditanstalt für Wiederaufbau
CFL	Compact Fluorescent Lamp	KP	Kenya Power
CFP	Country Focal Point	KNBS	Kenya National Bureau of Statistics
CIDPs	County Integrated Development Plans	kWh	Kilowatt hour
CSOs	Civil Society Organizations	KSh	Kenyan Shilling
CRBs	Credit Reference Bureaus	KSS	Kenya SE4All Secretariat
DANIDA	Danish International Development Agency	LPG	Liquefied Petroleum Gas
DFID	Department for International Development, UK	LV	Low Voltage
DRE	Directorate of Renewable Energy	MAED	Model for Analysis of Energy Demand
DSM	Demand Side Management	M&E	Monitoring and Evaluation
EAC	East African Community	MDGs	Millennium Development Goals
EDF	European Development Fund	MEPS	Minimum Energy Performance Standards
EE	Energy Efficiency	MER	Monitoring, Evaluation and Reporting
EIA	Environmental Impact Assessment	MFBS	Micro Finance Banks
EIB	European Investment Bank	MJ	Mega Joules
EPC	Engineering, Procurement, and Construction	MoEP	Ministry of Energy and Petroleum
EPP	Emergency Power Producers	MoWI	Ministry of Water and Irrigation
ESI	Electricity Supply Industry	MoENR	Ministry of Environment and Natural Resources
EU	European Union	MRPs	Money Remittance Providers
FIT	Feed-in-Tariff	MTP	Medium Term Planning
FY	Financial Year	MV	Medium Voltage
GACC	Global Alliance for Clean Cookstoves	MW	Megawatt
GDC	Geothermal Development Company	NAMA	National Appropriate Mitigation Action
GDP	Gross Domestic Product	NGOs	Non-Government Organisations
GEF	Global Environment Facility	NORAD	Norwegian Agency for Development Cooperation
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH	NSE	Nairobi Stock Exchange
GoK	Government of the Republic of Kenya	O&M	Operation & Maintenance
GTF	Global Tracking Framework	PPAs	Power Purchase Agreements
GVEP	Global Village Energy Partnerships	PPP	Purchasing Power Parity
GWh	Gigawatt hour	PPPs	Public Private Partnerships
HIIIs	High Impact Initiatives	RE	Renewable Energy
HIOs	High Impact Opportunities	REA	Rural Electrification Authority
HV	High Voltage	REB	Rural Energy Board
ICS	Improved Cook Stove	REF	Rural Energy Fund
IEA	International Energy Agency	REFIT	Renewable Energy Feed-in-Tariff
IP	Investment Prospectus	REM	Rural Energy Master Plan
IPPs	Independent Power Producers	RETs	Renewable Energy Technologies
IRENA	International Renewable Energy Agency	SAB	SE4All Advisory Board (Kenya)
KAM	Kenya Association of Manufacturers	SACCOS	Savings and Credit Co-operative
KCAP	Kenya Country Action Plan	SE4All	Sustainable Energy for All
		SEF	Sustainable Energy Finance

SHS	Solar Home Systems		
SIDA	Swedish International Development Agency	UNEP	United Nations Environmental Programme
SMEs	Small and Medium scale Enterprises	UNEP DTU	United Nations Environment Programme Technical University of Denmark
SNC	SE4All National Coordinator	UNF	United Nations Foundation
SPPA/T	Standardized Power Purchase Agreements and Tariff	UNIDO	United Nations Industrial Development Organisation
SPPAs	Standardized Power Purchase Agreements	USAID	United States Agency for International Development
SPPs	Small Power Producers	US\$	United States Dollar
SPPT	Small Power Purchase Tariff	WB	World Bank
SREP	Scaling-up Renewable Energy Programme	WHO	World Health Organisation
SSMPs	Sustainable Solar Market Packages	WRMA	Water Resources Management Authority
SWER	Single Wire Earth Return	WWF	World Wide Fund for Nature
TERI	The Energy and Resources Institute		
TFEC	Total Final Energy Consumption		
UN	United Nations		
UNDP	United Nations Development Programme		

Foreword



The UN Secretary-General Ban Ki-Moon launched the Sustainable Energy for All Initiative (SE4All) in 2011. He further declared 2012 the year for sustainable energy for all.

This great initiative is expected to catalyse major new investments to accelerate the transformation of the world's energy systems, pursue the elimination of energy poverty, and enhance prosperity.

The goal of the initiative is to: mobilize all stakeholders to take concrete action toward ensuring universal access to modern energy services; double the global rate of improvement in energy efficiency and; double the share of renewable energy in the global energy mix, within the UN timeframe of 2030. The Government of Kenya fully embraces the objectives of the SE4All Initiative and appreciates that its timelines fall within those of the national development blue print, Vision 2030.

Kenya opted to be part of the SE4All Initiative, because the Government had achieved significant strides in developing the framework for energy development, thanks to the Energy Policy, 2004, and Energy Act, 2006. Review of these two documents is almost complete and is expected to further improve the enabling environment for the engagement of a wide range of stakeholders, and particularly private sector in the delivery of clean and modern energy services. It also happens at a time when petroleum resources have been discovered in the country and will therefore be instrumental in diversifying the energy mix and addressing energy poverty.

The Kenya Action Agenda and Investment Prospectus, has been developed through a consultative process and has provided useful experience in defining the country roadmap to delivering clean energy to all Kenyans. In collaboration with the New Partnership for African Development (NEPAD) Energy, EU BizClim Facility and United Nations Development Organization (UNDP), MOEP and HCL Consultants initiated and completed the draft Action Agenda and Investment Prospectus, which were both taken through a validation process after extensive consultations with the stakeholders in the Kenyan Energy Sector.

Thereafter the SE4All Hub at the African Development Bank provided further financial assistance to enable the refinement of the draft AA and IP by Consultants IT Power UK and Integral Advisory Limited Kenya. The refinement included four key elements: addressing stakeholder validation comments and aligning the document to SE4All AA guidelines; the enhancement of the decentralized energy and energy efficiency components; creation of synergy between the AA and Kenya's Vision 2030 Medium Term Planning process; and alignment of the AA to the devolved Government systems comprising the National and County Governments, in line with the Constitution of Kenya (2010).

The AA finalization process was led by the Ministry of Energy and Petroleum, with a Technical Team comprising UNDP, Practical Action East Africa, SNV Development Organization, WWF, SEAF-K, Consultants and the MOEP's own technical staff in the Directorate of Renewable Energy – led by the Director Renewable Energy Eng. Isaac Kiva and the Deputy Director Renewable Energy, Faith Odongo, who doubles up as the SE4All Country Focal Point.

It is therefore with great pleasure that I present the Kenyan Action Agenda and Investment Prospectus, which represents the third milestone in the four-step SE4All process, namely: i) Country Opt-in; ii) Stock-Taking and Gap Analysis; iii) Country Action Plan (Action Agenda and Investment Prospectus) and; iv) Implementation, Monitoring and evaluation.

This AA therefore paves way for mobilization of resources and multi-stakeholder engagement to facilitate implementation, monitoring and evaluation of high impact opportunities and high impact initiatives and priority projects in the energy sector. It also presents the opportunity for increased private sector participation. It is worthwhile to remember that challenges will always be there but the onus is on us to devise innovative means of overcoming them.

The Ministry of Energy and Petroleum is pleased to take an early lead in contributing to the on-going efforts to address the energy needs of the African Continent. The Action Agenda and Investment Prospectus will be instrumental in driving socio-economic development in Kenya.

I therefore urge development partners, private sector, civil society, academia and the general public to take an active role in realizing the Kenyan dream towards sustainable energy for all.

Hon. Charles Keter
Cabinet Secretary
Ministry of Energy and Petroleum

Acknowledgement

The Ministry of Energy and Petroleum wishes to express deep appreciation to all parties who have unreservedly offered support to enable Kenya to achieve the first three milestones towards developing its Action Agenda and Investment Prospectus (AA/IP) under the Sustainable Energy for All Initiative.

In this regard, special gratitude is extended to the following:

- EU BizClim Facility for funding the first draft of the SE4All Action Agenda and Investment Prospectus
- African Development Bank (AfDB) for funding the National and County SE4All Initiative awareness and final drafts of the Action Agenda and Investment Prospectus.
- SNV, Practical Action Eastern Africa and WWF for funding the development of SE4All awareness materials, Newspaper supplements on SE4All Initiative and SE4All Technical Committee workshop respectively
- UNDP, which has funded the SE4All Country process since the launch of the Initiative in Kenya in March 2012.
- The African Union for coordinating the standardisation of the formats used, and the New Partnership for African Development (NEPAD) Energy Division, led by Prof Mosad Elmissiry, for taking the leading role in securing financial support from the EU BizClim Facility. Prof Elmissiry's team for guiding us through the whole process, and the NEPAD Kenya Team, for ensuring successful engagement of stakeholders to improve the initial draft documents.
- The SE4All African Hub, through Mr. Daniel Schroth, the SE4All African hub coordinator has consistently walked with us by providing review comments on the initial drafts.
- Consultants; HCL, IT-Power UK, Integral Advisory Limited Kenya; under the umbrella of the Africa SE4All Coordination Hub, for their unrelenting technical and financial support in preparing the Stock-Taking and Gap Analysis, conducting consultations with stakeholders, and reviewing the draft reports of the Action Agenda and Investment Prospectus.
- The EU Delegation to Kenya, led by programme officer Sanne Willems, has been ardent supporters of energy development in Kenya, including the SE4All process.
- The Council of Governors Secretariat, through the Ag. CEO Jackline Mogeni for supporting County SE4All Awareness Creation.

We also extend appreciations to stakeholders from line ministries of Environment and Mineral Resources,



Devolution and Planning, and Industrialization, and those from the Energy Sector, Semi-Autonomous Government Organisations, Kenya Renewable Energy Association (KEREAA), and Civil Society Organisations through Practical Action Eastern Africa, for providing valuable comments at all stages of implementation. Their inputs helped to improve the drafts to acceptable standards.

The Ministry of Energy and Petroleum team has ensured successful coordination of developing the SE4All Action Agenda and Investment Prospectus.

The Ministry looks forward to continued collaboration and support of all stakeholders in ensuring success in the achievement of SE4All national goals in solidarity with the spirit of the Global SE4All Agenda. The short-term vision is to entrench SE4All into the Medium Term Planning (MTP) process, starting with MTP III. The long-term vision is to support counties to develop their respective roadmaps while contributing to the national and global agenda.

We encourage county governments to support the Ministry of Energy and Petroleum in this exercise as we aspire to deliver clean and modern energy services to all Kenyans.

Dr. Eng. Joseph Njoroge, MBS

Principal Secretary

Ministry of Energy and Petroleum

In charge of Energy

Executive Summary

This Action Agenda (AA) presents an energy sector-wide long-term vision spanning the period 2015 to 2030. It outlines how Kenya will achieve her SE4All goals of 100% universal access to modern energy services, increase the rate of energy efficiency and increase to 80% the share of renewable energy in her energy mix, by 2030.

Access to modern energy services¹ is a necessary precondition for achieving development goals that extend far beyond the energy sector, such as poverty eradication, access to clean water, improved public health and education, women's empowerment and increase food production. The United Nations (UN)

Secretary General launched the SE4All Initiative in September 2011 to achieve three inter-related goals by 2030:

- Ensuring universal access to modern energy services;
- Doubling the global rate of improvement in energy efficiency;
- Doubling the share of renewable energy in the global energy mix;

The SE4All Initiative requires countries to set quantitative objectives for each of the three goals as shown in Table 1.

Table 1: SE4All Initiative Kenya targets

Universal access to modern energy services		Doubling global rate of improvement of energy efficiency	Doubling share of renewable energy in global energy mix	
Percentage of population with electricity access	Percentage of population with access to modern cooking solutions	Rate of improvement in energy intensity	Renewable energy share in Total Final Energy Consumption	
			Power	Heat
100%²	100%	-2.785%³/year	80%	80%

SE4All proposition is that, to achieve the initiative's objectives, all stakeholders need to play a leadership role:

- National and County Governments must design and implement a set of integrated actions (i.e. action agenda and investment prospectus).
- Private sector provides business and technical solutions and drives investment and
- Civil society organizations (CSOs) advocate and monitor public policy and businesses actions.

In this regard, the Government of Kenya (GoK) has developed the present AA building on existing plans/programmes/strategies and embracing SE4All guidelines principles. In the context of the SE4All, access to modern energy involves electricity and energy for cooking. Kenya has chosen the baseline year for electricity access as 2012. For the purpose of the AA, the definition of electricity access is connections to the national grid system or distributed

(off-grid) electricity solutions which include Solar Home Systems (SHS), mini-grids, which is consistent with the Global Tracking Framework (GTF) and with the multi-tier approach under GTF. In the baseline year, only 23%, which represents 1.97 million households of the population, had grid electricity supply. Access to modern cooking services refers to access to improved cookstoves and non-solid fuels. The baseline year for access to improved cookstoves is 2013, being at the level of 3.2 million households, according to market assessment of Clean Cookstoves Association of Kenya (CCAK) under the Kenya Country Action Plan 2013 (KCAP). Over 80% of Kenyans rely on the traditional use of biomass as the primary source of energy for cooking and heating with firewood contributing 68.7% and charcoal 13.3%. The Kenyan government is putting in place measures to regulate the fuel wood sector with a draft Forest Act envisaging a six-point system of control from producer to consumer. The 2009 charcoal production regulations developed by the Kenya Forest Service are yet to be adopted.

¹ Definition of related terms in Annex 1

² Projected to be reached by 2022

³ The energy intensity is expressed in negative as its improvement is a reduction on the energy intensity

According to March 2011 Least Cost power Development Plan (2011-2031), the required installed capacity for reference scenario in 2030 will be 15,065MW. The present value for this installed capacity amounts to U.S. \$ 41.4 billion, (committed projects excluded) expressed in constant prices as of the beginning of 2010. The transmission development plan indicates the need to develop approximately 10,345KM of new lines at an estimated present cost of US\$ 4.48 Billion. Transmission development during the planning horizon will be based on 132 kV, 220 kV and 400 kV.

According to 5 year (2013-2017) corporate strategy plan for the electricity sub-sector for, Kenya targets installed capacity of 6,762 MW consisting of 49.9% renewable energy, 15.5% Natural gas, 28.4% Coal and 6.2% diesel by 2018. The total generation capital expansion cost up to 2018 cost is estimated at US\$ 7.78 billion under the moderate. There are 41 transmission investment programme associated with implementation of the additional 5,000+MW investment by 2018 at an estimated cost of US\$3.7 billion. The corporate strategy plan targets 3,325 km of new transmission lines and 3,178 MVA of new transmission substation capacity for transmission systems and 3768 km of new MV lines. The distribution system targets 69 new substations of capacity 6,225 MVA; 20 new bulk supply points of capacity 1237.5 MVA for distribution systems, and 70% household connectivity to electricity. The estimate cost of implementing the distribution system is US\$1.3 billion. Implementers of transmission and distribution projects are Kenya Electricity Transmission Company (KETRACO) and Kenya Power and Lighting Company (KPLC) respectively.

Based on the Stocktaking and Gap Analysis report and discussions with key stakeholders, the AA includes the following priority actions:

■ Improving the policy and regulation of the energy sector:

- Develop specific regulations for sustainable efficient charcoal production and use methods linked with appropriate forestry management plans and afforestation efforts.
- Develop a concrete policy, strategy and targets to regulate biomass energy, in particular the clean cooking sector.

■ Human and Institutional Capacity Development:

- The SE4All Secretariat will develop a programme to improve the capacity of national and local institutions as part of accelerating renewable energy technology transfer and use.

■ Increase access to electricity:

- The Last Mile Connectivity Project and financing connections for "under-grid" areas: The project will extend the low voltage network to reach households located within a 600 metre-radius from a transformer as well as the installation of prepaid energy meters. In addition, financial support will be

available for households unable to afford the KShs 15,000 (~US\$ 150) fee required to be connected. Re-payments can be spread over a period of up to two years, or KShs 625 (~US\$ 8) loaded on their monthly bill.

- Opening the competition to private players by creating favourable legislation and regulation e.g. the exemption of VAT on solar products and, more recently, enabling solar micro-grid company PowerHive East Africa to become the country's first licensed private utility to generate, distribute and sell power to the public .
- The Ministry of Energy and Petroleum (MoEP) to appoint focal point for the Energy Access Market Accelerator that will implement a collaboration mechanism and assistance facility, facilitating the coordination of activities in the energy access market, connecting enterprises with service providers, and liaising with the international community and local government to communicate ongoing gaps and broker efforts to bridge them.

■ Increase access to modern cooking solutions:

- Access to modern cooking can have a transformative effect on lives, for example reducing indoor air pollution that causes ill-health and premature death, particularly to women and children. MoEP to lead on the creation of a cross-sectoral initiative to bring together different on-going efforts and improve coordination across agencies, private sector, CSOs and NGOs, and improve capacity.
- MoEP to finalize on the development of bioenergy and LPG strategy that will define action plans for implementation of improved cookstoves and biofuels.
- Develop wood fuels (firewood and charcoal) supply and demand master plan for the main supply and demand centres (including tree cover inventory, classification of harvesting zones, relevant data, analysis of wood fuels flows, development of conditions and technical specifications for wood fuels, production and use).

■ MoEP to work across Government Agencies and with stakeholders to:

- Develop and implement a National Energy Efficiency Programme to assess opportunities for energy efficiency in multiple sectors.
- Implement and enforce a labelling scheme for electric appliances. To increase its efficiency and impact, a national awareness campaign targeting consumers and distributors will be carried out.
- MoEP to lead in awareness creation on the use of clean cookstoves and fuels as a health benefit to prevent deaths and sickness from indoor air pollution.
- MoEP to promote institutional capacity development and create awareness on energy efficiency.
- Implement and develop cookstoves dissemination

projects and define and scale up certification processes for residential and commercial cookstoves.

As Kenya integrates SE4All into its national planning, the trajectory towards the country's SE4All Goals is informed by the following phases:

- **Transition (2015 – 2017).** During this period, Medium-Term Planning 2 (MTP 2), the country continues with its current strategies and starts a national dialogue toward the adaptation, update and alignment of the existing interventions under the country's SE4All agenda. During this period, all new strategies and interventions for energy sector will have to be consistent with Kenya's SE4All AA.
- **Phase I (2018 – 2022).** SE4All become the key energy sector reference for the MTP 3 process. In this context, the AA will be assessed by its progress and additional interventions and Investment Prospectuses (IP(s)) should be incorporated as needed.
- **Phase II (2023 – 2027).** The AA and the MTP 4 will be reassessed by its progress and additional interventions and IP(s) should be incorporated as needed
- **Phase III (2027 – 2030).** The AA and the MTP 5 will be reassessed by its progress and additional

interventions and IP(s) should be incorporated as needed

The SE4All process in Kenya includes the creation of the SE4All Steering Committee which will include representation from the public sector, private sector, civil society and donor community to support the design of the AA and the IP. Once the AA is validated and adopted, this Committee will remain in place and meet regularly to provide support and advice to the Kenya SE4All Secretariat (KSS). The Secretariat is the AA's lead advocacy and managerial unit that:

- Will monitor SE4All projects and studies, which should remain under the responsibility of the relevant Government Agencies and institutions
- Takes the responsibility for realizing SE4All goals, implementing the IP(s) associated to this AA, and applying the SE4All Monitoring plan
- Is the focal point for exchanging information with the SE4All global initiative, especially with the SE4All Global Facility Team, the SE4All Africa Hub, and the SE4All Thematic Hub
- Presents for review by the SE4All Coordination Committee and GoK authorities draft modifications to the AA and proposes any other "mid-course" adjustments that may be needed to keep Kenya on its path to achieve its SE4All goals.

Preamble

Following the launch of the SE4All in 2011, and Kenya opting into it in 2012 (Annex 2). The SEA4All Initiative was launched in Kenya by United Nations high-level mission in March 2012. United Nations Development Programme (UNDP) New York supported the development of the template for stocktaking and gap analysis. A Country Focal Point (CFP) was appointed within the Directorate of Renewable Energy in the Ministry. The Ministry formed a multi-stakeholder taskforce to oversee the development of Kenya's SE4All framework. The development of the AA was an inclusive process with national ownership that considered cross-sectoral impact of national SE4All goals (see Annex 5). Annex 3 presents a list of some of the Civil Society Organizations (CSOs), agencies

and private sector consulted during the development of this document. Additional consultation processes continued to expand the coverage and eventual buy-in of wider stakeholders at both National and sub-National levels to support the implementation of the AA. Annex 4 presents a list of some of the CSOs, private sector and Counties involved. The recognition by GoK ensures that the AA becomes part of the national development plans and budget system, for effective implementation.

The development of the AA was guided by the Africa SE4All Hub Guidelines for developing national SE4All action agendas (NPCA/AUC/UNDP/AFDB) that embraces the principles;

Table 2: Guidelines for developing SE4All action agenda

Guideline Principles	Response in the AA development
Building on existing plans/programmes/strategies;	Existing policies, plans, strategies in the energy sector and within the economy have been considered in the development (Annex 5)
Political commitment and leadership;	At the National level, MoEP is in charge of the SE4All Country Process and allocated dedicated senior civil servants to manage the project. MoEP through the Council of Governors (CoG) secretariat has brought on board Sub-National (County) governments to support the SE4All Initiative in Kenya.
A balanced and integrated approach;	The AA development has considered all aspects of the energy sector that are relevant to SE4All and has also considered interventions that can meet multiple SE4ALL goals for Kenya
An inter-ministerial and cross-sectoral approach;	Inter-ministerial Committee has been formed to take charge of cross-sectoral issues have an impacts on achievement of SE4ALL goals for Kenya e.g. land, water, forestry, agriculture, gender, health and the necessary reforms proposed
Adherence to sustainable development principles;	The AA development has focused on clean modern and renewable energy resources that can improve economic performance and social welfare and contribute to gender equality.
Participation and meaningful involvement of all stakeholders;	MoEP formed a core team with representation from government, private sector, development partners, Civil Society Organisations and private sector that steered the development of AA (See annex 6). Key energy stakeholders have been consulted either bilaterally or as part of group stakeholder workshops as per Annex 3 and Annex 4. In addition, participation of stakeholders (CSOs, private sector etc.) in Technical teams involved in the development of the AA.
Gender equality and inclusiveness; and	When determining which priority areas to consider for the AA, gender perspective has have been integrated especially in terms of addressing modern cooking services that reduce the burden of wood and fuel collection by women and children and in prioritisation of and decentralized solutions.
Transparency and accountability	Apart from involvement of key energy stakeholders in the mapping of priority areas (projects and reforms), the MoEP has also been involved in leading the workshops, guiding the process and endorsing the priority areas that are presented in this AA Report.

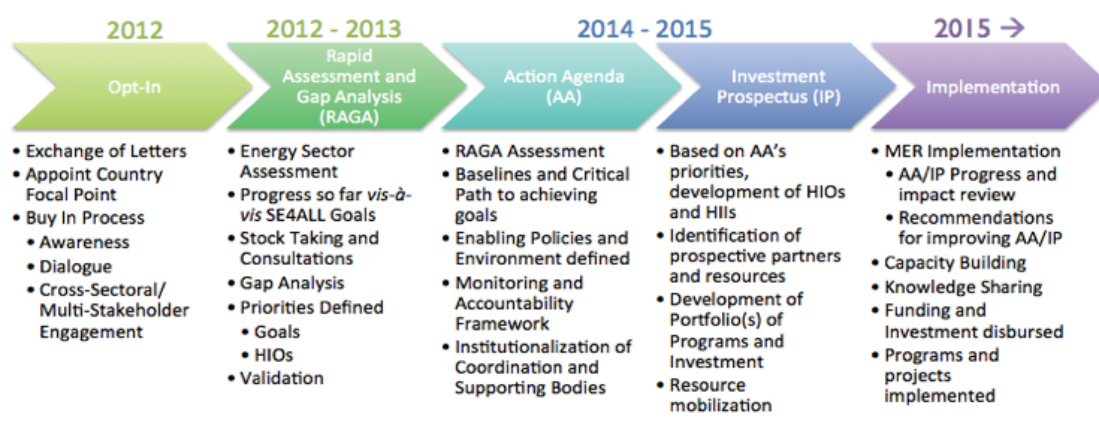
⁵ SE4All initiative process in Kenya

⁶ Process of developing AA in Kenya

The MoEP initiated the development of the Action Agenda and Investment Prospectus (AA/IP) in 2014 after completion of stocktaking and gap analysis in

June 2013. These developments have been in line with the SE4All process, reflected in the Figure 17.

Figure1: Proposed Actions and Timelines for Kenya⁸



The above SE4All timelines fall within those of Kenya's national long-term development blueprint, Vision 2030, whose purpose is to create a globally competitive and prosperous nation with a high quality of life by 2030. The vision is anchored on three key pillars; economic, social and political governance. The Medium Term Plan (MTP) operationalizes the Vision 2030. The MTP also integrates international community development goals such as Global Sustainable Development Goals (SDGs). The first MTP was implemented between 2008 and 2012. The current (second) MTP outlines the policies, programmes and projects which the Government

intends to implement during the five-year period starting from 2013 to 2017.

The SE4All⁹ Global Action Agenda (AA) was issued in April 2012 and it is based on a framework proposing a global AA for universal energy access, foster EE and boost investment in RE. The SE4All goals are expected to be achieved through a number of High Impact Initiatives (HIIs), which are targeted, on-the-ground programs or projects, and categorized into High Impact Opportunities (HIOs).

⁷ The Process has four steps, for purpose of illustrating the activities pertaining, the AA and IP step four was split in two and therefore five steps are shown.

⁸ Adapted from (Putti, 2012)

⁹ The SE4All initiative is described in Annex 1

1.0 Introduction

1.1 Country Overview

1.1.1 Geography and Demography

Kenya is located across the equator, stretching from latitudes 4° North to 4° South and longitudes 34° to 41° East covering an area of approximately 582,646 square kilometres. The population at the end of 2014 was estimated to be 45.56 million up from 38.6 million¹⁰ reported in the last Population and Housing Census (2009), with 50.3% being women compared to 49.7% men with the rural/urban share of 67.7% and 32.3% respectively.

1.1.2 Political Context

Kenya is a multi-party state governed through a devolved government system introduced by the Constitution of Kenya (2010). The Energy Sector development is influenced by the political decisions pertaining to policies and budgetary resource allocations. Kenya political system has recognised the fact that sustainable clean energy is required for the achievement of Vision 2030 and have incorporated it manifestos. Macroeconomic Context.

Vision 2030 whose purpose is to create a globally competitive and prosperous nation with a high quality of life by 2030 currently drives Kenya's economic agenda. The Vision is anchored on three key pillars: economic, social and political governance. The Vision is operationalized through 5-year Medium Terms Plans (MTP), which outlines the policies, programmes and projects for implementation in the five-year period. There are a series of development and sector policies and strategies in place which aid in the implementation of the MTPs that support efforts to realize the Vision. The county's national income of \$55.2 billion was 25% higher and gross domestic product (GDP) per capita, literally, from \$994 to \$1,256, following the rebasing of its GDP in September 2014¹¹.

Following the rebasing of her GDP in September 2014, Kenya joined the list of lower middle income economies. The country's GDP is KShs 3,798 billion (US\$ 39.15 billion)¹², with agriculture and forestry contributing the largest – 25.3% of GDP by activity¹³ and 13.1% to growth (although its growth rate was also among the lowest, at 2.9%). GDP per capita (constant) is KShs 40,345 (US\$ 416). Gross national income (GNI)

in 2012 was US\$ 860/capita¹⁴ compared to an average of US\$ 7500 for Upper Middle Income countries.

Average per capita energy consumption between 1971 and 2011 was 450 koe¹⁵ ranging from 430 koe in 1971 and 482 koe in 2010 compared to an average of 2000 koe for Upper Middle Incomes. External debt service charge as percentage of GDP is 1.2% and external debt service as a percentage of exports of goods and services. Total public debt in 2013/14 fiscal year was 43% of gross domestic production (GDP). The success of SE4All Initiative in Kenya will be hinged partly on the ability of the government to mobilize investment from external and internal sources.

The country's economy grew by 5.3% in 2014 and is projected to grow by 6% in 2015¹⁶. The resilience is likely to continue with the economy expanding at 6.6% in 2016 and 6.5% in 2017, according to the latest World Bank Group's economic analysis.

Figure 2: GDP growth and GDP per capita (2009-2012)



Data Source: Kenya National Bureau of Statistics Economic Survey

1.1.3 Socioeconomic Context

The World Bank estimates that poverty level has declined from 47% in 2005 to 34-42% in 2014¹⁷. GDP per capita in Kenya averaged 485.86 US\$ from 1960 until 2014, reaching an all-time high of 648.84 US\$ in 2014 and a record low of 155.69 US\$ in 1960. According to Kenya Facts and Figures 2014¹⁸, agriculture, forestry and fishing industry is the second largest employer by sector (15.3%), after education (17.7%). The total working population in public (30%) and private sector

¹⁰ The 2009 Kenya Population and Housing Census

¹¹ <http://www.worldbank.org/en/news/feature/2014/09/30/kenya-a-bigger-better-economy>

¹² Converted at (11 June 2015) CBK mean rate of 97 (<https://www.centralbank.go.ke/index.php/interest-rates/commercial-banks-weighted-av>).

¹³ Current Prices, 2010 – 2013

¹⁴ [http://en.wikipedia.org/wiki/List_of_countries_by_GNI_\(nominal,_Atlas_method\)_per_capita](http://en.wikipedia.org/wiki/List_of_countries_by_GNI_(nominal,_Atlas_method)_per_capita)

¹⁵ http://www.theglobaleconomy.com/Kenya/Energy_use_per_capita/

¹⁶ Kenya Facts and Figures 2014, Kenya National Bureau of Statistics

¹⁷ Synopsis for Kenya country policy paper 2013

¹⁸ Kenya National Bureau of Statistics, 2014

(70%) is 2.26 million¹⁹. About 81.6% of the population earns a monthly income of KShs 10,000 (US\$ 103) or less²⁰. The high levels of poverty incidence in Kenya remain a serious impediment to increasing access to modern energy services. In 2009, 45.6 % of Kenyans lived below the poverty line. The majority of the poor in rural areas are food and subsistence farmers and those who derive the bulk of their income from the informal sector; the urban poor are mainly in the informal sector. About a third of rural households are female-headed, and two-thirds of them have no male support, in other words, are headed by widowed, divorced, or separated women with children. The incidence of severe poverty is significantly higher among such households—44 percent compared to 20 percent for male-headed households. A major cause of poverty among divorced and separated women is the loss of access to land. Such women often flee to urban areas where they remain poor²¹. This means that many Kenyans will not afford the modern energy carriers envisaged in the SE4All objectives unless appropriate strategies are formulated that address the inherent poverty barrier.

As observed earlier, many energy projects have in the recent past stalled owing to social conflicts around the issue of land compensation. Furthermore, the

Kenyan constitution emphasizes the need for public participation in the decisions touching on the use of land and other resources within their localities.

Poverty remains a pervasive national problem to date. It is a social problem characterized by low levels of income and inadequate access to basic services. Socio-economic functions previously under the national government are devolved progressively. Energy policy including electricity and gas reticulation and energy regulation is the responsibility of the National Government while county planning and development, under which electricity and gas reticulation and energy regulation fall, is the work of County Governments²².

1.1.4 Financial Sector

Kenya's financial sector comprises of the banking, capital markets, insurance industry, pension industry, safety nets and resolution institutions like the Kenya Deposit Insurance Corporation, financial markets infrastructure, and Savings and Credit Co-operative (SACCOS) sub-sectors. As a proportion of GDP at Current Market Prices, total assets of the financial sector excluding capital markets accounted for 108.00% in 2013 up from 96.48% in 2012. Total value of equity market capitalization accounted for 50.57% of GDP (Table 3).

Table 3: Share of the Financial Sector to GDP

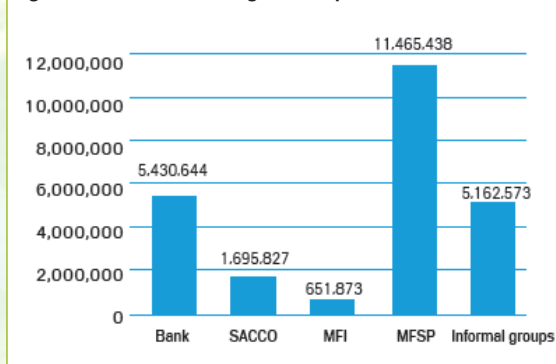
GDP/ SUB-SECTOR ASSETS	2012		2013	
	KShs in Million	Share of GDP	KShs in Million	Share of GDP
Nominal GDP	3,403,547	N/A	3,797,988	N/A
Banking Assets	2,330,335	68.47%	2,703,394	71.18%
Pension Assets	548,700	16.12%	696,680	18.34%
Insurance Assets	311,000	9.14%	366,252	9.64%
Saccos Assets	93,765	2.75%	335,437	8.83%
TOTAL	3,283,800	96.48%	4,101,763	108.00%
Equities Market Capitalization	1,272,002	37.37%	1,920,719	50.57%

Source: Kenya Financial Sector Stability Report 2013

The banking subsector accounted for 71.18%, followed by pension and insurance subsectors in that order. This shows significant contribution of the sector to the overall economy, making it very critical to the stability of the economy.

As of end of 2014²³, there were 44 banking institutions (43 commercial banks and 1 mortgage finance company), 8 representative offices of foreign banks, 9 Microfinance Banks (MFBs), 2 Credit Reference Bureaus (CRBs), 13 Money Remittance Providers (MRPs) and 87 Foreign Exchange (forex) Bureaus. Out of the 44 banking institutions, 30 are locally owned banks comprising of 3 with public shareholding and 27 privately owned while the other 14 are foreign owned.

Figure 3: Individuals using mobile phone financial services



¹⁹ Kenya Facts and Figures 2014, Kenya National Bureau of Statistics

²⁰ Kenya Facts and Figures 2014, Kenya National Bureau of Statistics

²¹ <http://web.worldbank.org/>

²² Constitution of Kenya (2010), Fourth Schedule, Distribution of functions between National and the County Governments

²³ Kenya Financial Sector Stability Report 2014

The 9 MFBs, 2 CRBs, 13 MRPs and 87 forex bureaus are all privately owned. Further, 10 of the 44 banking institutions are listed on the NSE. As seen in the figure 3, more than double the number of adults in Kenya use mobile phone financial services (11.5 million) compared with banks (5.4 million).

The East Africa Community (EAC) Common Markets Protocol, effective July 1, 2010, prioritizes regionalization of the East African Capital Markets with the aim of providing an opportunity for the growth and deepening of the capital markets in the region to promote economic growth.

1.2 Kenya's Energy Sector

1.2.1 Sector Wide Institutional Framework

The Ministry of Energy and Petroleum (MoEP) is the Government's apex institution in the energy sector. MoEP's directorates encompass Petroleum, Electrical Power, Renewable Energy and Geo-exploration. Due to the cross-cutting nature of energy, other Government ministries have a significant role to play in energy policy matters²⁴.

Sessional Paper No. 4 of 2004 and the Energy Act No.12 of 2006 restructured the energy sector in a bid to facilitate high-level performance as shown in annex 6. The role of the key institutions within the Ministry are presented in Annex 6.

Institutional arrangements in the energy sector in Kenya can be presented as either public or private, even though the public sector significantly controls the current energy mix, where wood fuel is dominant in the traditional sector (rural and urban poor communities), while petroleum and electricity are the dominant fuels in the modern economy. In both the public and private sector, further institutional categories are evident.

Public sector institutions comprise policy-makers, regulators, parastatals, special purpose formations and development partners. In this category, line ministries act both as custodians of policy as well as supervisory organs, controlling all the other institutions. The parent is the Ministry of Energy and Petroleum, to which all other relevant line ministries, regulators, state-owned enterprises, special purpose formations and development partners refer on matters related to energy.

1.2.2 Legal and Regulatory Context

Kenya has a series of development and sector policies and strategies²⁵, relevant to SE4All. These strategic documents and activities include the following:

Current Energy Policy and Legislation:

■ Energy Policy

- The Sessional Paper No. 4, 2004 on Energy lays the policy framework upon which cost-effective, equitable, affordable, adequate and quality energy services are made available to the domestic economy on a sustainable basis over the period 2004 - 2023. The agenda for action in the Sessional Paper included enactment of a new and robust

Energy Act (Energy Act 2006) to, among other things, create a common energy sector regulator, the Energy Regulatory Commission.

■ Energy Act, 2006

- The Energy Act, No. 12 of 2006 consolidated the Electric Power Act No. 11 of 1997 and the Petroleum Act Cap. 116. The Act, among other things provided for the establishment of, powers and functions of the Energy Regulatory Commission as a successor to ERB.

■ Electricity Regulations

- The Electric Power (Electrical Installation Work) Rules, 2006,
- The Energy (Complaints and Dispute Resolution) Regulations, 2012
- The Energy (Electricity Licensing) Regulations, 2012

■ Renewable Energy regulations

- The Energy (Solar Photovoltaic Systems) Regulations, 2012
- Designation of Energy Users Gazettment
- The Energy (Energy Management) Regulations, 2012
- The Energy (Solar Water Heating) Regulations, 2012

■ Petroleum Regulations

- The Energy (Gasohol Blending) Regulations, 2010
- The Energy (Petroleum Regulation Levy) Regulations, 2008 (June) - Ln 91
- The Petroleum (Amendment- No 2) Rules, 2003 - Ln 197
- The Petroleum (Amendment) Rules, 2002 - Ln 31
- The Petroleum (Amendment) Rules, 2000 - Ln 64
- The Energy (Petroleum Regulation Levy) (Amendment) Regulations, 2008 (August) - Ln
- The Energy (Petroleum Pricing) Regulations, 2010
- The Energy (Liquefied Petroleum Gas) Regulations, 2009
- The Energy (Importation Of Petroleum Products) (Quota Allocation) Regulations, 2010
- The Energy (Minimum Operation Stock) Regulations, 2008

²⁴ National Energy Policy, draft, August 2015

²⁵ <http://www.erc.go.ke/>

- The Energy (Strategic Stock) Regulations, 2008
- **Proposed Energy Policy & Law**
- The National Energy and Petroleum Policy 2015
- The Energy Bill 2015
- The Petroleum (Exploration, Development and Production) Bill, 2015
- Model Production Sharing Contract
- Energy (Local Content) Regulations, 2014
- Petroleum Exploration, Development and Production (Local Content) Regulations, 2014
- **Government driven strategies and plans:**
- Kenya Vision 2030
- Kenya's 5000 MW Power Plan (2013-2016)
- Kenya's Last Mile Connectivity Project (2015-2017)
- Least Cost Power Development Plan (2013-2033)
- Scaling-up Renewable Energy Programme (SREP) – Investment Plan for Kenya
- Rural Electrification Master Plan
- Kenya National Climate Change Response Strategy
- National Electrification Program Prospectus [herein referred to as Rural Electrification Authority (REA) Prospectus] developed by REA with support from Norwegian Agency for Development Cooperation (NORAD) July 2014.
- **Private Sector Strategies:**
- Kenya National Domestic Biogas Programme (KEDBIP)
- Kenya Country Action Plan – Cookstoves
- Lighting Africa Programme

1.2.3 Energy Resources - Demand and Supply

The main resources of energy in Kenya are renewable energy and fossil fuels. The country is highly dependent on biomass energy, which provides 68% of the total energy supply. Fossil fuels and electricity provide 22% and 9% respectively while other sources provide 1% of the overall energy requirements. Petroleum is imported in both crude and refined forms and accounts for 25% of the national import bill (KNBS, 2011).

Accelerating the pace of electrification is in line with the government's target of 70% electrification by 2017²⁶ that will contribute to eliminating extreme poverty and achieving shared prosperity.

1.2.4 The Power Sector

Kenya's power industry generation and transmission system planning is undertaken on the basis of a 20 year rolling Least Cost Power Development Plan (LCPDP) updated every two years. According to the Updated LCPDP 2013-2033, the load forecast based on the Model for Analysis of Energy Demand (MAED) excel worksheets indicates the peak demand is estimates as shown in Annex 8. From the MAED analysis, the peak demand in 2030 will grow to 11,318 MW in low scenario, 21,075 MW in reference scenario and 31,237 MW in the high scenario. The energy demand will increase from 8,010 GWh in 2012 to 17,719 GWh in 2018 to 81,352 GWh in 2030 and 118,680 GWh in 2033. The current peak load is expected to grow 10 times by the year 2030. Regional electricity trade is an important component of Kenya's strategy, as well as within the East African Power Pool (EAPP) countries. Kenya imports 84.3 million kWh of power and exports 39 million kWh to EAPP countries, which constitutes 1.1% of Kenya's net generation²⁷. Efforts are underway to enhance power trade in the region and Kenya is well placed to provide a wheeling framework to other EAPP countries²⁸.

Demand for electricity has shown an upward trend since 2004 due to accelerated economic growth and planned energy intensive Vision 2030 flagship projects (Annex 7). Peak demand increased from 899 MW in Financial Year (FY) 2004/05 to 1,468 MW in FY2013/14 reaching 1,512 MW by December 2014, while the number of electricity consumers more than trebled from 735,144 in FY 2004/05 to 2,757,983 by June 2014²⁹. Household electricity access is about 35%³⁰ with 51% of urban and 5% of rural households connected to the grid³¹. Per capita electricity consumption was 155 kWh³² in 2010 and 2011. This is in comparison to an average of over 1,500 kWh/capita³³ per year for African Upper Middle Income countries.

As of November 2014, the total installed electricity generation capacity in Kenya stood at 2,294.82 MW. The generation mix includes hydropower (821 MW), geothermal (598 MW), cogeneration (26 MW), wind (25.5 MW) and fossil fuel based electricity (827 MW)³⁴.

As one of the largest unsubsidized markets for solar pv systems in the world, Kenya represents a promising model for off-grid electrification based on private purchases of clean decentralized photovoltaic technologies. Kenya has a large-scale market-driven penetration of small PV systems with capacity of 12 –

²⁶ http://www.kplc.co.ke/img/full/2nPEsH9Dge4K_Launch%20of%20the%20Last%20mile%20connectivity%20Project.

²⁷ http://www.erc.go.ke/images/docs/National_Energy_Petroleum_Policy_August_2015.pdf

²⁸ Kenya National Bureau of Statistics, Economic Survey Report, 2014

²⁹ http://www.erc.go.ke/images/docs/National_Energy_Petroleum_Policy_August_2015.pdf

³⁰ National Energy and Petroleum Policy - Final Draft – June 2015 (page 68)

³¹ Rural Energy Master Plan

³² <http://data.worldbank.org/indicator/EG.USE.ELEC.KH.PC>

³³ Botswana 1600kWh/cap; South Africa 4604kWh/Cap

³⁴ ERC website (erc.go.ke/Home/Electricity)

50 watts power (Wp) consisting of low cost amorphous silicon modules and both mono- and polycrystalline silicon modules. It was estimated that by the end of 2014, more than 6 MW³⁵ of solar PV System capacity was installed in residential and commercial sectors through the private sector initiative. By the year 2020, it is projected that the installed capacity of solar photovoltaic systems will reach 100MWe generating 220 GWh annually. The off-grid and decentralized electricity market in Kenya is estimated to comprise about 6.7 Million households³⁶. Supply comprises micro and Pico systems, mini-grids, and stand-alone systems – with solar, wind and hydro being the main resources in use. In the off-grid segment, stand-alone solar PV systems are the most widely used technology, with well over 200,000 systems installed³⁷ and sales estimated at 20,000 systems per year.

1.2.5 The Process Heat Sector

Process heating is vital to nearly all manufacturing (industrial) processes, supplying heat needed to produce basic materials and commodities. Industries requiring thermal energy for their processes are also switching to biomass due to the increasing cost of fuel oil e.g. food processing. The tea industry is one of the largest consumers of fuel wood. There are over 90 tea factories in Kenya consuming an average of 10,900m³ of wood fuel per year; about 550,000 tonnes of fuel wood per year. Some of the industries are using briquettes as a source of fuel. The second highest consumer of wood fuel are the cottage industries which include brick making, tobacco curing, fish smoking, jaggaries and bakeries. Most of the biomass in Kenya originates from forested and non-forested lands (crop and grasslands).

Over 80% of Kenyans rely on the traditional use of biomass as the primary source of energy for cooking and heating – with firewood contributing 68.7% and charcoal 13.3%³⁸. About 87% of the rural population uses firewood for cooking and 82% of the urban

population uses charcoal for cooking³⁹.

Woody Biomass is the most important contributor to renewable energies, though biomass is only renewable if its sustainable production is ensured. Unsustainable logging to produce wood fuel (charcoal in particular) is a primary cause of deforestation in the country alongside other negative effects such as degradation of land and destruction of major water catchment areas and carbon sinks.

Waste energy recovery from used geothermal steam is a cheaper source of process heat. GDC launched its first Direct Steam Use Pilot Project at Menengai in August 2015. This is a demonstration project of alternative uses of geothermal including milk pasteurization, greenhouse heating, drying, and aquaculture.

1.2.6 Energy Efficiency

The government is addressing various energy efficiency in various ways which include drafting of energy regulations and implementation of programmes and projects at an institutional level and in cooperation with several Development Partners. Enabling reforms in place include; The Energy (Energy Management) Regulations, 2012 that require regular energy audits by large-scale energy users and The Energy (Solar Water Heating) Regulations, 2012, that require regular energy audits by large-scale energy users and those that require installation of solar water heaters by water users using greater than 100 litres of hot water per day. The implementation of energy efficiency regulations that were drafted in 2012 will start in 2017.

According to 5000+MW Power to transform Kenya, 2013- 2017, Electricity sector losses – Distribution and transmission losses in the electricity sector cost the country over US\$ 17 million per year⁴⁰. This is a priority area for Kenya Power and the Kenya Electricity Transmission Co. Ltd (KETRACO) and attention is being accorded to reduce both transmission and distribution losses.

³⁵ National Energy and Petroleum Policy - Final Draft – June 2015

³⁶ <http://www.solarwirtschaft.de/fileadmin/media/pdf/intersolar2013/4-Muchunku-Solar-P-Market-Kenya.pdf>

³⁷ Stock Taking and Gap analysis report, 2013

³⁸ The Global LPG Partnership (GLPGP) - Kenya Market Assessment, 2013

³⁹ Ministry of Environment, Water and Natural Resources: Analysis of Demand and Supply of Wood Products in Kenya July 2013

⁴⁰ 5000+ MW Power to transform Kenya

2.0 Part I – Vision and Targets Through 2030

2.1 Kenya's Overall Vision for SE4All

The growth projected in Kenya's Vision 2030 implies an increased energy demand. Much of this increased energy demand will be in the form of electricity. In line with this, Kenya envisions a 100% access to affordable quality Energy for all Kenyans. These ambitions are incorporated into a revised vision and mission in the Draft National Energy policy (2015).

- **Vision:** Affordable Quality Energy for All Kenyan,
- **Mission:** To Facilitate Provision of Clean, Sustainable, Affordable, Competitive, Reliable and Secure Energy Services at Least Cost while Protecting the Environment.

Another key consideration is the new devolved governance system in Kenya's new Constitution (2010)

that has resulted into demarcation of the country into 47 Counties. This change has significantly altered the planning processes to meet the development objectives.

Part 2 of the Fourth Schedule of the Constitution provides that counties are responsible for county planning and development including electricity and gas reticulation and energy regulation and therefore are a key stakeholder in the implementation and achievement of SE4All targets.

As required under SE4All Initiative Kenya has set quantitative targets for each of the three goals of the initiative depicted in Table 4 below.

Table 4: Kenya SE4All Targets until 2030 under each SE4All goal

Universal access to modern energy services		Doubling global rate of improvement of energy efficiency	Doubling share of renewable energy in global energy mix	
Percentage of population with electricity access	Percentage of population with access to modern cooking solutions	Rate of improvement in energy intensity	Renewable energy share in Total Final Energy Consumption	
			Power	Heat
100% ⁴¹	100%	-2.785% ⁴² /year	80%	80%

Source: Kenya Financial Sector Stability Report 2013

The baseline year for electricity access⁴³ is 2012. In the baseline year, only 23%⁴⁴ of the population was connected to electricity supply. Kenya aims to achieve 100% electricity access by 2022; ahead of the target set in Vision 2030.

Over 80% of Kenyans rely on the traditional use of biomass as the primary source of energy for cooking and heating – with firewood contributing 68.7% and

charcoal 13.3%⁴⁵. About 87% of the rural population uses firewood for cooking and 82% of the urban population uses charcoal for cooking⁴⁶. Access to modern cooking in 2012 was estimated at 18%⁴⁷ and the target by 2030 is 100%.

The renewable energy share in the mix (power and heat) targets 80% by 2030, which will be projected from 65% and 43% for power and heat respectively.

2.2 Integration of Action Agenda into MTP Process

The Medium Term Plan (MTP) is an instrument of Vision 2030 that outlines the policies, programmes and

projects that the Government intends to implement during the five-year MTP cycle. The AA/IP will be

⁴¹ Projected to be reached by 2022

⁴² The energy intensity is expressed in negative as its improvement is a reduction on the energy intensity

⁴³ For the purpose of the AA, the definition of electricity access is connections (or equivalent when dealing with Solar Home Systems (SHS), distributed power or non-metered mini-grids) consistent with the Global Tracking Framework (GTF) and with the multi-tier approach under GTF

⁴⁴ Kenya Facts and Figures 2014, Kenya National Bureau of Statistics

⁴⁵ The Global LPG Partnership (GLPGP) - Kenya Market Assessment, 2013

⁴⁶ Ministry of Environment, Water and Natural Resources: Analysis of Demand and Supply of Wood Products in Kenya July 2013

⁴⁷ Estimate based on The 2009 National Population and Housing census report

incorporated into the MTP process as priority actions and investment opportunities that are part of the operationalization of a fully SE4ALL attuned MTP cycle.

SE4ALL targets are supported by priority actions and investment opportunities that focus on the short-term or transitional period, as additional actions and related investment prospectus will be added as part of the operationalization of MTP 3 and beyond. As Kenya integrates SE4ALL into its national planning, the trajectory towards the country's SE4ALL Goals is informed by the following phases:

- Transition (2015 – 2017). During this period, current MTP2, the country continues with its current strategies and starts a national dialogue toward the adaptation, update and alignment of the existing interventions under the country's SE4ALL

agenda. During this period, all new strategies and interventions will have to be consistent with Kenya's SE4ALL AA.

- Phase I (2018 – 2022). SE4All become the key energy sector reference for the MTP 3 planning process. In this context, the AA will be reassessed by its progress and additional interventions and IP(s) should be incorporated as needed.
- Phase II (2023 – 2027). The AA and the MTP 3 will be reassessed by its progress and additional interventions and IP(s) should be incorporated as needed
- Phase III (2027 – 2030). The AA and the MTP 4 will be reassessed by its progress and additional interventions and IP(s) should be incorporated as needed.

2.3 Energy Sector Trajectory

Energy sector trajectory is based on population average annual intercensal of 2.5 as per the 2009 Census report and economic growth rate of 9% (reference scenario) from 2015, table 4 based on KIPPRA Kenya economic report estimates. Kenya's population is projected to reach 65.7 million by 2030. The growth projected in Kenya's Vision 2030 entails rapidly increased energy demand. Much of this increased energy demand will be in the form of electricity, one of the drivers of economic growth. Kenya in its load forecasting has assumed an economic growth rate of more than 10%⁴⁸

per year in the period 2017 to 2024. Assumptions and hypothesis used for the projections 4.6.1 a) Energy demand forecast as in the previous LCPDP, three demand forecasts scenarios are considered, in line with the GDP growth rate projections, table 5. The high scenario assumes the Vision 2030 GDP growth rate projections. This scenario assumes complete implementation of the flagship projects while in the low and medium scenarios only part of the projects will be implemented.

Table 5 : GDP growth scenarios

Year	Low scenario	Reference Scenario	High Scenario
2010	4.50%	4.50%	4.50%
2011	5.20%	5.40%	6.50%
2012	5.90%	6.30%	7.80%
2013	6.60%	7.20%	8.90%
2014	7.30%	8.10%	9.40%
2015 onwards	8.00%	9.00%	10.00

Source: The 2010 KIPPRA Kenya Economic Report estimates

In 2013, the access to electricity and improved cook stoves was 26.3%⁴⁹ and 36.1%⁵⁰ respectively. The projected access to electricity and modern cooking solutions in 2030 will be 100%.

The contribution of renewable energy in power

generation was 62.2% in 2013 of the total installed capacity of 1,765 MW⁵¹ and this is projected to be 80% by 2030⁵². The peak load forecast and the energy demand forecast are presented in Figure 4 and 5 respectively.

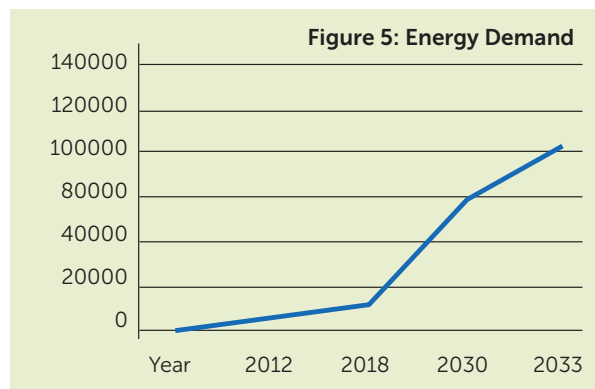
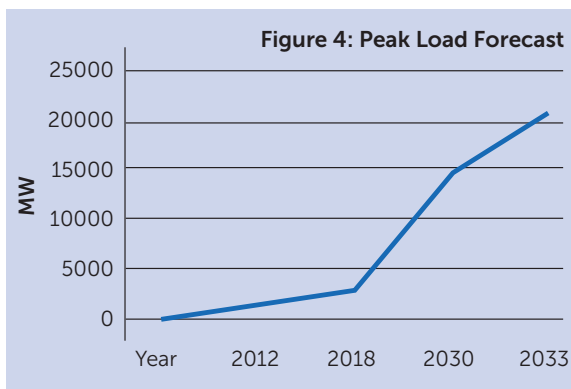
⁴⁸ Vision 2030, economic pillar aims to improve the prosperity of all Kenyans through an economic development programme, covering all the regions of Kenya, and aiming to achieve an average Gross Domestic Product (GDP) growth rate of 10% per annum beginning in 2012.

⁴⁹ Kenya power 2012/2013 annual report

⁵⁰ Kenya Country Action Plan (CAP), 2013

⁵¹ Kenya power 2012/2013 annual report

⁵² SE4All target



The reference case ranges from 1370 MW in 2012 to 3034 MW in 2018 to 14446 MW in 2030 and 21,075 MW in 2033 while the energy demand increases from 8010 GWh in 2012 to 17,719 GWh in 2018 to 81,352 GWh in 2030 and 118,680 GWh in 2033⁵³.

Biomass fuels are by far the largest source of primary energy in Kenya with wood-fuel (firewood and charcoal and agricultural residue) accounting for 69% of the total primary energy consumption⁵⁴. Wood fuel supply does not match demand in many parts of the country: the resources are being depleted faster than they are replenished. The wood fuel shortage is further compounded by widespread inefficient methods of production and use and lack of standards as well as unclear national targets for sustainable use. 5% of the population use LPG mainly for cooking, of which 90% is in urban areas⁵⁵. Hundred percent of the LPG is imported. The demand for LPG in 2010 was 87.8 thousand tonnes compared to the demand of 64.6

thousands in 2006⁵⁶. Demand for LPG is expected to grow to 18% of the population by 2022 as a result of low cost of LPG especially when the import handling and storage facility is on board.

The GoK plans to review and update biomass energy development plans, update biomass energy databases and expand improved stoves and charcoal kiln programmes, to eliminate the fuel-wood deficit.

These actions aim to increase the rate of adoption of improved cookstoves from 37.2%⁵⁷ currently to 57.7%⁵⁸ by 2030 while the target for clean cooking fuels in 2030 is 42.3%. The government targets to make Kenya kerosene free by 2022 by availing alternative modern energy services⁵⁹. Plans are also underway to reduce total electricity losses in the grid from 17.3% in 2012 to 13.5% by 2020. Related to this is the scheme to achieve 100% energy efficient lighting systems by 2020⁶⁰ and to switch to 100% energy efficient transformers by 2030⁶¹.

2.4 The Methodological approach in Support of Kenya's SE4ALL Goals

Targets are supported by priority actions and investment opportunities that will focus on the short-term, or transitional and transformation periods. Additional actions and related investment prospectuses will be added as part of the operationalization of a fully SE4All compatible MoEP Plan.

2.4.1 Baseline and Quantitative Projections on Access

The methodological approach to estimating baseline and progression on access assumes:

2.4.1.1 Electricity

■ Baseline for Access to Electricity

■ *The baseline year for electricity access is 2012.* Based on the Kenya National Bureau of Statistics (KNBS) the total population was 40.7 million, representing about 8.14 million households (at the national average of five people per household). Consumption per capita for the baseline year was 157.60 kWh⁶² with access level at 23%, which represents 1.97 million households.

■ *Population Growth.* Based on 2012 population compounded annually by the average annual inter censal growth of 2.5⁶³ the projected population will be about 55.1 million in 2022.

⁵³ Updated LCPDP 2013-2033 (March 2013)

⁵⁴ The Draft National Energy Policy, 2015

⁵⁵ Stock taking and gap analysis report, 2013

⁵⁶ The Global LPG Partnership (GLPGP) Kenya Market Assessment, 2013

⁵⁷ Kenya Country Action Plan, 2013

⁵⁸ Kenya SE4All Action Agenda

⁵⁹ The Draft National Energy Policy, 2015

⁶⁰ Stock Taking Gap Analysis, 2013

⁶¹ Stock Taking Gap Analysis, 2013

⁶² Based on total power generation as reported by the 2013 KNBS Statistical Abstract

⁶³ Reference to 2009 census

■ Progression for Access to Electricity

■ *Progression time Intervals.* In 2015, the access to electricity 38.9%⁶⁴ of the population, which translates to 18.2 million people or 3.64 million households. In addition, there are indeterminate number of households, institutions and industries that are served by diesel engines, mini-grids and solar home systems that are not counted. In the next five years starting in 2016, the government

targets a connectivity rate of 1.0 million customers⁶⁵ per year⁶⁶. The planned on grid connectivity rate together with the off grid alternatives will enable achievement of 100% access to electricity in the MTP3 by 2022 as shown in Table 6.

■ Beyond 2022. Consistency with the Vision 2030, the MTP process will ensure that the pace of new connections meet the demand to maintain universal access through 2030 and beyond.

Table 6: On grid and off grid connectivity progression⁶⁷.

Year	2012	2017	2022
Total Connectivity of the HHs in %	23.6	67.8	100

Source: Kenya Power annual report, 2014

■ Kenya will target to have minimum levels of access to electricity at tier 2 by 2022. The percentage

access levels of electricity are indicated in table 7.

Table 7: Levels of access to electricity by 2022

Levels electricity access	Percentage of access		
	2022	2027	2030
Tier 1	20	15	10
Tier 2	40	35	30
Tier 3	25	30	35
Tier 4	10	12.5	15
Tier 5	5	7.5	10
Total	100	100	100

Source: Compilation from 2015 Draft national energy and petroleum policy

2.4.1.2 Access to modern cooking solutions

The efforts to provide universal access to modern cooking solutions will include at least three focal points: improved cookstoves and clean fuels, which refers to use of non-solid fuels for cooking (electricity, liquid and gaseous fuels). Modern energy inputs for thermal applications include electricity, LPG, biogas and solar thermal.

Increasing Access to modern cooking solutions

■ Baseline for Access to improved Cookstoves

■ The baseline year for access to improved cookstoves is 2013 at the level of 3.2 million households⁶⁸. The Kenya Country Action Plan target is 5 million Kenyan households and institutions using improved cookstoves for cooking and heating applications by 2020.

■ Progression for accessing modern cooking solutions

■ Progression time Intervals. Consistent with the other access indicator, progression is presented on five-year intervals of the MTP cycle. The progression, while discretionary, has considered and is consistent with the progression resulted from analysing the Kenya Country Action Plan (CAP) 2013 and the draft bioenergy strategy 2015.

■ Assuming equal achievement per year the KCAP requires adoption of 270,542 cookstoves per year to get to 5,000,000 cookstoves in 2020. If this effort is sustained at same level, 57.7% households would be using improved stoves in 2030. As per the Draft National Energy Policy 2015 the use of LPG target by households by 2020 is 18%, this is an increase of 2.16% per year. If this is sustained, then 35.3% of Kenyan's households will be using LPG by 2030. Use of electricity, bioethanol and biogas for cooking is projected to reach 7.6% by 2030. Table 8 shows clean cooking fuels progression for households until 2030.

⁶⁴ Kenya Power report 2015

⁶⁵ KPLC has 35,000 distribution transformers spread across the country. Within a 600 meter radius from these transformers, and the company has a potential to connect 472,002 households corresponding to approximately 1.2 million customers.

⁶⁶ Kenya Last Mile Connectivity Programme

⁶⁷ Kenya Power annual report 2014

⁶⁸ Kenya Country Action Plan 2013

Table 8 : Clean cooking fuels progression for households until 2030

Year	2013	2017	2020	2022	2027	2030
LPG(%)	8.6	13.6	15.0	18.6	25.6	35.3
Biogas(%)	0.1	0.2	0.3	0.4	0.6	0.8
Bioethanol(%)	0.0	0.0	1.0	1.5	3.0	4.5
Electricity(%)	0.6	1.0	1.2	1.5	2.0	2.3
HHs access to clean fuels-non-solids (%)	9.3	14.8	17.5	22.0	31.2	42.9
Improved cookstoves-Solid fuels (%)	37.2	42.9	47.7	52.7	57.6	57.7
Total access to modern cooking services (%)	46.5	57.7	65.2	96.7	88.8	100.0
Access to unclean cooking services (%)	53.5	42.3	34.8	25.3	11.2	0.0
Total access to cooking (%)	100.0	100.0	100.0	100.0	100.0	100.0

Source: Compilation from 2015 Draft national energy and petroleum policy

2.4.2 The Methodological Approach to the Baseline and Quantitative Projections on Energy Efficiency

The SE4All Global Initiative defines, table 9, energy intensity as the global economic output divided by total energy consumed divided by the GDP. The SE4All

guideline of doubling the rate of energy efficiency is based on energy intensity. At an economy-wide level, it is a challenge to define an energy intensity target (i.e. the relationship between energy and GDP) without much more detailed sectoral growth projections (for example the growth rates of energy intensive industries vs. service sector growth).

Table 9: World Bank Energy Intensity Definition

Indicator Name	Energy intensity level of primary energy (MJ/\$2005 PPP)
Indicator Code	6.1_PRIMARY.ENERGY.INTENSITY
Definition	Energy intensity level of primary energy (MJ/\$2005 PPP): A ratio between energy supply and gross domestic product measured at purchasing power parity. Energy intensity is an indication of how much energy is used to produce one unit of economic output. Lower ratio indicates that less energy is used to produce one unit of output.
Statistical Concept and Methodology	Indicator is obtained by dividing total primary energy supply over gross domestic product measured in constant 2005 US dollars at purchasing power parity
Unit of Measure	MJ/\$2005 or TOE/\$2005 PPP
Comments	Energy intensity level is only an imperfect proxy to energy efficiency indicator and it can be affected by a number of factors not necessarily linked to pure efficiency such as climate.

Kenya's historical progression of energy intensity presents a trajectory that has remained almost constant within a range, as illustrated by Table 10.

Table 10: Historical Progression of Kenya's Energy Intensity⁶⁹

Energy intensity	2000	2002	2004	2006	2008	2010	2012
In TOE/\$2005 PPP	0.28	0.28	0.28	0.27	0.26	0.27	0.25 ⁷⁰
In MJ/\$2005 PPP	14.33	14.26	14.25	13.79	13.40	13.65	N/A

⁶⁹ World Bank and International Energy Agency (IEA Statistics © OECD/IEA, <http://www.iea.org/stats/index.asp>)

⁷⁰ The baseline is positive because this is the actual Energy Intensity not a ratio of reduction.

Table 11: Kenya Targets for EI

Indicator	Rate of energy intensity (TOE/\$2005 PPP)
Baseline year 2012	0.25
Target year 2030	0.125 ⁷¹
Goal by 2030	- 2.785%/year

The focus for Kenya is to:

- At least double the efficiency of biomass energy use
- Extend current rates of electrical efficiency improvement by 2030

Within the cooking sector, it is possible to identify a more specific energy efficiency target. Performance tests carried on cookstoves for solid biomass and liquid fuels (kerosene and bioethanol) cookstoves by university of Nairobi-Chemistry department. The project was support from MoEP and UNDP under energy access programme. The results indicated that Charcoal stoves have higher thermal efficiencies than those of firewood (17-37 versus 26-47) while the Liquid fuels (kerosene and ethanol) stoves achieved much higher thermal efficiencies (30 -53%)⁷². In same report, the thermal efficiency of institutional cookstove ranged between 43-60%. In these scenarios, based on a population growth rate of 2.7% per year, and assuming that each household on average will experience a 2.7% per year growth in cooking demand (more elaborated meals, more cooked meals per day, etc.), the total useful energy demand for cooking heat grows by over 250%. The tests results were used to develop cookstove standard.

Under the projected energy savings in scenarios developed for the Action Agenda, the actual energy consumed for cooking grows by only 15%. This means that the efficiency of cooking will have more than doubled by 2030 relative to 2009. Based on these scenarios, Kenya is adopting a target of doubling the rate of energy efficiency in the cookstoves sector by 2030.

In terms of the efficiency of electricity use, there are ambitious programmes underway, including substantial investment for grid-loss reduction, as well as an additional programme on efficient lighting. The 250 energy audits undertaken on behalf of the MoEP up to 2014 indicates a savings potential of KShs 7.5 billion and 20 MW equivalent. Assistance from DANIDA to Centre for Energy Efficiency and Conservation (CEEC) also saw the completion of a further 150 energy audits translating to indicative savings of KShs 8.0 billion and 25 MW equivalent.

2.4.3 The Methodological Approach to the Baseline and Quantitative Projections on Renewable Energy

Process heat

Process heating is vital to nearly all manufacturing (industrial) processes, supplying heat needed to produce basic materials and commodities. Industries requiring thermal energy for their processes are also switching to biomass due to the increasing cost of fuel oil e.g. food processing. The second highest consumer of wood fuel are the cottage industries which include brick making, tobacco curing, fish smoking, jaggaries and bakeries. Most of the biomass in Kenya originates from forested and non-forested lands (crop and grasslands). The plan is to enforce sustainable management practices to ensure that the level of carbon stocks do not systematically decrease over time through the following measures;

1. The woody biomass originates from land areas that are forests where:
 - a. The land area remains a forest;
 - b. Sustainable management practices are undertaken on these land areas to ensure, in particular, that the level of carbon stocks on these land areas does not systematically decrease over time (carbon stocks may temporarily decrease due to harvesting);
2. The biomass is woody biomass and originates from non-forest areas (e.g. croplands, grasslands) where:
 - a. The land area remains cropland and/or grasslands or is reverted to forest;
 - b. Sustainable management practices are undertaken on these land areas to ensure in particular that the level of carbon stocks on these land areas does not systematically decrease over time (carbon stocks may temporarily decrease due to harvesting);
 - c. National or county forestry, agriculture and nature conservation regulations to be compiled.

Power Generation

Kenya installed generation capacity is projected to increase from 1,645 MW in 2012 to about 14,676⁷³ MW by 2030 basing on the reference scenario. The strategy

⁷¹ This is the end level of Energy Intensity and the goal is to reduce the baseline rate in half meaning to 0.125. The goal by 2030 is -2.785%

⁷² September 2014, Documentation and evaluation of the efficacy of household institutional and energy stoves for improved livelihood and poverty reduction of Kenyan communities

⁷³ March 2013 Least Cost power development (2013-2033)

is to diversify the base-load from hydro to other sources of energy mainly geothermal. The expected power supply from various sources will by 2030 be composed of 80.11% renewable energy: geothermal 5,450.00MW (37.13) hydro 3,000MW (20.44%), diesel 500 MW (3.40 %), natural gas 1,500 MW (10.22%),

Co-generation/Gasification 600 MW (4.08%) Solar PV 1,200.00 MW (08.17%), Biogas 10MW (0.07), wind, 1,500.00 MW (10.22 %) coal 2,420MW (16.49%) and gas 496 MW (3.38%). The RE mix is expected to be at 80% by 2030 as shown in Table 12.

Table 12: Kenya Targets for RE mix in power generation⁷⁴

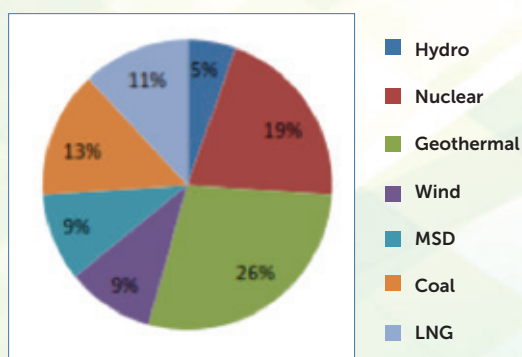
Sources of Electric Power Generation	Capacity 2012		Capacity 2014		Capacity 2017		Capacity 2022		Capacity 2027		Capacity 2030		
	MW	%	MW	%	MW	%	MW	%	MW	%	MW	%	
Hydro	816.30	46.21	821.00	37.78	900	27.33	1,500	24.80	2,500	23.35	3,000.0	20.44	
Geothermal	250.40	14.17	593.50	37.78	800	24.30	2,000	33.07	4,000	37.36	5,450.0	37.13	
Wind	5.90	0.33	25.00	1.15	500	15.19	900	14.88	1,200	11.21	1,500.0	10.22	
Renewable Energy	Cogeneration/gasification	26.00	1.47	38.00	1.75	50.0	1.52	100	1.65	300	2.80	600.0	4.08
	Biogas	0.00	0.00	0.155	0.01	2.0	0.06	5.0	0.06	6.00	0.06	10.00	0.07
	Solar PV	0.50	0.03	1.68	0.78	40.00	1.22	300.0	4.96	700	6.54	1,200.0	8.17
	Total	1,099.10	62.21	1478.18	68.01	2,292	69.62	4805	79.45	8706	81.32	11760.0	80.11
Non-Renewable	667.40	37.79	695.3	31.99	1000	30.38	1243	20.55	2,000	18.68	2916.0	19.89	
Grand total	1,766.50	100.0	2,173.48	31.99	3,292	100	6,048	100	10,706	100	14,676.0	100.	

a) Progression in Power Generation

In the updated LCPDP, 2013, the peak demand is projected to grow 10 times in 2030 to reach the peak demand 11,318 MW in low scenario, 21,075 MW in reference scenario and 31,237 MW in the high scenario. The energy demand will increase from 8,010 GWh in

2012 to 17,719 GWh in 2018 to 81,352 GWh by 2030 and 118,680 GWh in 2033. These projections are based on an array of planned infrastructural, mining and manufacturing projects including the standard gauge railway line, the establishment of a steel smelting plant in Meru, Konza Techno city and several other major energy intensive undertakings.

Figure 6: Projected generation mix in year 2030



Source: GoK (2011)

It is expected that the development of resources like geothermal, wind, solar, cogeneration will have an impact on the capacity projections as well as the mix of resources contributing towards power generation to the grid by 2030.

2.5 Sectoral-Energy Nexus

Energy intersects with several other socially important development themes. Attempts in developing specific quantitative targets have been done while in some cases qualitative targets are being used owing to the lack on baseline data. Table 13 illustrates the issues and targets.

⁷⁴ Computation based on updated LCPDP 2013-2033, March, 2013

Table 13: Indicative goals for nexus issues

Nexus	Issue	Target
Health	<p>Indoor air quality from cooking predominantly affects women and children. Overlapping with other nexus issues, inadequate access to modern cooking solutions can affect food quality and nutrition. Lack of electricity (on or off-grid systems) for maternal health care services has a negative effect on infant mortality and childcare. Vaccine refrigeration, lighting, ICT, running medical equipment for procedures, sterilization and even staff amenities in health centres are services that require energy.</p>	<p>All households to be at Tier 3⁷⁵ or above air quality standards by 2030 defined by ISO standards in line with WHO guidelines. The majority of Improved Cookstoves (ICS) used in Kenya today operate at Tier 1 level. For those using cookstoves that do not meet this standard, implement other methods such as ventilation for improving air quality.</p> <p>Electrification of all Government health centres, by 2030-100% of health centres should receive electricity (on or off-grid systems). Sustainability of these initiatives needs to be factored into implementation to ensure sufficient, reliable supply of energy for household, communal and productive use.</p>
Water	<p>-Coordination of water planning is required because delivery of water, especially in semi-arid areas, relies on energy for pumping water for both irrigation and drinking – with significant time, health and labour impacts for those without it.</p> <p>-Vulnerability of hydro supplies to climate change impacts</p>	<p>Hydro plant fully integrated into Water Resources Management Authority (WRMA) plans by 2020 for domestic use, energy, agriculture, and industry. Multi-use schemes routinely considered in project planning.</p> <p>By 2020 at the latest, all hydropower and multi-use schemes fully assessed for climate vulnerabilities and adaptation measures identified and costed. By 2030 at the latest, majority of schemes, have risk-mitigation strategies implemented.</p> <p>Access to clean drinking water especially by women who are charged with the responsibility to provide water for the family. Women spend a lot of time fetching water.</p>
Food	<p>Land-use competition</p> <p>Energy consumption for irrigation</p>	<p>Beyond 2020, net expansion of land use for forestry or other energy production will only be considered if there is no conflict with food security objectives.</p> <p>Water irrigation is planned to increase significantly, and solar PV powered pumps should be routinely considered as the way to provide energy for such systems. Such technologies can help improve resilience to climate change.</p>
Gender	<p>Energy interventions are likely to impact women and men differently. For example, access to affordable modern energy services can reduce both time and effort spent in reproductive and productive labour.</p> <p>While some of the benefits of access to modern energy are equally applicable to both women and men, some interventions bring specific benefits to women</p>	<p>Halve the amount of time women in rural areas spend collecting firewood by 2030.</p> <p>Involve women in the selection of technologies (e.g. cookstoves) and in the selection of relevant research topics in support of the SE4All targets.</p> <p>Provide relevant training to women (e.g., on business development services, on better water management or water storage</p>

⁷⁵ These tier level classifications include not just energy criteria, but also health criteria.

Nexus	Issue	Target
	<p>Energy projects, including those focusing on cookstoves, do not always take a gendered perspective</p> <p>Women are particularly time-poor and the associated drudgery of their tasks, which has implications on health, and well-being of children and families.</p> <p>The high up-front costs of access to modern energy services may affect more severely female-headed households, often over-represented in low-income quintiles.</p> <ul style="list-style-type: none"> -Access to water for irrigation for farmers, especially women to increase food security and also for drinking -Energy for food processing can lead to labour/time saving freeing more time for women and men to engage in more productive activities <p>While gender issues are interspersed all along the energy supply chain, energy projects, including those focusing on cookstoves, do not always in reality take a gendered perspective because women's access to decision making within the household and community is restricted, limiting their ability to influence processes and resource allocation on many issues, including energy.</p>	<p>for energy purposes, including for biogas installations, improved cookstoves etc.</p> <p>Involve women as actors in the value chain for marketing the stoves and other renewable energy technologies as energy entrepreneurs</p> <p>Support women groups to use modern technology in agriculture to boost their come and put energy to productive uses e.g. irrigation agriculture, processing of farm produce thus adding value, poultry keeping and processing of animal feeds on the farm.</p> <p>Access to clean drinking water especially by women who are charged with the responsibility to provide water for the family. Women spend a lot of time fetching water.</p> <ul style="list-style-type: none"> -Increase access to modern energy services improve on the quality and quantity of farm produce thus increase small farm income, given women's role in food security. - Gender mainstreaming in energy policies and programs to ensure that projects achieve greater livelihood enhancements and contribute to women's economic empowerment and increased participation in decision making
Climate change	<p>Kenya is currently facing significant threats from global climate change:</p> <ul style="list-style-type: none"> - Increased variations in weather patterns (reduced rainfall and failed seasons); - Habitat destruction; loss of biodiversity - Resource use conflicts all impact negatively on the energy sector 	<ul style="list-style-type: none"> -Enhance use of renewable energies to minimize Green House Gas (GHG) emissions and foster alternatives to climate-sensitive energy resources (such as hydro and biomass) -Support energy efficiency measures -Sustainable use of renewable energy resources
Education	<ul style="list-style-type: none"> -Pastoralists prefer learning in the evening -Electricity penetration in pastoralists regions very low -Difficult to introduce digitised education such as computer studies -difficult to carry out electrical courses in learning institutions 	<ul style="list-style-type: none"> -By June 2013, out of 50,000 of the five public (Trading centres, Administrative centres, health centres, schools and water projects) facilities in the country, about 66% were electrified. The table below shows the status of the electrification of the facilities as at June 2013 -By 30 June 2014, 71% of 21,222 public primary schools in the country were connected to electricity. -The target is to electricity all the public institutions by 2017 (Rural Electrification Master Plan).

3.0 Part II – Priority Action Areas⁷⁶

Kenya adopted the 11 Action Areas identified in the Global Action Agenda for achieving the three SE4All objectives. These provide a framework for identifying high-impact opportunities (HIOs); a way to organize multi-stakeholder actions across all relevant sectors of the economy; and tangible entry points for stakeholders interested in taking action in specific areas of interest.

Within each Action Area, Kenya has identified specific high impact opportunities and for each area of opportunity the related high impact initiatives (HIIIs). Alongside the HIOs are also priority programmes that

relate to both enabling the environment, overcoming barriers, and catalysing investment opportunities. There are also priority projects acting as pacesetters, market makers and which contribute significantly to achievement of set targets.

Part 2 of the Fourth Schedule of the Constitution provides that counties are responsible for county planning and development including electricity and gas reticulation and energy regulation and therefore are a key stakeholder in the implementation and achievement of SE4All targets.

3.1 Energy Access

3.1.1 Electricity

3.1.1.1 Status

As at June 2014, there were nine generation substations with transformation capacity of 1,846 MVA and forty-five transmission substations with a capacity of 3,181 MVA. The existing transmission network comprises 1,434 km of 220 kV and 2,513 km of 132 kV lines, as at June 2014 and is interconnected with Uganda through a 132 kV double circuit line.

By 31st July 2015 national customers electricity connectivity for Kenya stood at 38.9%⁷⁷ and the target for 2022 is 100% to be achieved through both grid and off-grid solutions⁷⁸. In the next five years starting in 2016, the government targets connectivity rate of 1 million customers per year⁷⁹. Currently, there are 16 off-grid stations operated Kenya Power with a total capacity of 16.8 MW. These are located in Wajir, Elwak, Takaba, Mandera, Marsabit, Moyale, Habaswein, Rhamu, Lodwar, Lokichoggio, Baragoi, Merti, Mfangano, Mpeketoni, Hola and Eldas. Ten other mini-grids are under construction across the country.

In the solar sub sector, 2014 study by M-KOPA Solar and InterMedia showed that 14% of the Kenyan population uses off-grid solar as their primary lighting and charging source. Combining this with electricity access at 38.9%, there are approximately 47.1% of Kenyans still relying on kerosene, firewood and candles for lighting.

Out of the 47 counties nine are considered to be off-grid, these are Marsabit, Turkana, Mandera, Wajir, Lamu, Tana River, Isiolo, Garissa, Samburu.

3.1.1.2 Trajectory

Kenya's power industry generation and transmission system planning is undertaken on the basis of a 20

year rolling LCPDP updated every two years. With the peak demand growing to 11,318 MW in low scenario, 21,075 MW in reference scenario and 31,237 MW in the high scenario by 2033 and energy demand increasing to 17,719 GWh in 2018 to 81,352 GWh in 2030 and 118,680 GWh in 2033, the generation capacity needs expansion to be in tandem with the growth.

Candidate generation resources considered in the system expansion plan include geothermal, hydro, wind, coal, oil-fired and nuclear power plants, with geothermal capacity planned to increase from 198MW (2011) to 5,530 MW, equivalent to 26% of the system peak demand by 2031. Other sources by 2031 are 19% from nuclear plants, 13% from coal plants and 9% from imports. Wind and hydro plants will provide 9% and 5% respectively while medium speed diesel (MSD) and gas turbines (GTs) - LNG plants will provide 9% and 11% of the total capacity respectively⁸⁰.

As of 30th June 2014, the distribution system comprised of 1,212 km of 66 kV lines, 20,778 km of 33 kV lines, 30,860 km of 11 kV lines and low voltage lines, primary distribution substations with transformation capacity of 3,311 MVA and distribution transformers with total capacity of 6,317 MVA. It is projected that by 2020, capacities of primary and distribution substations will be 11,888 MVA, 190,204 MVA, while the lengths of HV lines and MV lines will be 7,925 km and 118,875 km respectively. In the year 2030 capacities of primary distribution substations and distribution transformers will be 37,565 MVA and 60,104 MVA, while lengths of HV and MV lines will be 25,043 km and 187,825 km, respectively.

The government also plans to develop new transmission lines comprising of about 5,438 km in the short term and 18,173 km by 2033⁸¹. Through the LCPDP process and feasibility studies, KETRACO has identified priority

⁷⁶ Section 6.3.2 presents the time line for the implementation of priority HIIIs through 2018

⁷⁷ Kenya power annual report 2014/2015

⁷⁸ Targeted households for the plan is 1,416,000 connectable customers (World Bank assessment report 2015-2017)

⁷⁹ Last Mile Connectivity Project

⁸⁰ Updated LCPDP 2011-2031, GoK

⁸¹ Updated LCPD 2011-2031, GoK

projects for implementation totalling about 6,270 km of transmission lines comprising 2,081 km of 132 kV, 1,278 km of 220 kV and 2,299 km of 400 kV AC lines as well as 612 km of 500 kV High Voltage Direct Current (HVDC) line between 2011 and 2017. It is projected that by 2033 KETRACO will have constructed over 18,000 km of transmission lines.

3.1.1.3 Existing Plans/Strategies

GoK has embarked to increase connectivity per year to one million starting in the 2014/2015 financial year to reach 100% connectivity by 2022. To achieve these targets, the following strategies are being employed;

- **Rural Electrification Master Plan:** The GoK is implementing initiatives to make electricity more accessible to the population especially in rural areas. Among the consumers were some 382630 rural households electrified through the Rural Electrification Programme under REA. In addition, REA connected more than 23,000 public facilities in the last five years constituting 89% of the main public institutions that were to be electrified in REA's first strategic plan (2008/09-2012/13). The focus on electrification of primary schools started in 2013, as one of the priority projects by the new government, which was elected in March 2013. By June 2013, out of the overall 21,222 primary schools in the country, 10,157 had been electrified. To complete the electrification of all primary schools by June 2015, the Authority put in place a programme aimed at completing electrification of the remaining 11,062 primary schools in two years with 5,000 primary schools planned for electrification in the 2013/14 financial year and 6,065 in the 2014/15 financial year.
- **The 5,000+MW Project⁸²** : A roadmap to increase the installed generation capacity from 1664 MW as at October 2013 by at least 5000 MW to 6,762 MW by 2017. Through the plan the generation cost is projected to reduce from US\$ 11.30 to 7.41, while indicative end-user tariffs are projected to reduce from US\$ 14.14 to 9 for commercial/industrial customers and from US\$ 19.78 to 10.45 for domestic customers
- **Scaling Up Renewable Energy Programme (SREP).** The decentralized segment, mini-grids development has been getting the most attention, especially from the Government, development partners, and programs such as SREP. It is also an area of growing interest from the private sector. Private sector approaches to mini and micro-grid development are being developed, though there is still no formal regulatory framework for this. Donors such as DfID, working with GIZ, have recently introduced innovative mini-grid development financing, with the introduction of Results Based Financing, targeting 20 private-sector-operated mini-grids and working with locally based financial institutions. Conventional solar, wind, diesel or hybrid plants exist, with 22 mini-grids developed by Kenya Power and Lighting Company (KPLC), with a reach of over 20,000 customers, mainly installed in remote areas. The private sector and civil society have installed at least a dozen wind/solar/micro hydro/hybrid mini-grids. Isolated solar/diesel mini-grids managed by KPLC contribute almost 1 MW, while wind mini-grids produce 550 kW. Efforts are underway by the Ministry of Energy and Petroleum, working with Kenya Power and REA to scale this up under hybrid mini-grid initiatives. At least 68 new sites are in development under Kenya's Scaling up Renewable Energy Programme (SREP) Investment Plan, 2011.
- **Last Mile Connectivity Project-** The project involves extension of the Low Voltage network (415 and 240 volts) around existing distribution transformers within the transformer protection distance, currently capped at a radius of 600 Metres. The Project aims to offer connections to up to 1,416,000 connectable households in a period of 3 years (2015-2017).
- **Provision of Stima loan:** StimaLoan is a Kenya Power initiative in partnership with the French Development Agency (AFD) through the Government of Kenya. It aims at connecting low-income families that cannot afford the connection fees upfront by providing loans at 5% administration fee (one-off payment) and 20% upfront payment. The balance is payable over a period of 24 months. As at May 2014, more than 49,000 Kenyans have benefitted from the loan scheme⁸³.
- **Least Cost Power Development Plan (LCPDP):** A long-term commitment (2013-2033) to electrification plan that provide a framework for institutional, technical, economic and financial design and implementation of specific programs.
- **National Electrification Strategy** that is expected to provide a framework for electrification, encompassing technical, financial, and institutional planning.
- **Distribution Expansion Plan 2014-2018.** The medium term distribution expenditure plan is projected to cost KSHS 35,067 million equivalents to US\$433.45million. Besides the distribution master plan, Kenya Power through their Distribution Division has developed strategies geared towards absorbing the additional generation capacity totalling to about KSHS 5 Billion. Funding the electrification of informal settlements. Informal settlements are a reality of Kenya's urban areas. Millions of Kenyans live in informal settlements with unsafe electrical installations and limited access to legal connections, while power theft in the informal settlements results in high commercial and technical losses for the Company. However, electrification of informal settlements is often uneconomic for power utilities as returns are too low to recover the cost of

⁸² http://www.erc.go.ke/images/docs/National_Energy_Petroleum_Policy_August_2015.pdf

⁸³ <http://www.kplc.co.ke/content/item/77/Stima-Loan#sthash.gjWIVC03.dpuf>

investment, operations and service. The Company, therefore, has been exploring sustainable ways to provide electricity to the settlements in partnership with the Government and development partners. Towards this, in February 2012, the Company obtained a grant from the International Development Association (IDA), acting as administrator of the Global Partnership on Output-Based Aid (GPOBA), for electrification of informal settlements in the country. The programme entails the Company pre-investing in the electrification of informal settlements, after which GPOBA will reimburse the Company US\$75 per meter connected up to a total of US\$5million; while the World Bank will reimburse US\$150 per meter connected up to a total of US\$10 million. About 66,000 customers are expected to benefit from this initiative.

■ **The Kenya Joint Assistance Strategy (KJAS)** presents a core strategy of 17 development partners for 2007–12. The KJAS partners will aid the government program in several ways⁸⁴.

■ They will continue to support implementation of substantial changes in the organization and structure of the electricity market (including agreement on a management contract for the Kenya Power and Lighting Corporation), and institutional reforms of the rural electrification program.

■ They will finance investments to expand generation capacity (including through geothermal and hydro); improve efficiency of power production, transmission, and distribution; and increase access to modern energy services in rural areas.

■ They will support cross-border projects, including the Kenya–Ethiopia, and the Kenya–Tanzania–Zambia power interconnection projects. They will also help to develop the capacity of the regulatory bodies and of the Ministry of Energy, improve energy management and governance, and promote cross-border cooperation in the energy sector.

■ They will facilitate access to environmentally friendly technology, including solar and wind power. Finally, they will support Kenya’s efforts to regularize, improve efficiencies, and reduce the environmental impact of the charcoal industry, on which 75% of Kenyans depend for domestic energy.

■ **M-KOPA business models for solar**- raising US\$ 20 million (KSHS 1.72 billion) to fund expansion of their customer base from 50,000 homes to one million homes by 2018. M-KOPA provides affordable solar-powered lighting and mobile charging to rural Kenyans on a pay-as-you-go basis, with payments conveniently sent via M-PESA (Kenya’s leading mobile money service). When customers have fully paid for the value of the solar product, they own the product and can continue to use it freely.

According to International Finance Corporation 2012 report, the private sector is vibrant in the solar sector, with 21 distributors/importers, and over 1500 SMEs selling solar lanterns in Kenya. There are currently with 29 quality verified solar lighting products, from 17 manufacturers, currently on sale in the country. The solar lantern market grown by more than 200% in the last 3 years with about 700,000 solar lanterns sold to off-grid families in rural Kenya by end of 2014.

In light of the overarching objectives, these plans are ambitious enough to meet the challenge, and have targets that aim to achieve the energy access objective sooner than 2030. The activation of these plans, are not fully operationalized, and their funding, will be necessary to make them effective.

3.1.2 Clean Cooking

While universal access to modern cooking services by 2030 refers to both use of non-solid fuels and improved (efficient) cookstoves, clean cooking refers to use of non-solids fuels for cooking. Hence, According to 2009 census report over 80% of rural and 10% of urban households regularly use firewood, while about 7% of rural households, and over 30% of urban, use charcoal. The rate of use of biomass has outstripped the rate of supply thus rendering biomass non-renewable sources of energy. In Kenya, use of improved (efficient) cookstoves is being taken as a stopgap measure as efforts are being made to transit to clean cooking fuels and sustainable bioenergy strategies being put in place.

3.1.2.1 Existing plans/strategies for clean cooking

■ The Government has prioritized clean cooking in its climate change action plan 2013-2017 and recognizes its impacts on climate change; therefore, it is at the forefront in advocating for improved cooking technologies and alternative clean cooking fuels.

■ The Kenya Country Action Plan (CAP) for Clean Cookstoves and fuels, which has a target of 5 million households by 2020.

3.1.3 Existing Gaps

3.1.3.1 Universal Access - Electricity

The main challenges/gaps that Kenya faces to reach SE4All universal access to electricity by 2030 are as follows:

■ **Affordability of electricity:**

■ Although connection fees was significantly lowered in May 2015, their cost is still a deterrent for rural households and the poor especially female -headed households. The same is true for off-grid solutions such as solar home systems and mini-grids, although these can be scaled down to an appropriate cost for consumers.

■ Although universal access makes sense from economic and equity perspectives, its financial viability is often uncertain. The financial viability

⁸⁴ Kenya Joint Assistance Strategy 2007-2012

of electrification for those without access usually requires subsidies to cover part of its capital and/or operating costs, as many unconnected households cannot pay fully for the cost of electricity service.

- The upfront cost of connection is a more serious barrier to extending access than the monthly payments for consumption, and only 35–40% of household in electrified areas are usually ready to connect.

■ **Fragmented energy access market:**

- Most population lacking access to modern energy services are dispersed and not properly mapped which is a challenge for companies providing services to this market resulting in uncoordinated, immature and not widely known services to stakeholders.

■ **Need to develop mini grid policy**

- Although there are strategies and plans to address access above 1 MW, there is no comprehensive strategy for mini-grids and stand-alone systems for access below 1 MW. Such a strategy will boost the development of micro-decentralized systems that may be a cost effective solution to small settlements in remote areas of Kenya.

- Lack of regulations to a policy for mini grids

- Lack of net metering regulations

■ **Infrastructure**

- Primary substations (and BSPs) are equipped with just a single transformer and even those with two or three transformers are often loaded such that no spare capacity exists to cater for a transformer failure. This is a particular issue for parts of the network with no alternative means of supply.

- Much of the distribution network does not have adequate capacity to effectively manage the present demand,

- The distribution network suffers from poor reliability and quality of supply, which is generally due to underinvestment. Many parts of the distribution network are supplied over extremely long, radial 33 kV and 11 kV feeders, with no alternative source of supply.

- In some cases, 33 kV feeders may be hundreds of km long, with many spurs, resulting in a total length (in extreme cases) in excess of 1000 km supplied from a single source. A fault on such a long feeder will have widespread impact, be difficult to locate and therefore will result in a long restoration time.

- Due to excessive feeder lengths and use of undersized conductors, voltage levels on feeders, particularly outside of the urban areas are typically poor and significantly under the required standard. Automatic voltage regulators (AVRs) have been installed on feeders in the past, however many of these have failed and have

subsequently been bypassed. Excessively long, undersized feeders also result in high losses.

- Electricity generation shortage: An obstacle to rural electrification in many countries with low access rates is insufficient generation capacity of the main electricity system. It is unrealistic to expect these countries to make more than modest gains in increasing electricity access by means of grid extension until the capacity constraint is eased.

■ **Costs and financial considerations:**

- Lack of appropriate incentives. The high costs of electricity supply in rural areas and the limited capacity of households to pay for the service make it difficult to attract investment in rural electrification. To do so, it requires a system of tariffs and subsidies that ensures sustainable cost recovery while minimizing price distortions. However, such a revenue-generation scheme is absent.

- High costs of supplying rural and peri-urban households. Low population density and a very high percentage of poor households characterize most rural communities, as well as many peri-urban areas. Demand for electricity is usually limited to residential and some agricultural consumers, and many households consume less than 30 kilowatt-hours (kWh) per month. The combination of these factors results in high costs of supply for each unit of electricity consumed.

- Financial and Operational Sustainability. Making service sustainable is one of the main challenges in extending access, both in rural electrification and in low-income urban areas. While a large portion of capital costs is usually subsidized through specially designated funds (frequently supported by donors), more financial assistance is often needed because many households cannot pay the full cost of operation.

■ **Rural Electrification Strategy:**

- Adequate design and effective implementation of a rural electrification program requires technical and managerial skills that are not always available. This process may entail new or amended legislation, institutional strengthening, planning, and establishing technical standards and regulatory procedures tailored to the nature of rural electrification.

- Under these circumstances, extending access in rural areas requires a system of subsidies that recognizes the lower income levels of rural households and higher costs of supply.

3.1.3.2 Universal Access – Clean Cooking

For Kenya to achieve universal access to clean cooking by 2030 the following gaps, need to be addressed:

■ **Regulatory issues:**

- Policy, strategy and regulations related with biomass use are still insufficient to ensure the sustainable use of biomass in the cooking sector

despite being the major energy consumer in the country.

- Charcoal production sector is largely unregulated and, therefore, informal with low efficiency in transforming biomass into charcoal.

- Limited availability of performance or other standards for energy products and where they exist, lack of implementation and enforcement. Consumers are therefore unprotected against substandard equipment and services.

■ Awareness and knowledge issues:

- Lack of awareness of indoor pollution and its impact on health within the general population⁸⁵ limits the rate of adoption of efficient cooking stoves, especially by the rural population.

- People tend to prefer traditional cooking solutions because of cultural heritage. In order to increase the use of modern cooking solutions it would be necessary to raise awareness about its benefits so people will start to shift to cleaner or improved cooking.

- Need to mainstream gender, cultural practices and the nexus of energy, especially with the sectors of health, cooking and water.

■ Information and sector analysis:

- There are no gender-disaggregated data on the status of the clean cooking appliances and fuels adoption. Statistics used are estimates. This needs a comprehensive study to inform the sector.

- No impact study of the ongoing clean cooking appliances and fuels adoption.

■ Cook stove quality and performance:

- The number of improved cookstove models and fuel production solutions customized for local environments is still low, there is evidence that many basic ICS perform poorly in the field at least in part due to the difficulty of accessing high quality materials, and systemic support for innovation

- R&D on breakthrough solutions that can offer higher performance (e.g., fan gasifiers) and, even more important, more attractive and functional end-user focused designs, is still limited.

- For clean cooking and improved solutions that do reach the market, access to standardized testing is limited or unaffordable for many, and does not increase end user understanding of their likely performance so they are able to make informed purchasing decisions.

■ Last-mile distribution and producer finance:

- Distribution of clean cooking products is costly, with no easy answers to the challenge of reaching rural consumers; progress will require both experimentation with new institutional and retail approaches and significant investment into channel development.

- In the immediate term, commercially oriented ventures likely need to focus on more profitable urban and charcoal user consumer segments, reaching the rural consumer requires cross-subsidization from more profitable urban market segments or less commercially driven business models.

- Building successful last mile clean cooking businesses in Africa is a costly endeavour, due to product importation hurdles, logistic and transport challenges, the need for intensive consumer marketing, and the importance of extending credit to both last mile retailers and end-users (i.e., via pay as you go schemes).

3.1.4 High Impact Initiatives for Energy Access

3.1.4.1 Increasing Access to Modern Clean Cooking

- MoEP to lead on the creation of a cross-sectoral initiative to bring together different on-going efforts, like Global Alliance Clean Cookstove (GACC), and improve coordination across agencies, private sector, CSOs and NGOs. This initiative aims to;

- Foster an enabling environment by engaging national and local stakeholders, building the evidence base for the benefits of stoves, promoting standards and rigorous testing protocols and enhancing monitoring and evaluation.

- Promote industry standards for efficiency, safety, and emission reduction, based on testing and certification for clean cooking appliances, such as ICS.

- Support development and implementation of large national programme on scaling up ICS.

- Contribute to improving the policy framework, train entrepreneurs and develop sustainable value chains and robust infrastructure for clean and efficient cooking stoves and fuels.

- Support continuous research on consumer use and demand for efficient stoves and on the design of products that meet user needs.

- Universal Adoption of Clean Cooking Solutions, objective that can be pursued under the umbrella of the GACC;

- Human and Institutional capacity development - cookstoves;

- Support the use of improved cooking appliances by engaging youth organisations and women MSEs in the production, dissemination and distribution of these technologie

⁸⁵ Global Village Energy Partnership, Kenya Market Assessment, 2012.

- Contact awareness campaigns on the benefits of clean cooking appliances and fuels for remote/isolated populations. These awareness campaigns should additionally inform consumers on how to purchase quality ICS.

- Raise general awareness to the public about the available clean cooking technologies

- Innovative Finance, to support financial closure and financing access to energy services and clean cookstoves;

- Develop financing schemes to provide credit to households that cannot afford the upfront costs of access to modern energy services;

- Provide regulatory support for scalable and sustainable business and financial models.

3.1.4.2 Increasing Access to Modern Electricity

- REA is tasked with the development and implementation of a clean energy mini-grid programme as a means to accelerate clean off-grid access, including:

- Provide distributed electricity solutions that support productive use and economic development

- Create more favourable business environments with appropriately refreshed (or new) policies, regulations, and energy plans to incentivise commercial investments (small, medium and large scale) and develop markets (powerhive concept).

- Facilitating financing for mini-grid and stand-alone energy access projects.

- **Formulation of mini-grid regulation:** - effectiveness of enforcement of the liberalised regulatory environment by Energy Regulatory Commission (ERC); the ease of obtaining generation and distribution licences by independent power producers, as well as Power Purchase Agreements in the event of the grid coming to the locality of the mini grid project

- **Distributed electricity solutions:**

- Distributed electricity solutions i.e. mini-grids or individual systems, are deployed to the unserved community too distant from the existing grid and/or that their demand is too small to justify the high fixed cost of extending the grid

- The regulatory environment for Pico solar and solar home systems for lighting and productive use is already being developed; ERC has published regulations for installation of solar systems, and Lighting Africa (IFC/World Bank) has made major strides in helping the market to improve product standards. Kenya Renewable Energy Associations (KEREAs) is currently implementing a voluntary quality accreditation programme for solar vendors

and integrators.

- Strategy is to increase competition and flexibility in mini-grid provision through measures to simplify licensing: development of an off-grid strategy, a conducive, legal, and regulatory environment must be developed to support the private sector and avoid direct subsidisation as much as possible.

- Create a clear timetable for grid rollout to avoid unexpected duplication of infrastructure. It should be very clear to installers of off-grid equipment what time they have before the grid arrives at the locality, as this will affect the payback periods that they need to work with when considering their investments.

- Improve smart grid technology solutions, grid-scale storage and interaction between renewables and fossil fuels.

3.1.5 Relevant High-Impact Opportunities⁸⁶

- Clean Energy Mini-Grids, to accelerate clean off-grid access:

- Develop and implement small-scale renewable energy solutions;

- Provide distributed electricity solutions that support productive use and economic development

- Study on decentralised system. Mapping out of regions/populations for decentralised energy systems

- Invest in disaggregated data to reveal gender disparities in relation to energy poverty to achieve effective gender mainstreaming in decentralized energy solutions. This is crucial in informing relevant policy interventions

- Mini-Grid /micro-grid Development strategy. Development of mini grid and micro-grids policy. Develop framework for implementation of mini-grids.

- Scaling Up of Renewable Energy Programme (SREP)

- Setting up of commercial renewable energy micro grid in rural areas without access to national grid

- DfID in partnership with AfD solar PV mini-grids: € 30 million available for funding mini-grid projects (Solar PV mini-grids).

- KfW Solar PV mini-grids High-Impact Initiatives Targeting 3 pilot projects. Result based financing.

- DfID Hydroelectric initiative, KfW Solar PV minigrids: Financing electricity access

- Joint Import up to 50 kW, Joint credit Mechanisms (JCM)-Japanese government.

- Local manufacture of small wind turbines supporting electricity access

⁸⁶ This is based on the list of HIOs identified by the Global Action Agenda

- Universal Adoption of Clean Cooking Solutions, objective that can be pursued under the umbrella of the GACC
- Improve smart grid technology solutions, grid-scale storage and interaction between renewables and fossil fuels.
- Innovative Finance, to support financial closure and financing access to energy services and clean cookstoves:
 - Develop financing schemes to provide credit to households that cannot afford the upfront costs of access to modern energy services;

- Provide regulatory support for scalable and sustainable business and financial models;
- M-Kopa Solar Initiative. Offering solar Pico and solar Home Systems at a credit with a repayment of over 12 months.

3.1.6 Risk management for electricity access

Kenya like most of the developing countries faces some risks to in terms of addressing energy access. There are a number of initiatives that GoK will do to manage some of these potential risks are included Table 14 and Table 15.

Table 14: Risk Management

Challenge	Causes	Mitigating Actions	Responsibility
Unreliability and poor quality of electricity supply.	Inadequate generation capacity to meet the peak demand	Planning criterion to define the needed amount of power and the technology mix Use of Solar PV	GOK , KETRACO and KPLC
Timely electrification for universal access	Lack of implementation capacity and financial resources for mini-grids	<ul style="list-style-type: none"> • Human capacity building • Provide low interest credit • Involvement of political leaders in project planning 	Government
The high costs of electricity supply in rural areas and the limited capacity of households to pay for the service make it difficult to attract investment in rural electrification.	Low population density scattered settlement and low power consumption	<p>A system of tariffs and subsidies should ensure sustainable cost recovery while minimizing price distortions.</p> <p>Provision of micro-grids</p> <p>Use of alternative options such as Solar lantern and Solar Home Systems</p>	Government Private sector CSOs
Coordination between regional countries	Lack of proper coordination between regional countries on funding of regional projects	Setting up regional body to plan for regional infrastructures	EAC

3.1.7 Risk management for clean cookstoves and fuels

Table 15: Risk management for achieving universal access to modern clean cookstoves and fuels

Challenge	Causes	Mitigating Actions	Responsibility
Lack of concrete policy to accelerate access to modern cooking fuels or advanced cookstoves	Lack of momentum among national institutions to promote advanced cookstoves	Both National and County government to take access to modern cooking services and fuels by 2030 as a priority	Government
Difficulties in the expansion of the infrastructure for natural gas and LPG to serve customers in remote rural areas	Scattered settlement making the expansion capital intensive	Promotion of biogas as the main option for a modern cooking fuel Establish rural based refilling centres and introduce affordable packages	Government/private
Financing for cookstoves industry	The channels for providing credit for the manufacture or purchase of advance stoves, and for marketing them widely, are underdeveloped.	Development of appropriate channels for extending credit for developing the cookstoves market	Government/private

3.2 Renewable Energy

3.2.1 Status and Trajectory

Kenya is endowed with large renewable energy resources of wind, geothermal and hydropower but developing these poses a number of challenges.

Biomass fuels are the largest source of primary energy in Kenya with wood-fuel (firewood and charcoal) accounting for about 69% of the total primary energy consumption. About 55% of this is derived from farmlands in the form of woody biomass as well as crop residue and animal waste and the remaining 45% is derived from forests. There is a gap between the existing tree cover vis-a-vis the minimum constitutional requirement of 10%⁸⁷. The continuous overreliance of Biomass as a primary source of energy threatens achievement of this requirement.

The Government in 2010 developed a strategy for introduction of biofuel blends in the market. Facilities for ethanol-gasoline blending have been completed in Kisumu to be followed by Eldoret and Nakuru. However, there are not sufficient quantities of bio-ethanol feedstocks.

A feasibility study carried out under biogas initiative

established that it is possible to construct 6,500 biogas digesters in Kenya every 5 years⁸⁸.

The demand for solar water heating (SWH) is projected to grow to more than 800,000 SWH units by 2020 equivalent to 300,000 TOE. This represents a growth rate of 20% per annum. This demand will mainly be from domestic, institutional and small commercial consumers spurred by the operationalization of the Energy (Solar Water Heating) Regulations, 2012⁸⁹.

An estimate of 6MW of solar PV System capacity was installed in residential and commercial sectors through the private sector initiative in 2014. By the year 2020, it is projected that the installed capacity of solar photovoltaic systems will reach 100MWe generating 220 GWh annually⁹⁰.

The installed capacity of wind power connected to the grid as at November 2014 was 25MW. The 300MW Lake Turkana Wind power project is expected to be commissioned in 2017. Other committed projects include 110MW at Kinangop and Ngong. There are proposals for development of 650MW of wind power at Marsabit, Isiolo/Meru and Ngong⁹¹.

⁸⁷ http://www.erc.go.ke/images/docs/National_Energy_Petroleum_Policy_August_2015.pdf

⁸⁸ http://www.erc.go.ke/images/docs/National_Energy_Petroleum_Policy_August_2015.pdf

⁸⁹ http://www.erc.go.ke/images/docs/National_Energy_Petroleum_Policy_August_2015.pdf

⁹⁰ http://www.erc.go.ke/images/docs/National_Energy_Petroleum_Policy_August_2015.pdf

⁹¹ http://www.erc.go.ke/images/docs/National_Energy_Petroleum_Policy_August_2015.pdf

The total installed electricity generation capacity in Kenya was at 2,299 MW⁹² as of June 2015. The total renewable energy generation contribution was 66.03%, which included hydropower (821 MW), geothermal (598 MW), cogeneration-biomass based (26 MW) and wind (25.5 MW). Off-grid renewable systems constituted of wind 0.55 MW, solar 0.55 MW. Hydropower contributes the most, representing 36% of the total production (IEA, 2012). Geothermal contributes to 26%. However, fluctuations in yearly hydropower availability due to droughts has historically resulted in acute electricity shortages, causing the capacity factor to drop from more than 53% to as low as 33% during severe drought conditions in 2009 (Government of Kenya, 2011). When combined with a limited development of these geothermal resources, this has led to the dependence of the power sector on imported oil, almost entirely from the United Arab Emirates, for over 30% of total generated power (UNEP, 2006; EIA 2014). Due to unsustainable supply, the use of biomass for power generation is limited to bagasse and municipal waste.

According to LCPDP 2013-2033 renewable energy in the power generation mix is planned to be 42% of the 20,156 MW in 2030. The total installed capacity of renewable energy in the power mix is planned to be 8,185 MW consisting of 1,039 MW hydro; 5,110 MW geothermal and 2,036 MW wind. However, the SE4All action agenda target reverse the percentage of renewable energy from 42% to 80% renewable by 2030.

3.2.2 Existing Plans/Strategies

The following strategies were put in place to meet energy demand for renewable energy resources:

- **Kenya National Domestic Biogas Programme (KENDBIP)** aiming at supporting the construction of over 41,000 domestic biogas plants by 2018. KENDBIP, which is part of the African Biogas Partnership Programme (ABPP), first phase was implemented from year 2009 to the end of year 2013, and had a target of, among sector development objectives, installing 8,000 biogas digesters within 4 ½ years and through the initiative over 11,000 digesters were installed. Second phase is designed to run for 4 years from January 2014 to the year 2017 and targets installation of 27,500 digesters across the country.
- **PIMA Gas**, the initiative of pay-as-you-go LPG. Gulf gas developed PIMA gas, which is a system by which a client can buy gas in small quantities – as small as KShs 50, which is an amount equal to the cost of charcoal or petroleum, but containing more energy. Clients can buy a 1 kg gas canister with a burner for about the equivalent to the price of a charcoal

or petroleum burner, and then have the gas bottle refilled when they need to.

- **Bioenergy and LPG Strategy:** the overall objective of the strategy is to improve sustainability of bioenergy production and utilization and to promote alternative modern forms of energy with a view to ensuring a clean environment. The specific objectives are:
 - Promote sustainability in the production of bioenergy
 - Promote efficient collection and use of energy and fertilizer generation of all municipal and business wastes to promote and sustain a healthy and clean environment
 - Promote alternative clean forms of energy e.g. biogas, briquettes and liquid biofuels
 - Promote efficiency in the utilization of bioenergy and alternative modern forms
 - Enhance environmental protection and contribute to enhancement of climate controls.
- **Feed-in tariffs for Renewable Energy (2012)** for electricity generated from renewable energy sources; specifically wind, biomass and small hydro in order to safeguard the investments made by the respective developers in data collection undertaking feasibility studies; and to boost the development of Renewable Energy Sources Electricity (RES-E) generation. The tariff allows power producers to sell renewable energy generated electricity to an off-taker at a pre-determined tariff for a given period depending on type of RE technology used.
- **GDC Business Plan & Strategy-** As part of strategy, GDC is engaged in early generation of electricity using portable modular power plants that can be commissioned within six months from the time a well is drilled. In the next 10 years, GDC will carry out detailed surface exploration, drill wells and invest in wellhead generation units to achieve the planned 3000 MW and at least 5,000 MWe by 2030 through an accelerated geothermal development programme⁹³.
- **Net Metering-** the draft national Energy Policy 2015 contains provisions on net metering⁹⁴. The Government aims, under the policy's Agenda for Action, to develop in the short term (from the year 2012-2016), necessary legislation for net metering⁹⁵.
- **Installation of wind masts with data loggers:** The Ministry has annual project of installation of wind masts with data loggers. The wind masts with data loggers at a height of 40 and 20 metres installed at 95 wind sites. In 2014, masts with data loggers d 100 metres at five (5) sites.

⁹² Kenya Power annual report 2014/2015

⁹³ http://www.gdc.co.ke/index.php?option=com_content&view=article&id=161&Itemid=155

⁹⁴ "a system that operates in parallel with the electrical distribution facilities of a public utility and measures, by means of one or more meters, the amount of electrical energy that is supplied. It is an incentive for consumers of electrical energy to sell renewable energy generated electricity to a retailer or distributor as the case may be."

⁹⁵ *Ibid*, section 9.9.1.3 (2)

3.2.3 Existing Gaps

Kenya has huge renewable energy resources but their rate of development has been very low. The gaps include:

- Limited publicly available information on RE resource assessment and mapping to support investment promotion, decision making and energy planning;
- Limited diversification on policies to address specific issues and challenges associated to the different Renewable Energy Technologies (RETs);
- Limiting incentives for private sector in the development of the renewable energy technologies
- Lack of grid access in Renewable energy resource endowed areas such as North Kenya.

3.2.4 High Impact Initiatives for Achieving the Overarching Objective of Renewable Energy

There are various options of actions to achieve the set targets. The regional context is also important in relation to power generation, as Kenya is already part of the East African Power Pool. In order to achieve 80% renewable energy in power generation a combination of the following action areas must be undertaken:

Biomass utilization and promotion of alternative energy sources

- Develop wood fuels (firewood and charcoal) supply and demand master plan for the main supply and demand centres (including tree cover inventory, classification of harvesting zones, relevant data, analysis of wood fuels flows, development of conditions and technical specifications for wood fuels, production and use).
- Development of strategy for use of denatured bioethanol as household cooking fuel giving consideration to design of conducive legal and regulatory framework for companies operating in the sector, communication to potential users on the benefits of using the technology and definition of credit facilities to improve access to finance by users.
 - The biomass supply chain will undergo reforms aimed at providing a medium to long-term reduction in reliance on charcoal, whilst retaining the rural economic value of biomass by promoting cost-effective and efficient alternatives. This can be done by redirecting jobs to other parts of the alternative biomass value chain; radically improving cook stove emissions and efficiency performance to reduce energy costs, and improving the productivity and sustainability of wood production. Key actions identified during the SE4All AA development are:
 - Support transition to much more efficient charcoal production methods, including investment in necessary equipment.
 - Introduce a harmonized tax regime for

charcoal which rises over time, and reduce taxes on alternatives (e.g. biomass pellets) at least to the level of taxes on charcoal or lower

- Create cross-ministerial taskforce (national and county) to effectively coordinate biomass related activities in particular national awareness-raising strategies to increase demand for higher tier stoves and fuels including bioethanol fuel.
- Establish infrastructure for scaling up the use of bioethanol as a household cooking fuel in Kenya based on the work already done to pilot this and the subsequent inclusion of bioethanol as non-excisable commodity in the Excise Duty Bill 2014

Renewable power generation

Kenya has enough renewable energy resources, which can be deployed to achieve its SE4All target of 80% share of renewable energy in power generation mix. The following actions will be required to achieve the 80% target of renewable energy in the energy mix.

- Development of a legal and regulatory framework to foster the development of RE: This will include;
 - Develop a specific Renewable Energy Strategy with clear goals and targets integrated in the Energy Sector Wide policy framework. This should include targets and goals for grid-connected and off-grid RE technology integration.
 - Develop a mini-grid policy that fosters the use of RE with guidelines and targets in order to increase the confidence of the private sector to invest in these projects.
- Investment Incentives: Working together across Government Agencies and key stakeholders, MoEP will update and expand incentives, and limit subsidies by:
 - Reviewing the FiT in place to provide adequate incentives to investors in renewable energy projects
 - Foster the development of a number of innovative funding mechanisms such as grants, challenge funds to promote the development of RE projects. After attaining a dissemination of certain critical mass in terms of number of units and assemblers / manufacturers, the renewable energy industry, with the support of MoEP and other stakeholders, can become self-sustaining and subsidies can be gradually withdrawn without any adverse effects on continued dissemination of renewable energy technologies.
 - Implement a governmental subsidy for supporting the development (pre-investment, capital and operation) of micro/mini-grids in particular for productive use in off-grid areas;
 - Prioritise grid development in areas with RE potential.
- Developing a SE4All database: to improve collection of gender disaggregated energy data for planning and investment purposes. The database to include;

- Renewable Energy Resource System (RERS): an umbrella for the different renewable energy resources assessment and mapping, in order to confirm the potential of specific sites and accelerate project development by the private sector. This database will also be linked to, or use, the resources available under SE4All renewable energy hub at IRENA.

- Biomass Information System (BIS); The major purposes of the information system is to: (i) Keep track of the new biomass energy technologies and their success rates; (ii) Support continuous updating of the strategy; and (iii) Provide timely gender disaggregated information for decision making and planning.

- Power generation projects under REFIT:

- Geothermal: power purchase agreement approved 407 MW; awaiting negotiation 400.7 MW and drilling ongoing 1,055 MW

- Wind: power purchase agreement approved 530 MW; power purchase agreement to be negotiated 100 MW

- Hydro: purchase agreement approved 39.3 MW, power purchase agreement to be negotiated 511MW of hydro, importation from Ethiopia purchase agreement approved 400MW

- Biogas power purchase agreement approved 2.4 MW

- 10 MW, 10 MW of co-generation (biogas) and biomass gasification respectively purchase agreement approved

Industrial and agricultural processes

In January 2010, Kenya revised the FIT policy⁹⁶, which resulted in the addition of three renewable energy sources: geothermal, biogas, and solar energy resource generated electricity. In addition, the revised policy extended the period of the power purchase agreements from 15 to 20 years and increased the fixed tariffs per kilowatt-hour for pre-existing wind and biomass under the FIT.

The capture and recycling of waste heat and the use of renewable energy sources in industrial and agricultural processes will be enabled by the following actions:

- Mandate agro processing companies to upgrade their biomass-based cogeneration potential in order to benefit from the FIT policy. This will involve:

- Feasibility study on resource assessment to estimate cogeneration potential in the agro processing companies.

- Formulation of standards & regulations for biogas

- Continued review of the cogeneration FITs

- Formulate and implement a national strategy for regulatory framework, certification and coordinating development of cogeneration.

- Develop and implement legal and regulatory framework for exploitation of municipal waste into electricity generation.

- Direct use of steam from geothermal power production plants for industrial process heat

Building and appliance⁹⁷

Involves the design and retrofit of buildings incorporating renewable self-generation options, including:

- Rooftop solar

- Solar water heating system

- Integrated solar PV systems (buildings)

- Harnessing sewerage for Biogas systems

Transportation

Actions will focus on increasing the share of renewables in the fuel supply:

- Programme to build value chains for biofuel use in transport (focus on Research)

- Overall policy framework for introduction of biofuels including: Production and blending standards for E30 and B5.

- Institutional and regulatory framework needed pricing policy for biofuels.

- Base knowledge of biofuel options and viable approaches in Kenya

- Data/information systems on feedstock types, production and market assessment; there is already some experience with ethanol production and blending which can inform new projects.

- Formation of bioenergy partnership to bring together public, private and civil society stakeholders in a joint commitment to promote bioenergy for sustainable development. The Partnership to focus on three strategic areas: sustainable development, climate change and food and energy security⁹⁸

3.2.5 Relevant High-Impact Opportunities⁹⁹

- Clean Energy Mini-Grids, to accelerate clean off-grid access:

- Develop and implement small-scale renewable energy solutions;

- Provide distributed electricity solutions that support productive use and economic development;

- Studies to establish viability of the renewable

⁹⁶ <http://www.unep.org/greeneconomy/SuccessStories/FeedintariffsinKenya/tabid/29864/>

⁹⁷ <http://www.un.org/wcm/webdav/site/sustainableenergyforall/shared/Documents/SEFA-Action%20Agenda-Final.pdf>

⁹⁸ <http://www.un.org/wcm/webdav/site/sustainableenergyforall/shared/Documents/SEFA-Action%20Agenda-Final.pdf>

⁹⁹ This is based on the list of HIOs identified by the Global Action Agenda

energy resources in the country

- Accelerating private-sector investment through private leverage mechanisms

■ Energy and Women's health

Energy is a critical enabler for vital primary health care services, especially during maternal and childbirth emergencies. Without electricity, mothers in childbirth are particularly at risk. While maternal mortality has declined in the past 20 years, the international community still has farther to go to save lives and ensure that health workers are given the tools and facilities they need to provide effective medical care. Electricity is needed for basic lighting, vaccine storage, access to clean water, equipment sterilization, and to power other essential equipment. Yet many clinics, hospitals, and workers do not have access to the power they need: The World Health Organization recently found that up to 58 percent of health care facilities in Sub-Saharan African countries have no electricity at all¹⁰⁰. Some of the deliverables of this high-impact opportunity include:

- Mapping the market: Understand the existing gap in access to energy-dependent health care services (both for prevention and for treatment).
- Securing evidence for guiding intervention design: Engage the health sector in assessing the gap in energy-related services critical to women's health.
- Supply chains and maintenance: Develop public-private partnerships to encourage good design and mobilize financing for installation.
- Building local and national capacity: Establish appropriate system design, maintenance and repair requirements to train local electricians, mechanics and engineers.
- Advocacy and media: Mobilize public/private energy sector linkages with the health sector and catalyse support and action for identified policies/investments to close the energy gap in healthcare, as well as catalysing sustainable energy service installations in medical clinics¹⁰¹.

3.2.6 Risks and mitigation for renewable energy

Table 16: Risk management for renewable energy

Risks	Impact	Mitigation	Responsibility
Hydrology risk	Unfavourable hydrological conditions affecting the generation capacity of hydropower plants	a) Proper water reservoir management b) Diversification of generation in energy mix to include wind, geothermal, and reduce exposure to risks of hydrological risks c) The government to establish a committee comprising of different stakeholders to ensure co-ordination at policy, regulation and operational levels on matters relating to apportioning of water resources d) Plan for implementation of hydrology mitigation levy in power tariffs e) Ministry of Water and Irrigation (MoWI) and Ministry of Environment and Natural Resources (MoENR) should help MoEP	MoEP, MoWI and MoENR
Political risks	The risk is that the government may alter its policies or introduce other regulations may adversely affect investments and existing companies operations such as county governments demanding revenues in form of levies in respect to power stations that lie within their counties and this could increase the cost of power	Put in place effective management programme to avoid/minimize adverse effects of government/county legislation on its operations. On-going review of the energy Policy & Act has taken into consideration changes in the constitutions including specific changes related to the energy sector.	National parliament and regional parliament
Single buyer model	Currently there is one buyer (KPLC) of all the power generated in Kenya. This is a major risk as anything affecting the financial health will adversely affect the power generating companies	a) Companies to be allowed to supply directly to selected large consumers b) Engaging with the power distributor to ensure billing disputes are resolved promptly and payment made to avoid adverse effects on cash flows.	MoEP MoIED, KPLC, ERC and MoEP

¹⁰⁰ <http://www.SE4All.org/hio/energy-and-womens-health/>

¹⁰¹ <http://www.SE4All.org/hio/energy-and-womens-health/>

Risks	Impact	Mitigation	Responsibility
		<ul style="list-style-type: none"> a) Appointment of independent operators to ensure economic order of power dispatch is strictly followed. b) Ministry of Industrialisation and enterprise Development (MoIED), KPLC, ERC and MoEP should work together 	
Availability of land/site acquisition for power generation projects	Any project requiring acquisition of private land for its development must always consider the Project Affected Persons (PAPs) such as resistance of the communities to engage with the site owners, host community unwillingness or opposition to relocate from identified project site, political factors, high compensations demands by the community and the ineffective stakeholder management. This may lead to delay in implementation of the projects thus missing out on timeliness	<ul style="list-style-type: none"> a) Expedite land acquisition and willingness to engage with all PAPs from the project sites. b) Carrying out environmental and social impact assessment (ESIA). The result of this form the basis for successful negotiation with the PAPs to relocate and compensation of their land to be acquired for the project development c) Through the Corporate Social Investment (CSI) support the PAPs in various community and development activities to enhance stakeholder relations d) Government to support/facilitate the acquisition of land for power projects 	Government National Environmental Management Authority (NEMA) Community
Financial risk	Delay in project implementation	<ul style="list-style-type: none"> a) MoEP Identifies, evaluates and hedges financial risks in close cooperation with operating units b) Written principals for overall risk management, as well as written policies covering specific areas such as credit risk, liquidity risk, foreign exchange risk, interest rate risk and price risk. c) Put in place an internal audit function to assist MoEP in assessing the risk faced by the company on an on-going basis, evaluate and test the design and effectiveness of its internal accounting and operational controls. d) Development of detailed risk management policies (subject to review and approval by Audit and Risk Management Committee) and for the day-to-day implementation of those policies. e) National treasury should help MoEP 	MoEP, National Treasury

3.3 Energy Efficiency

3.3.1 Current Status and Trajectory

The available data shows that since 2006 to 2012 the energy intensity for Kenya has been constant at 0.26 TOE/\$2005 PPP in the hence making the analysis of the trajectory for the rate of improvement in energy efficiency until 2030, using energy intensity as the measure, is complex. As indicated in the targets section, energy intensity is the measure used in the

Global Tracking Framework to imply improvements in energy efficiency in the context of SE4All. However, energy intensity is an imperfect proxy given that a number of factors not necessarily linked to energy efficiency can affect it. Primary energy consumption, total GDP, and Purchase Power Parity (PPP) figures are used to compute this indicator. In 2012, Kenya's energy intensity was at 0.25 toe.

Given (i) the different sectors in which energy efficiency can be applied (grid electricity, modern cooking, buildings, appliances, transport, etc.), and (ii) the need for energy consumption growth to build the economy, it is difficult to set firm numbers and targets on energy efficiency. The approach of Kenya to energy efficiency, and the trajectory, in the target section, is based on measures to encourage efficiency (e.g. energy audits in industry, encouragement of more efficient appliances, mandates to switch to solar water heaters, etc.)

3.3.2 Existing Plans/Strategies

In the sphere of energy efficiency, plans and strategies addressing inter alia residential, industrial and commercial energy efficiency, and energy efficiency in transport, are:

- Energy Efficiency Improvement in buildings - new residential buildings are required to install solar water heaters, with target of 800,000 units by 2020¹⁰².
- Energy Management Regulations (2012) provide guidelines on energy auditing and management. The government is also offering support to Kenya Association of Manufacturers (KAM) to undertake energy efficiency audits and other programme trainings.
- Energy efficiency initiatives relate to biomass cooking and heating. Most of this work is led by civil society with support from the government as seen in the development and implementation of Kenya Country Action Plan (KCAP) in 2013 and subsequent establishment of the Clean Cookstoves Association of Kenya.
- Kenya Power is undertaking the following measures to improve efficiency: Compact Fluorescent Lamps (CFL) Roll out in the residential sector. In 2010 Kenya Power started with distribution of 1.25 million energy saving bulbs in Phase 1 and are proposing 3.3 Million in Phase 2. The aim is to reach 100% efficient lighting by 2020;
- The Kenya Association of Manufacturers (KAM) has been running programmes geared towards improving energy efficiency in Kenyan industry. The Association, through the Centre for Energy Efficiency and Conservation (CEEC), has been conducting energy audits, energy efficiency campaigns, training of industry personnel in energy efficiency, among others since 2006.

3.3.3 Existing Gaps

The main weaknesses to improve the efficient use of energy in Kenya include:

- Limited capacity and awareness of main energy actors on EE related matters such as energy saving opportunities, investment costs, financing instruments, available technologies and standards;

- Limited information and options to access more efficient fuels and technologies;
- Limited understanding on the potential savings from the different economic subsectors and the impact on the projected energy demand if EE measures are implemented;
- Need to follow up implemented programmes and initiatives in order to understand their impact and identify lessons learned for future initiatives;
- Low awareness by end users in the residential, commercial, industrial and transport sectors on the benefits of investing and adopting energy efficient measures in their activities;
- Low capacity in organisations and weak institutional framework in general: the manpower in the key institutions dedicated to EE. There is also a constraint on budget allocations earmarked for EE;
- Inadequate national capacity to plan and regulate building and appliance efficiency.

3.3.4 High Impact Initiatives for Achieving the Overarching Objectives of Energy Efficiency

Grid infrastructure and supply efficiency

Kenyan Government targets to maximize efficiency in the electricity sub-sector by reducing wastage, theft and losses. Through supply and distribution, the government aims to reduce losses to below 15% by 2020 from the current level of 18.6%¹⁰³.

Action Areas under this objective are:

- Improving the transmission system by use of High Voltage Direct Current (HVDC) lines and installation of high efficient transformers,
- Automation of the distribution system which will be achieved through: installation of a modern robust and integrated Distribution Management system, installation of different types of sensors on feeders, transformers and distribution substations, installation of metering on transformers and feeders,
- Integrated Grid modernisation Project (Smart Grid Project): This project is expected to transform the existing distribution power in a smart grid capable of providing reliable, quality, affordable and sustainable energy services.

Buildings and Appliances

Widespread implementation of state-of-the-art policies, building design and technologies, coupled with behaviour change could deliver reductions in energy demand from new and existing buildings of over 50% compared to business as usual (IPCC, 2014). Achieving such savings would not only significantly reduce GHG emissions, but also produce additional comfort, health,

¹⁰² Draft National Energy Policy 2014

¹⁰³ KPLC Annual Report 2012-2013

environmental and economic benefits. Kenya has put in place various policies to address energy efficiency in the building and appliance sector which include Minimum Performance Standards (for CFL, motors, refrigerators), solar water heating regulations, 2012 draft energy management regulations, regulations on institutional biomass and standards for biomass cookstoves.

Industrial and agricultural processes

A survey of Kenyan industries revealed that wastage of energy input ranged from 10% to 30%. This was attributed to lack of information, motivation and expertise as well as financial restrictions. At the end of the initial phase of the Global Environmental Fund-Kenya Association of Manufacturers (GEF-KAM) Industrial Energy Efficiency Project, in 2006, cumulative energy savings to the tune of 1,800GWh had been attained, equivalent to shutting down 200MW plant for one year. An important benefit of energy efficiency is that it is possible to avoid emissions of CO₂ to the tune of 5.2 million tons by the year 2015, corresponding to energy savings of about 16,130GWh over the period. Actions include those that will realize opportunities to improve the efficiency of business operations and product design, reduce energy consumption and wasteful practices along the value chain.

Agriculture

Agriculture is one of the most important sectors in the Kenyan economy. However, majority of Kenyan practice small-scale subsistence farming and the use of energy consuming technologies is minimal. Mostly farming is done manually and they do not practice value addition to their farm products. This can be attributed to low income levels to afford the technology hence huge losses due to bad weather. However, with economic growth and farmers will shift from subsistence farming to modern agriculture thus energy efficiency measures would be important for agricultural producers save energy without harming productivity.

Transportation

According to the international energy agency (IEA), the transport sector has the highest growth of CO₂ emissions of any sector – its contribution to energy related CO₂ emissions are estimated to go from one quarter today to one-third by 2050. Black carbon and pollutant emissions are also set to increase similarly with major health and short-term climate impacts. Transport sector accounts for 13% of Kenya's total final energy consumption (TFEC) (71x10⁹ megajoules). Kenya transport sector's TFEC grew by 85% between 1990 and 2010 equating to annual growth of approximately 6.4% per year (IEA, 2012). This growth represents the fast growing motorisation of the economy, with the number of vehicles registered in the country doubling over the last five year period (Kenya National Bureau of Statistics, 2013). This is due to increases in private car use that is expanding as incomes rise, the middle class

expands and the public transport sector continues to decline.

Actions needed

- Reviewing the tax policy on importation of motor vehicle with a view to incorporating measures that will encourage importation of environmental-friendly and low-fuel consuming motor vehicles such as hybrid designed models,
- Promotion of low-cost public transport modes such as bus rapid transit (BRT) and other means of mass transport,
- Proper urban and transport planning to facilitate efficient and low GHG modes of transportation, e.g. decongesting roads,
- Encouraging non-motorized modes of transport (NMT) by creating bikeways and pedestrian walkways,
- Creating transport demand management measures that encourage or favour public transport and NMT
- Creating a programme to phase out old and inefficient (high fuel-consuming) motor vehicles, while encouraging importation of efficient vehicles through tax incentives and other financial tools,
- Creating awareness and possibly carpooling policies through punitive taxes and charges, e.g. road and fuel levies to reduce unnecessary travel,
- Enforcing vehicle inspection rules to ensure motor vehicles are well maintained in order to reduce pollution.
- Enacting a law that would compel vehicle owners to install pollution-control devices, such as the three way catalytic converters that can inter alia converting nitrogen oxides including the infrared-active global-warming causing nitrous oxide (NO₂) to nitrogen and oxygen,
- Developing a Light Rail Transit (LRT) in major cities and towns to decongest traffic, and
- Improving the rail-network to facilitate low-cost and low-carbon long-distance transportation of cargo and passengers, construction of standard gauge railway is underway.

MoEP will establish a dialogue and collaboration with the SE4All Energy Efficiency Hub. The Copenhagen Centre on Energy Efficiency (C2E2) is the thematic hub for energy efficiency; with the prime responsibility of supporting actions towards the SE4All energy efficiency target.

3.3.5 Relevant High-Impact ¹⁰⁴ Opportunities

- Advanced Lighting & Appliance Efficiency
- Energy Efficiency in Buildings

¹⁰⁴ This is based on the list of HIOs identified by the Global Action Agenda

3.3.6 Risk and mitigation

Table 17: Risk management in achieving the energy efficiency targets

Risks	Impact	Mitigation	Responsibility
Exchange rate risks related to the projects, especially for equipment sold in international markets	Avoidance of buying efficient equipment	Local manufacture of energy efficient equipment	Government
Regulatory, governance and contract uncertainties with equipment suppliers, contractors and third parties who may be necessary to implement projects;	Lack of confidence in the organisations management to issue contract to Energy Service Companies	Strengthen the regulatory and governance of contracts	MoEP
Limited access to capital/credit, which often implies a very short-term payback approach to EE project evaluation especially for small micro enterprises	Inability to pay for energy efficient technologies	Increasing the credit tenor Creation of a fund to support energy efficiency projects	Financial Institutions, CSOs, Development partners
The mismatch of investment costs and energy savings costs, budget and credit constraints and the opportunity costs of exhausting one's credit limits on energy efficiency rather than on increasing sales;	No budget set aside for investing in energy efficient projects	Inclusion of budget of implementation of energy efficient projects in the investment plan	Government
Availability of energy is a critical issue: Even when manufacturing firms are willing to assume a high unit cost per kWh, energy supply is often not only insufficient, but also unreliable, giving rise to costly backup and self-generation (e.g. smelting and energy dependent, continuous chemical processes) in many companies	Energy cost remains high even after installation of energy efficient technologies	Lowering the unit cost per kWh	

3.4 Additional Nexus Action

3.4.1 Current Status and Trajectory

Sustainable energy supply is a prerequisite for regional growth and poverty reduction in Kenya. The key nexus are in the energy sector are in environmental, health, food security, water and gender. Water is critical for energy security; at the same time, there are areas where water for irrigated agriculture will not be available without energy for pumped supply. Energy is also required for crop processing, and value addition of agricultural products, which is mainly done by women. Access to modern energy services may improve livelihoods and increase small farm income for subsistence farmers as well as increased food security. Energy production requires massive quantities of water and most water distribution processes use large amounts of energy.

The cornerstone of the Kenyan economy and employment is agriculture and a steady growing manufacturing base. The national government has heralded a call for agricultural innovation targeting new value additions and product diversifications. To support value chain upgrades in agribusiness, major investments are being made in renewable energy, hard infrastructure and water management solutions to boost growth and production efficiencies. Today, large amounts of agricultural products never reach the consumer simply because of lacks of processing technologies, cooling, value-added treatment, packaging solutions and logistics.

3.4.2 Existing Plans/Strategies

Existing strategies

- ASAL Development – Irrigation: 404,800¹⁰⁵ hectares will be put under irrigation by 2017 especially in the Arid and Semi-Arid area in Turkana and Tana Delta.
- There exists concerted effort by the Government to electrify public institutions (schools, health facility and markets); the target for universal connectivity institutions to electricity is expected to reach 100% by 2015 as per REA's Rural Energy Master Plan.
- Installation of renewable energy power plants for processing (cooling and drying) of agricultural produce.
- Policy review and enforcement and approaches that cut across the nexus issues that will capture information and awareness raising, policy integration (normative, organizational, and procedural) and develop an energy sector land-use plan to reduce competition and clarify where to locate infrastructure.

- National Green House Project has installed a total 131 greenhouse units across the country.

3.4.3 Gaps

The following are the gaps in the energy nexus;

- Un-harmonized legislation (e.g. land act, water act with regard to riparian land) and policy (e.g. for land use of energy crop)
- Un-coordinated sector interventions, lack of awareness raising and information about technical (innovative) solutions which have mutual benefits (e.g. rainwater harvesting, exploitation of alternative sources of energy etc.), promoting resource efficient solutions, e.g. drip irrigation as water efficient irrigation system, energy efficient pumping systems, etc.
- Lack of comprehensive plans (e.g. water allocation plan, land use plans), involving other ministries (e.g. involving water ministry and water sector institutions in the development and review of off-grid rural electrification plans (on basis of renewable energies)
- Insufficient resource data (e.g. regarding land use for energy crop, water abstraction survey etc.) that hinders planning.
- Moreover, household pollution from smoky fires and kerosene lamps is a major cause of health complications, particularly respiratory and eye diseases. According to the World Health Organization (WHO) estimates, household pollution causes 14,300 deaths in Kenya¹⁰⁶ annually and directly impact the health of 14.9 million Kenyans with the majority of the affected being rural women and children¹⁰⁷.

3.4.4 High impact initiatives for achieving the overarching Nexus Objectives

- Policy review and enforcement and approaches that cut across the nexus issues that will capture gender disaggregated information and awareness raising, policy integration (normative, organizational, and procedural) and develop an energy sector land-use plan to reduce competition and clarify where to locate infrastructure.
- Harmonization of legislation and policies and better enforcement of laws, standards and guidelines is required to address nexus issues. Institutional strengthening and harmonization of institutional responsibilities at the national and county governments.

¹⁰⁵ Second Medium Term Plan (2013-2017)

¹⁰⁶ Global Alliance for Clean Cookstoves - Kenya Country Action Plan

¹⁰⁷ Global Alliance for Clean Cookstoves - Kenya Country Action Plan

- Gender mainstreaming which will involve incorporating gender impact assessments into existing planning tools, incorporate full economic opportunity costs associated with time spent by women using unimproved cooking methods.
- Stakeholders' involvement in implementation of the AA, not only to mitigate conflicts between the sectors but for regular dissemination of information and training of target groups (e.g. training of farmers on technical alternatives in agriculture such as efficient irrigation system, rain harvesting etc.).
- Research and development for innovation solutions to address energy and food, energy and water and gender nexus.
- Training of farmers on technical alternatives in agriculture such as efficient irrigation system, rain harvesting etc.
- The national green house project, agro-technology focusing on agriculture with limited water resource and controlled environment in all the 47 counties.
- This is a National Economic Program aimed at putting one million acres of land under irrigated agriculture within the MTP2

3.4.5 Relevant High-Impact Opportunities¹⁰⁸

■ **Energy and Women's health:** Energy is a critical enabler for vital primary health care services, especially during maternal and childbirth emergencies. Without electricity, mothers in childbirth are particularly at risk. While maternal mortality has declined in the past 20 years, the international community still has farther to go to save lives and ensure that health workers are given the tools and facilities they need to provide effective medical care. Electricity is needed for basic lighting, vaccine storage, access to clean water, equipment sterilization, and to power other essential equipment. Yet many clinics, hospitals, and workers do not have access to the power they need: The World Health Organization recently found that up to 58 percent of health care facilities in Sub-Saharan African countries have no electricity at all¹⁰⁹. Other health impacts of the energy sector include the reduction in women's drudgery, and improvement in food quality and nutrition from modern cooking and refrigeration solutions; better

retention of qualified staff in remote health centres which are served by electricity; street lighting may improve women's mobility and hence increase their opportunities. In addition, access to affordable modern energy services can reduce both time and effort spent in reproductive and productive labour. Some of the deliverables of this high-impact opportunity include:

- Mapping the market: Understand the existing gap in access to energy-dependent health care services (both for prevention and for treatment).
- Securing evidence for guiding intervention design: Engage the health sector in assessing the gap in energy-related services critical to women's health.
- Supply chains and maintenance: Develop public-private partnerships to encourage good design and mobilize financing for installation.
- Building local and national capacity: Establish appropriate system design, maintenance and repair requirements to train local electricians, mechanics and engineers.
- Public awareness on the benefits of accessing modern energy options to address the scanty knowledge of the linkage between traditional cooking methods and health implications
- Advocacy and media: Mobilize public/private energy sector linkages with the health sector and catalyse support and action for identified policies/ investments to close the energy gap in healthcare, as well as catalysing sustainable energy service installations in medical clinics¹¹⁰.
- Clean Energy Mini-Grids, or self-contained systems
 - Develop and implement small-scale renewable energy solutions for social services
 - For healthcare establishments, street lighting, and schools
 - Address the energy and water nexus with solar and other technology options for energy-efficient water pumping and provision of potable water
- Universal adoption of clean cooking solutions, a goal that can be pursued under the umbrella of GACC, although Kenya is only a partner country.
- Advocate for and educate consumers on the importance of health, environment and gender benefits of clean cooking.
- Energy, Water and food nexus.

¹⁰⁸ This is based on the list of HIOs identified by the Global Action Agenda

¹⁰⁹ <http://www.SE4All.org/hio/energy-and-womens-health/>

¹¹⁰ <http://www.SE4All.org/hio/energy-and-womens-health/>

3.4.6 Risk and mitigation

Risks	Mitigation	Responsibility
<ul style="list-style-type: none"> Unreliable/Sub-standard technology, leading to lack of confidence in the interventions due to perceived risks, e.g. health, security 	<ul style="list-style-type: none"> Education and awareness to the beneficiaries Enforcement of standards / where no local standards available to develop 	MoEP CSOs Development partners
<ul style="list-style-type: none"> Cultural barriers- hindering adoption of interventions 	<ul style="list-style-type: none"> Awareness -demonstrating benefits of interventions; participatory planning and dissemination 	MoEP, CSOs Development partners
<ul style="list-style-type: none"> Lack of capacity/knowledge/skills at the county level especially for those in charge of energy dockets to plan and implement nexus priorities (provide leadership) 	<ul style="list-style-type: none"> Action agenda to incorporate plans for capacity building on energy and other sectors planning at county level Sensitize County government to allocate resources for capacity building on energy planning/ nexus issues at county level MoEP to champion capacity building of county governments that incorporates nexus issues 	MoEP, CSOs Development partners
<ul style="list-style-type: none"> Lack of finance at the county level to implement the planned energy nexus issues 	<ul style="list-style-type: none"> Innovative financing mechanisms, e.g. PPP's Mobilising community initiatives-Energy cooperatives model- funded by counties – participatory planning and implementation Encouraging cross-sectoral financial support for nexus issues within counties 	MoEP, CSOs Development partners Private sector
<ul style="list-style-type: none"> Some counties may lack substantial energy resources to support planning and implementation to addressing energy nexus issues 	<ul style="list-style-type: none"> Involve counties in grid infrastructure initiatives- funding/policy to support this; Participatory planning involving community- seek funding to enhance this; segmented distribution systems for other areas and addressing identified needs Participatory development of resources within the counties 	Government ,CSOs Development partners
<ul style="list-style-type: none"> Political interference 	<ul style="list-style-type: none"> Inclusive implementation/ involvement of all stakeholders in the awareness creation Cross sectoral planning and engagement 	Government , CSOs Community

3.5 Enabling Action Areas

Energy policies are quite well developed in Kenya; however, there are some areas which require further development, particularly, the biomass and off-grid sectors. In addition, there is a general need to improve the clarity in terms of enforcement and overlapping with other sectors policies as well as to improve governance and interaction between all the stakeholders, including governmental institutions, donors and civil society. National coordination to monitor the implementation of policies and strategies, develop effective and comprehensive planning and define adequate funding.

3.5.1 Energy Planning and Policies

Areas that require further development are the biomass and off-grid sectors. In addition, there is a general need to improve the clarity in terms of enforcement and overlapping with other sector policies as well as to improve governance and interaction between all the stakeholders, including governmental institutions, donors and civil society. Part 2 of the Fourth Schedule of the Kenyan Constitution (2010) provides for devolvement of functions to county governments. It states that County Governments shall be responsible for planning and development energy sector

which include preparation of county energy plans, incorporating petroleum and coal, renewable energy and electricity master plans, physical planning relating to energy resource, provision of land and rights of way for energy infrastructure, regulation and licensing of retail supply of petroleum and coal products. Roles of County Government in the energy sector are elaborated in the draft National Energy Policy 2015.

Critical Areas

- In adequate effective communication mechanism between county and national government on energy planning, implementation and monitoring as most of these functions are still centralised by national Government Agencies with limited intervention from county authorities and other local stakeholders.
- Un-developed off grid and bioenergy strategy to guide decentralized system deployment and biomass utilization at both National and County level.
- Limited statistical data on progress made from the policy interventions.
- In adequate impact for NEMA as the Designated National Authority (DNA) for the Clean Development Mechanism (CDM) on the banking sector and limited understanding on carbon trading.

Actions Needed

- Form a national coordination committee to monitor the implementation of policies and strategies, develop effective and comprehensive planning and define adequate funding for the national and county government.
- Comprehensive approach to development of standards and regulations
 - Standards for several sustainable energy-related technologies need to be developed. Whereas the Energy Regulatory Commission has begun development of regulations, this effort requires a comprehensive approach encompassing all related standards, technical regulations, education and enforcement framework.

■ Fiscal and monetary interventions

Development of wholesome fiscal and monetary briefs by the Energy Institute (once established) that would:

- Assist institutions such as the Kenya Revenue Authority and the Central Bank of Kenya create the desired tax regime (rebates, exemptions and other incentives) and to develop monetary policy, regulations and incentives that can stimulate the financial sector in Kenya to raise long term sustainable energy finance and to avail project finance to private sector energy project developers.
 - Assist NEMA, Treasury and stakeholders in the development of a carbon finance instrument.
- Develop and approve off grid strategy and bioenergy strategy to foster the development of mini-grids, micro-grids and bioenergy to encourage private

sector participation

- Formulate and enforce framework for charcoal industry that includes regulation of charcoal production and incentives for sustainable production. The pending Forestry Act should be a key part of this framework.
- Formulate LPG policy and appropriate incentives to support the growth of LPG adoption.
- Data collection and tracking of progress made against targets will be essential to be able to monitor the effectiveness of policy actions and make any corrective changes. The following actions should therefore also be taken:
 - Annual assessment of energy targets in three main areas of access, RE and efficiency.
 - Regular detailed mapping to assess status of all energy markets including market actors, supporting inputs, services and finance, and enabling environment factors.
- Develop alternative cooking fuels strategy with clear goals and targets (bioethanol, biogas, solar cookers, vegetable oils, briquettes and agricultural waste).
- Strengthening of the energy policy, legislation and strategic planning. Specific energy policies that need to be entrenched in the policy and regulatory framework include:
 - Policy to guide Sustainable Energy Fund (SEF) fund-raising efforts, including obligating SEF budgetary allocations both at national and county levels.
 - Policy to guide integrated sustainable energy planning, including inter and intra-ministerial planning and decentralised by coordinated energy resource planning.
 - Establishment of an integrated approach in energy policy development and planning taking into consideration the new Government and political structures in accordance to the constitution.
 - The transmission and distribution provisions in the Act recognise that "conveyance of electrical energy to or from any transmission or distribution network is possible; a framework for wheeling on the distribution network shall be developed.

3.5.2 Business Model and Technology Innovation

There a number of business models and technology innovation being implemented in Kenya which include:

- Public Private Partnerships (PPPs) models for power generation,
- Innovations such as Pay As You Go (PAYG)
- Energy access solutions e.g. leasing if any, Result based financing being implemented in the mini grid by GiZ,
- Polices encouraging R&D, research institutions, Energy service companies that work with communities, how do project developers engage

with communities- community engagement models- examples e.g. the Kitonyoni Community Solar Micro-grid in Makueni county and Ngerech Community Small hydropower in Murang'a county

In the development of projects, the developers have been challenged in raising finance, the local banking sector involvement in energy project financing is limited.

Critical Areas

- Dependence on donor funding for critical energy sector initiatives such as financing of pilot projects particularly of sustainable energy projects
- Limited involvement from the local banking sector in financing small and medium size energy projects
- Limited capacity of developers to raise finance for small energy projects
- The transmission and distribution provisions in the Act recognise that "conveyance of electrical energy to or from any transmission or distribution network is possible"; wheeling tariffs in the transmission network are accordingly provided for in the existing schedule of tariffs and rates, but there is not yet a framework for wheeling on the distribution network.

Actions Needed

- Establishment of Kenya Energy Development Fund (KEDF) with the aim to streamline access to early-stage project finance into a single programme. The concept shall be elaborated and established under the MoEP as the primary means to co-finance strategic domestic energy projects with public resources. Its main purpose would be to provide early-stage seed capital and equity to get such projects to the stage of commercial bankability, thereby leveraging more private capital into the sector. Ministry that will outline the rationale, feasibility and optimal governance and institutional arrangements shall prepare a concept note for the KEDF. This can draw on the wide range of experiences (e.g. development partners) of supporting financing programmes in Kenya.
- Create favourable environment for private investors in the sector, Government will develop a coordinated plan to streamline investment procedures, guarantee stable and positive returns, and reduce perceived and real risks to energy infrastructure investment. Among these measures, include updating the investment code, developing a dedicated energy fund, and clarifying the rules and modalities of engagement for PPPs.
- Strengthening market instruments
 - Establish and implement a framework for wheeling on the distribution network.
 - Project pre-finance facilities through financial institutions and project developers.
 - Improving the existing standard PPA.
 - Improving the existing FIT policy, where some work is already ongoing.
 - Set standards and regulations on net metering,

where some work is already ongoing.

- Support for formation of energy service companies.

3.5.3 Finance and Risk Management

Critical Areas

- Dependence on donor funding for critical energy sector interventions such as financing of pilot projects particularly of sustainable energy projects
- Low involvement of the local banking sector in financing small and medium size energy projects

Actions Needed

- Establishment of Kenya Energy Development Fund (KEDF) with the aim to streamline access to early-stage project finance into a single programme as explained in 4.5.2 above. Development of a Sustainable Energy Finance(SEF) sustainability strategy
 - The SEF sustainability strategy would capture the critical path for financing clean energy projects, including energy resource needs/ sources, required standards, market dynamics, capacity building and financing needs. This activity can be spear-headed by the Energy Institute (once in place) in collaboration with stakeholders, and implemented by the KEDF.
- Appoint a Kenya National SEF Focal Person

There is need for a focal person to strategize on, advice on and facilitate SEF in Kenya at the national and sub-national (County) levels. The SEF focal point can be based at the SE4All Secretariat, under the SE4All Focal point, with among other functions:

 - Develop market instruments such as marketable securities and services related to mobilisation of finance and management of energy-related investment funds.
 - Deepen financial sector and insurance sector involvement in the energy investments.

3.5.4 Capacity Building

Critical Areas

- Limited human resources at MoEP and other key energy related institutions.
- Limited awareness by the public to identify and understand the benefits of quality renewable energy technologies and equipment.
- Limited capacity from entrepreneurs to develop technologies adapted to the local environment.

Actions Needed

- Establishment of Sustainable Energy for All Advisory Board with crucial mandate directly affecting the flow of finance and investment in sustainable energy need their capacities enhanced to plan, formulate related policies and mobilise funding. Establishment of national Energy Institute as proposed in the draft National Energy Bill 2015.would be appropriate. The Energy Institute can have linkages to Universities and other research institutions like KIRDI. It would continuously build the sustainable energy finance

capacities of, among others:

- Parliament, which has responsibility for the approval of budgetary allocations. The Parliamentary Departmental Committee on Energy would be the appropriate entry point.
 - Constituency Development Fund managers and County Governors, responsible for allocation of development funds at the local levels.
 - The Ministry of Energy and line ministries strongly influenced by sustainable energy, including Ministry of Environment, Ministry of Agriculture, Ministry of Industrialisation, Ministry of Education and Ministry of Finance.
 - Revenue and financial sector authorities such as KRA and CBK.
 - Counties to support local institutions to offer courses in energy
- Strengthening clean energy sector associations
- Institutions such as CCAK, SEAF-K, ABC-K and KERIA, which advocate for clean energy and help sector wide networking and collaboration can be useful instruments of both change, implementation of policy and market development. They need to be specifically supported and strengthened through budgetary allocations at national level. Institutional capacity development to close the gap between responsibilities/commitment and management capacity:
 - The capacity of governmental institutions, namely, MoEP, REA and ERC, should be developed to assist in the implementation of policies, strategies, programmes and project management
 - Staff of local banks should be trained in order to better understand and become more comfortable when lending to energy projects
 - Assist organisations in developing gender mainstreaming tools
 - County energy planning capacity should be improved for increasing coordination and planning of energy related activities, investment strategies and monitor the progress of SE4All and other energy related interventions.

3.5.5 Awareness and Knowledge Management

- Develop a methodology and implementation plan for creating and maintaining the SE4All Energy Data Base. Design of data collection and processing process should apply rigorous methods (such as individual programme evaluations, cross-national quantitative studies, systematized expert interviews, and sectorial surveys) and be capable of producing timely data suitable for Kenya's implementation

of SE4All's GTF and country reporting to the International Energy Agency's (IEA). It will also encompass the:

- Biomass Information System (BIS): The major purposes of the information system are to: (i) Keep track of the new biomass energy technologies and their success rates; (ii) Support continuous updating of the strategy; and (iii) Provide timely information for decision making and planning.
- Renewable Energy Resource System (RERS): This will be the umbrella for the different renewable energy resources assessment and mapping, in order to confirm the potential at specific sites and accelerate project development by the private sector.
- RET Data Base and technology vendors. This database should integrate information of vendors of technologies, systems and solutions by type of technology and service provided.

3.5.6 Cross Cutting Enabling Actions

- SE4All and regional integration: Power pooling and cross-border projects and programmes, standardization and other infrastructure guidelines and strategies developed through EAC. The Heads of State of the EAC Countries agreed on a Cross-Border Electrification Policy at both Medium voltage and high voltage¹¹¹.
- Update a "one stop shop" within government: To provide clear and timely information and support to investors interested in developing EA/EE/RE projects.
- Establish & refine fiscal incentives for RE/EE/EA project development: To reduce costs of technology uptake and attract investments. These could be in form of tax/VAT exemptions and credits enhancement, tax holidays or specialized grants.
- Common funding mechanisms- green fund scope: To buy down costs of capital and provide for equity/debt borrowings by investors and project preparation where needed
- Enhance the institutional structure and capacity for RE/EE/EA planning and regulation: When introducing SE4All Initiatives, institutions need to be equipped to deal with the new SE4All paradigm and allocate resources for the initiatives.
- Mainstream gender issues into energy policy and planning: Inclusion of gender consideration is important in all the initiatives and is also in line with the Africa SE4All Hub Guidelines
- Data management systems for energy planning: Undertake baseline studies to obtain data for planning.
- Land reform: Streamline issuing of land permits to project developers.

¹¹¹ The EAC Cross-Border Policy, 2014

4.0 Part III – Coordination And Follow-Up

4.1 The Process of Development of the Action Agenda and Investment Prospectus

The development of the Action Agenda and investments prospectus involved all the key stakeholders

The process of developing the AA/IP was conducted in six key stages.

Stage 1 included literature review and interactions with MoEP and key stakeholders to enable identification of initiatives underway (or already undertaken) on which this AA/IP development could be built. This was provided for at the Kick-off meeting and at the Coordination meeting where the Inception Report was discussed with key stakeholders from public, private and civil society.

Stage 2 involved bilateral consultations with public, civil, private and development partners to get inputs on required priority projects and reforms areas for consideration in the AA/IP. Consultation was enhanced by the formation of the SE4All Technical Team and SE4All Technical Committee as working group on the development of AA/IP.

i) Technical Team: This was the core team for the development of the AA and IP composed of a team of eighteen members. The representation of this team was as follows: Government-Ministry of Energy and Petroleum; Consultant; Development Partners-United Nations Development Programme, SNV and WWF; Civil Society Organisation-Practical Action; Private sector-Kenya Renewable Energy Association (KERA) and Kenya Association of Manufacturers (KAM). The team held meetings on monthly basis to discuss the development of the AA and IP in details chapter by chapter.

ii) Technical Committee: This is an expanded team is made up more than 40 members

drawn from government, private, development partners and the technical team. The committee, with wider representation ensured that the development of the AA and IP gain wider acceptance. The team reviewed the AA and IP drafts prepared by the Technical Team and added their inputs.

Stage 3 involved group stakeholder workshops of private sector, public sector and civil society. The workshop stakeholders reviewed results of the stocktaking, gap analysis, and contributed their inputs on;

- (i) Reforms required to create a conducive enabling environment for private and public investment in the energy sector;
- (ii) Identification of priority projects to meet SE4All goals for Kenya. In this stage, each group of stakeholders had a chance to analyse existing policies/plans/strategies/programmes, related gaps and each provided suggestions on priority project areas and required reforms.

Stage 4 involved training of Kenya stakeholders to develop the AA and IP documents and in the prioritization of project and reforms areas identified in stages 1-3.

Stage 5 involved county awareness forums on SE4All initiatives with focus on formation of SE4All County Technical Committees to oversee the implementation of AA/IP at county levels.

Stage 6 involved a close consultation with the MoEP and energy sector players to agree on the focus of priority project areas and reforms. The process of development of the Action Agenda in Annex 5.

4.2 Action Agenda's Implementation

The Action Agenda being the overarching Government strategy document towards the achievement of sustainable energy for all citizens of Kenya. It forms the reference point for development of other strategy documents as far as energy access; renewable energy and energy efficiency are concerned. It synergizes with the Country's Vision 2030, and provides the framework that guides planners and other stakeholders in their own strategies and engagement with the Kenya sustainable energy sector.

A clear implementation framework for the AA is therefore critical to the achievement of the Country's SE4All objectives. Implementation of Kenya's SE4All Action Agenda is hinged on four key pillars:

- 1. Institutional structures**
- 2. Programming of actions**
- 3. Mobilization of resources**
- 4. Effective monitoring and evaluation**

4.3 Institutional Structures

4.3.1 Structure

Kenya has a strong institutional framework that is supportive of the country's SE4All agenda, headed by MoEP. MoEP is the focal point for Kenya's SE4All Initiative, a function domiciled within the Directorate

of Renewable Energy (DRE).

The team comprises the Director for Renewable Energy, the Deputy Director for Renewable Energy – also the Country Focal Point for SE4All Initiative, and

five technical officers. MoEP collaborated with key stakeholders in the SE4All process.

4.3.2 Proposed National SE4All Coordination Structure

The SE4All function at the MoEP, led by the Country Focal Point (CFP) will be transformed into the "Kenya SE4All Secretariat" ("KSS"). KSS will be a separate unit within the MoEP, with its operational the budgetary. MoEP, through the DRE, will appoint a SE4All National Coordinator ("SNC") to head the KSS, and shall report to the DRE. A team of technical staff assigned by MoEP and relevant administrative staff will support the SNC. Altogether, this team will comprise the KSS.

KSS will be supported and guided by the SE4All Advisory Board ("SAB"), a multi-stakeholder group drawn from what is currently the Technical Committee for SE4All. It will be chaired by the Principal Secretary in MoEP, with the Director for Renewable Energy as the Secretary. The SNC will be an ex officio member, working with the DRE to propose the agenda and table documents for deliberation by the SAB. The SAB will comprise diverse stakeholder representations styled similarly as the SE4All stakeholder groups: public, civil society, private, research institutes. Guidelines will be developed for to direct the roles of various sub-groups of the SAB.

The SAB will be divided into four thematic Sub-groups, representing (i) Finance – mobilization and concept designs for implementation; (ii) Initiatives – initiating

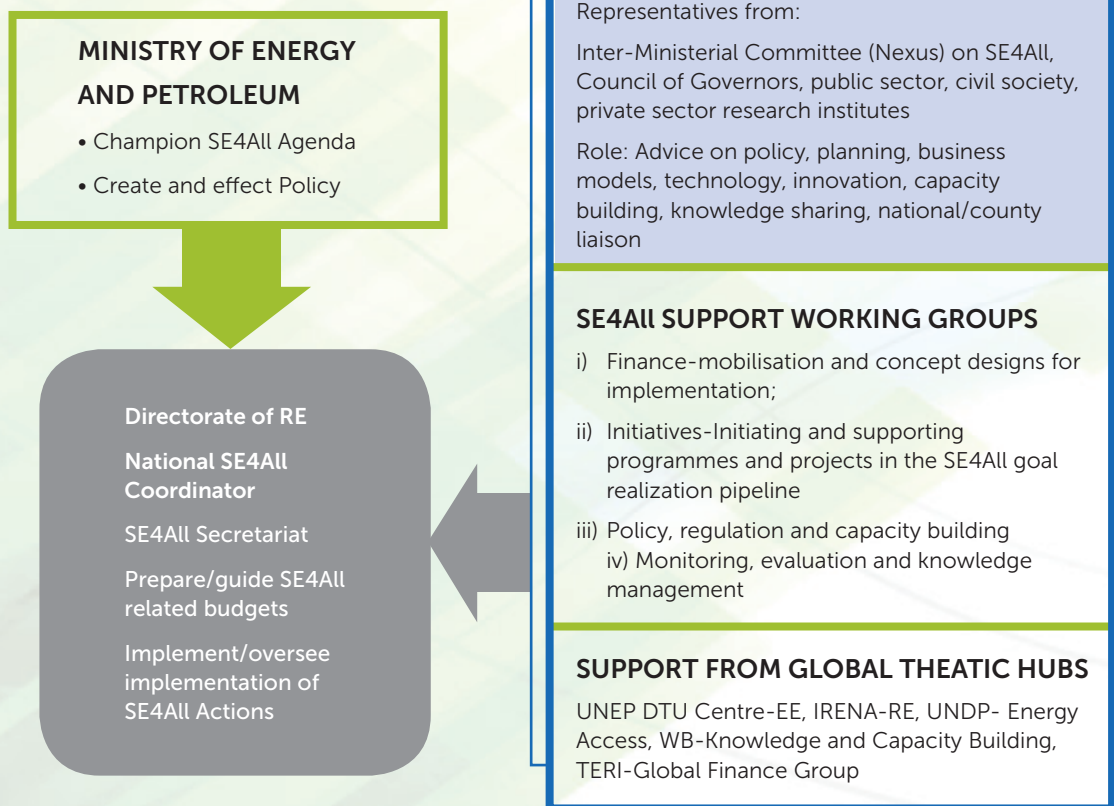
and supporting programmes and projects in the SE4All goal realization pipeline (iii) Policy, regulation and capacity building (iv) Monitoring, Evaluation and knowledge management.

In its day-to-day work, the KSS will be supported by stakeholder groups convened by the SNC to assist the KSS on specific technical matters, akin to the Technical Team that has assisted the Focal Point to produce the AA and IP. It is expected that the close relationship held during the AA development process between the CFP/ MoEP and key stakeholders will continue during the implementation phase to ensure that there is a clear coordination and compatibility of efforts in the energy sector, which should consolidate and accelerate the progress towards Kenya's SE4All goals.

The formation of KSS will increase the capacity of the GoK to improve coordination of activities across interventions funded and implemented by key stakeholders. Because of this process, it is expected that the harmonization and integration of strategies and programs under the SE4All AA will be facilitated, and key implementation challenges will be mitigated. This is especially important for addressing the challenges associated with devolution and the operationalization of the AA.

This administrative transition into the KSS will be scheduled in a manner that ensures the Secretariat is in place and resourced in time for involvement in the next (third) Vision 2030 Medium Term Planning Cycle in 2018. The structure is schematized in Figure 7.

Figure 7: Proposed structure



4.3.3 Integrated approach between National and County Governments

Formation of SE4All engagement framework is proposed to coordinate smooth flow of information on matters of energy among the stakeholders at both National and County levels. The key stakeholders in the engagement framework are National Government, County Government, County SE4All Technical Committee, community (research institutions, civil society, financial institutions, private sector and donor agencies).

MoEP will support the establishment of SE4All County technical committee to oversee the implementation of the SE4All initiative at counties and provide linkage with the national government. MoEP will support to establishment of Energy centres in all the counties

Harmonizing SE4All Action Agenda with County Integrated Development Plans (CIDPs) will ensure faster delivery of the SE4All Kenya objectives. Counties have published "County Profiles" containing geographic, resources, economic and social data of the counties. These documents provide basic information to county governments in preparing their County Energy Plans¹¹¹. CIDPs are used to guide the county Medium Term Expenditure Framework and annual budgets. The SE4All objectives will be incorporated into the CIDPs.

The Activities will include:

- Sensitize counties on SE4All (county engagement process) involving respective stakeholders working on existing programmes;
- Define their energy needs in the counties (energy needs assessment) including mapping energy resources;
- Build capacity on county energy planning, understanding of the energy issues as per ministry of energy and petroleum guidelines;
- Promotion of PPPs at the county level;
- Incorporating decentralized/distributed energy solutions in the county energy plans;

The energy plans shall;

- Take into account the national energy policy;
- Serve as a guide for energy infrastructure investments;
- Take into account all viable energy supply options; and
- Guide the selection of the appropriate technology to meet energy demand

Annex 9 presents proposed framework at the national level in MoEP for evaluating and approving county energy plans for implementation.

4.4 Programming of Actions

The AA was drafted at a time that Vision 2030's Medium Term Plan (MTP) 2 is being implemented. The intention of the GoK is to integrate the strategic approach of the SE4All into the MTP process; hence, some of the targets, especially energy efficiency, would be subject to the assessment of the progression of the AA implementation, which will take place as part of the MTP 3 (2018 – 2022) design process. Hence targets, will be supported by priority actions and investment opportunities that will focus on the short-term, or transitional period, as additional actions and related investment prospectus will be added as part of the operationalization of a fully SE4All compatible MTP 3.

With this in mind, the realization of Kenya's AA's Goals depends on the deployment strategy, institutional support, MER and review process of this AA through 2030.

4.4.1 Implementation Methodology

The AA is developed at a time when:

- The country is implementing the new constitution with energy planning being decentralized to the counties,
- Last mile connectivity is launched with the overall goal of achieving over 70% connectivity by 2017 in Kenya.
- The council of governors has designated an office, which liaises with the National government on

county issues including energy planning.

The integration of these interventions with the current policy and regulatory framework and the on-going review of targets and plans present some challenges to the early stages of implementation of the AA, among them:

- Interventions may overlap between them, like with REMP and SREP;
- Key stakeholders vary at leading and implementing roles as indicated below:

Civil Society Organisations: Practical Action Eastern Africa is the SE4All CSOs representative at Advisory Group for the proposed SE4All implementation and coordination structure. Civil society organizations, community-based organizations, NGOs, advocacy groups and donor partners also have key roles to play in the achievements of SE4All objectives. Their roles are diverse and critical for continued development, implementation and monitoring of the SE4All agenda.

Civil society continues to play a pivotal role in providing energy solutions to the majority of poor and marginalized population without access to clean energy sources and/or grid electricity. The Civil Society is also active in both broad based participation in energy sector policy/planning and also on developing and deploying renewable energy/energy access solutions.

Private Sector: Private sector is playing and will continue

¹¹¹ This is a requirement in the law which points to the need to have a body that develops guidelines, vets and approves county energy plans.

to play a critical role in the implementation of the SE4All objectives. The government of Kenya has deregulated the energy sector thus allowing the participation of the private sector. Private sector is actively engaged in all sectors of energy. The GoK cooperates with the Kenya Association of Manufacturers in promoting RE/EE in industry. There is however a required institutional framework to cater for EE activities in the other sectors. The Kenya Private Sector Association (KEPSA) represents private stakeholders in the SAB.

The power sector is deregulated opening up opportunities for Independent power producers (IPP's) to participate in power generation including for renewable energy under the Feed-in Tariff Policy. IPPs are private companies, which generate electricity and sell it in bulk to KPLC. Currently, seven IPPs are operating in the country contributing about 30% of the effective generating capacity to the national grid. The Energy Act also allows private distribution companies to buy bulk power from power generators and supply directly to customers in competition with Kenya Power. Transmission network is being opened for such power trading through KETRACO.

- It is expected that the transformation of the SE4All team at MoEP, led by the Country Focal Point (CFP) institutionalized as Kenya's SE4All Secretariat, will increase the capacity of the GoK to improve coordination of activities across interventions funded and implemented by key stakeholders. Because of this process, it is expected that the harmonization and integration of strategies and

programs under the SE4All AA will be facilitated, and key implementation challenges will be mitigated.

4.4.2 Implementation Timeline

Considering that, the current scenario is led by the early stages of the promotion of REA's IP and as Kenya integrates SE4All into its national planning, the trajectory towards the country's SE4All Goals is informed by the following phases:

Transition (2015 – 2017). During this period, the country continues with its current strategies and starts a national dialogue toward the adaptation, update and alignment of the existing interventions under the country's SE4All agenda. During this period, all new strategies and interventions will have to be consistent with Kenya's SE4All AA.

Phase I (2018 – 2022). SE4All becomes the corner stone of the MTP 3 planning process. In this context, the AA will be re-assessed by its progress and additional interventions and IP(s) should be incorporated as needed.

Phase II (2023 – 2027). The AA and the MTP 4 will be reassessed by its progress and additional interventions and IP(s) should be incorporated as needed.

Phase III (2027 – 2030). The AA and the MTP 5 will be reassessed by its progress and additional interventions and IP(s) should be incorporated as needed.

The following timeline presents a proposed sequence of key activities and interventions to be implemented upon the adoption of the AA.

Table 18: Potential AA Implementation Sequence

Activity	2 nd half 2015	1st half 2016	2 nd Half 2016
SE4ALL Secretariat institutionalisation, define the implementation and operational programme, and secure funding for personnel, equipment and execution of activities			
TA assistance support to the SE4AALL Secretariat at MoEP			
National Dialogue, including sub-national structures County Governments, in preparation to the transition of the AA and IP into the MTP			
Integration of the AA and IP into the MoEP Five-Year Strategy Plan			
Institutional and human capacity building of government institutions and private sector organisation			
Design and implement a programme for institutional and human resources at county level to increase the role of county governments on local and national energy planning needs and monitoring			
Establishment of Kenya Energy Development Fund (KEDF) with the aim to streamline access to early-stage project finance into a single programme			
Development of a mini-grid strategy to improve access to electricity			
Development of bioenergy strategy to improve access to modern cooking			
Improved market data for planning and investment purposes at MoEP by developing a SE4ALL database - Design and rollout			
Development, enact and rollout a full regulatory and enabling environment framework for energy efficiency			

4.4.3 Kenyan's Action Agenda's Coordination

The SE4All process in Kenya includes the creation of the SE4All Advisory Board to support the design of the AA and the IP. The members of this Committee represent government agencies, donor, CSOs (inclusive of private sector) and NGOs representatives.

Once the AA is validated and adopted, this Committee should remain in place and should meet regularly to provide support and advice to the SE4All Secretariat.

The Secretariat is the AA's lead advocacy and managerial unit that:

- Will monitor SE4All related projects and studies, which should remain under the responsibility of the

relevant Government Agencies and institutions.

- Takes the responsibility for realizing SE4All goals, implementing the IP(s) associated to this AA, and applying the SE4All Monitoring.
- Creates and increases awareness.
- Is the focal point for exchanging information with the SE4All global initiative, especially with the SE4All Global Facility Team, the SE4All Africa Hub, and the SE4All Thematic Hubs.
- Presents for review by the SE4All Coordination Committee and GoK authorities draft modifications to the AA and proposes any other "mid-course" adjustments that may be needed to keep Kenya on its path to achieve its SE4All goals.

4.5 Mobilization of Resources

The SE4All National Coordinator (NC) will work with a national Finance Working Group (FWG). The FWG will be responsible for mobilizing the local financial sector to support AA implementation and mobilize financial resources from various sources including Philanthropic, development partners and other sustainable energy supporting sources e.g. carbon financing. The FWG will also recommend the directing of financial resources to priority project areas through some form of fund matching system. This could be in form of a SE4All Fund to host various mobilized financial resources that can be directed to support the various Risk and Finance Management actions proposed for enabling

the selected priority areas. Some sources to support energy fund include¹¹³ ;

- Contribution from energy sector players
- Contribution from Treasury other than funds provided to public institutions for the discharge of their mandates.
- Raising funds through the stock market (bonds and bills)
- Support from development partners
- Recovered assets from proceeds of corruption and economic crimes in the energy sector

4.6 Effective Monitoring and Evaluation

4.6.1 Guidelines

Designing and implementing a Monitoring, Evaluation and Reporting (MER) system is an essential task that will allow Kenya to track, assess and report progress on the achievement of expected outcomes under the SE4All Initiative. The MER, as tool, allows for identifying key issues that need to be addressed to ensure a proper implementation of the AA. It will also allow the GoK to review and update the AA in the future. The MER system will therefore comprise a Monitoring Plan, an Evaluation Plan, and a Reporting Plan.

4.6.2 Monitoring Plan

The GOK will apply the GTF mono

4.6.2.1 GTF Monitoring Framework

The GTF proposes guidelines for monitoring each SE4All goal, i.e. for monitoring the progress made on energy access (electricity and modern cooking), renewable energy and energy efficiency. For access to energy, the key components are presented in Figure 8 as in the GTF:

Figure 8: Key components for tracking access to energy under the GTF

TRACKING ACCESS TO ELECTRICITY	GLOBAL TRACKING	NO ACCESS NO ELECTRICITY	NO ACCESS SOLAR LANTERN OR RECHARGEABLE BATTERY LANTERN	ADVANCED ACCESS HOME SYSTEM OR GRID CONNECTION			
	COUNTRY-LEVEL TRACKING	TIER-0	TIER-1	TIER-2	TIER-3	TIER-4	TIER-5
TRACKING ACCESS TO COOKING	GLOBAL TRACKING	NO ACCESS SELF-MADE COOKSTOVE	BASIC ACCESS MANUFACTURED NON-BLEN COOKSTOVE		ADVANCED ACCESS BLEN COOKSTOVE		
	COUNTRY-LEVEL TRACKING	TIER-0	TIER-1	TIER-2	TIER-3	TIER-4	TIER-5

¹¹³ National Energy Policy draft 2015

As shown in Figure 8 the GTF proposed to track access to energy using different “levels of access” or Tiers. Using a multi-tier approach, it is possible to track access not only from the “yes/no” point of view, which means that people have or do not have access, but also from a multi-dimensional perspective where it is possible to track the several attributes associated to access, such as affordability, quality, capacity (Watts), reliability, safety, efficiency, impact on health, etc. thus providing the opportunity to perform a much more in-depth analysis (See Annex 10).

4.6.3 Evaluation Plan

The evaluation process consists of annual reviews of the progress made through the activities conducted and performance achieved towards the targets that are set under Kenya’s SE4All AA.

The evaluation will ensure a broad and representative perspective on the achievements and challenges in the implementation of Kenya’s SE4All activities, and will allow the adequacy of the adopted strategy to be assessed to meet the targets as planned and take any corrective action if needed. The evaluation should include the provision of recommendations for future monitoring periods and it is intended to inform the stakeholders participating in the implementation of the AA of follow-up actions required to further strengthen its performance and strategic activities.

In general, terms, the purpose of the evaluation activities is twofold:

- I. To contribute to improving programme effectiveness and delivery towards Kenya’s SE4All goals by 2030 by using knowledge and lessons learnt from its implementation back into the country initiative;
- II. To contribute to overall alignment of strategic activities of the AA and ensure that it remains relevant to addressing country level objectives whilst also aligned to the global SE4All Initiative.

During the annual SE4All evaluation, the designated SE4All Secretariat will review the results achieved in the current monitoring period in comparison to the baseline and the previous year: progress on actions and targets met as planned in Kenya’s AA using the selected indicators. It will also help identify the actions needed for the following year.

4.6.4 Reporting Plan

Using the results of the evaluation phase, the designated SE4All Secretariat will report on an annual basis on the progress and performance towards the implementation of Kenya’s SE4All AA. The yearly progress will be presented in a Performance Assessment Report. The report must clearly show the baseline scenario and the progress made against the targets set. The annual report would be prepared in consistent manner with MTP cycle and shared with Stakeholders for awareness, socialization and proper contributions on their part.

4.7 Follow-Up Analysis

There is a need for additional follow-up analysis in two main areas. Firstly, there is a need to develop more detailed action plans with priorities, timelines and budgets in each of the main themes covered by the different technical working groups. These plans can then be used to manage and track implementation of the actions. These plans will integrate actions arising from the SE4All Action Agenda with those in the energy sector strategic plan, and additional actions identified in other strategies.

Secondly, additional scenario analysis is required to

assess the costs of different pathways to the SE4All goals, and to explore sensitivity of the goals themselves to various sources of uncertainty. These include technical uncertainties (e.g. availability of different sources of generation), as well as economic and social uncertainties such as the affordability of different solutions, and the degree of regional integration of energy systems. In practice, the goals outlined in this Action Agenda are illustrative, and the government will need to keep these goals under review and revise as necessary in response to new emerging information and as progress made between now and 2030.

4.8 Linking to Investment Prospectus

The Action Agenda is a stand-alone document that provides a framework for achieving the national SE4All objectives. On a “global” level, it provides for interventions (policy adjustments, financial allocations, business model developments and capacity building initiatives) that will focus national support for energy access, renewable energy and energy efficiency. However, as shown in Figure 9, the Action Agenda provides for specific measures that will drive particular investments that are part of the Investment Prospectus. In this way, some AA activities will be “operationalized” by an Investment Prospectus (IP) that is a separate document and describes a set of investments that Government, the private sector developers, civil

society organisations, finance organizations and other stakeholders can support.

The IP contains investment opportunities and a priority projects pipeline emanating from priority project areas identified in the AA. The projects in the IP are those that can be implemented in the short term and have been prepared adequately to attract investments. The IP projects consist of both, infrastructural and non-infrastructural projects. The AA presents the strategic elements and project priorities for the IP. The IP has Kenya’s status of why investors should invest in Kenya’s energy sector considering both national and sector level investment conduciveness and the institutional framework that will support IP implementation.

Figure 9: Action Agenda and Investment Prospectus linkages



5.0 References

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Annex 1: Definitions

Energy: A measure of the ability of a body or system to do work or produce a change, expressed usually in joules or kilowatt-hours (kWh).

Energy poverty: The absence of sufficient choice in accessing adequate, affordable, reliable, clean, high quality, safe, benign energy services to support economic and human development.

Access to Modern Energy Services: Defined as access to electricity and clean cooking facilities e.g. fuels and stoves that do not cause air pollution in houses (source: International Energy agency).

Clean Energy: Heat and electricity produced from renewable sources, generating little or no pollution or emissions.

Electricity Transmission: Electricity transmission is the process by which large amounts of electricity produced at power plants (such as hydro, geothermal, thermal and wind), is transferred over long distances for eventual use by consumers. Due to the large amount

of power involved, and the properties of electricity, transmission normally takes place at high voltage (132-kilovolt or above) to reduce losses that occur over long distances.

Electricity Distribution: Electricity is usually transmitted to a substation near a populated area. At the substation, the high voltage electricity is converted to lower voltages suitable for consumer use, and then distributed to end users through relatively low-voltage electricity distribution lines.

Green Energy: Refers to the energy from natural sources e.g. sunlight, wind, rain, tides, plants, algae and geothermal heat. These energy resources are renewable, meaning they are naturally replenished.

Renewable Energy: Refers to the energy that occur naturally, theoretically inexhaustible source of energy such as biomass, solar, tidal, wind, wave and hydroelectric power that is not derived from fossil or nuclear fuel.

Annex 2: The Sustainable Energy for All (SE4All) Initiative

This Action Agenda (AA) in the context of SE4All initiative presents a sector-wide long-term vision on SE4All goals and the country action to achieve the set goals. The global goals are: Universal access to modern energy services, doubling global rate of improvement of energy efficiency and doubling the global share of RE in the energy mix by 2030. Kenya has targets to match specific country development needs hence this AA has specific goals for Kenya with intermediate and end targets based on the country's Vision, policies and development plans and programmes. Where national targets are not defined, the global SE4All goals are assumed.

On December 21st, 2012, the United Nations General Assembly declared 2014–2024 the Decade of Sustainable Energy for All. Worldwide, 1.2 billion people, nearly one person in six on the planet, lack access to electricity. More than twice as many, 2.8 billion people, rely on wood, coal, charcoal or animal waste for cooking and heating. This creates major barriers to eradicating poverty and building shared prosperity.

The SE4All Global Action Agenda (AA) was issued in April 2012 and it is based on a framework proposing a global AA for universal energy access, foster EE and boost investment in RE. The SE4All goals are expected to be achieved through a number of High Impact Initiatives (HIIIs), which are targeted, on-the-ground programs or projects, and categorized into High Impact Opportunities (HIOs) which are categories of action that have been identified as having significant potential to advance the three goals. The hierarchy between the

Objectives, the HIOs and the HIIIs are depicted in the figure on the right.

Approximately 50 High Impact Opportunities have been identified to date¹¹⁴ but only 10 are confirmed which are: Advanced Lighting and Appliance Efficiency, Building Energy Efficiency, Energy and Women's Health, Finance, Modern Cooking Appliances and Fuels, Off-Grid Lighting and Charging, Phase out of Gas Flaring, Sustainable Bioenergy, Sustainable Energy for Island Economies, and Vehicle Fuel Efficiency. The Action Areas address almost 95% of global energy consumption, key components of productive energy use, and the supporting mechanisms needed to overcome the most common impediments to action¹¹⁵ (SE4All, 2012). The Global Action Agenda is disaggregated into eleven (11) action areas as shown in Figure 11. Of these, seven (7) are related to sectoral areas and four (4) addressing the enabling environment¹¹⁶.

Figure 10: SE4All Initiative goals

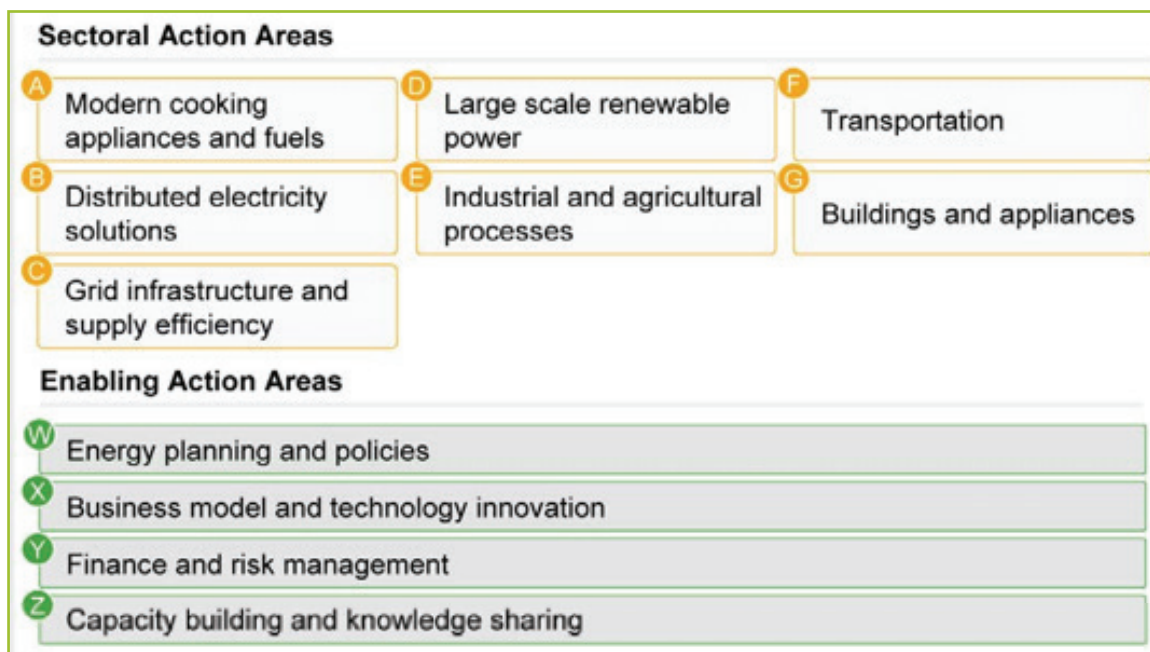


¹¹⁴ <http://www.SE4All.org/actions-commitments/high-impact-opportunities>

¹¹⁵ Extracted from page 7 of the Sustainable Energy For All – A Global Action Agenda, April 2012

¹¹⁶ Adapted from page 8 of the Sustainable Energy For All – A Global Action Agenda, April 2012

Figure 11: Action Areas of the Global Action Agenda



The SE4All Global AA relies on the full participation of all stakeholders and implementation of HIOs; both having a direct impact towards reaching and sustaining the SE4All objectives. The HIOs can accelerate action, mobilize resources and drive outcomes by building strong partnerships, fostering common actions and shaping sustainable commitments.

Energy is not a goal in itself, but a key driver for development. The tabular representation below in Figure 12 shows how the SE4All objectives and the interventions (initiatives) included under the HIOs drive sustainable development¹¹⁷ (SE4All, 2012).

Figure 12: SE4All framework towards Sustainable Development

SE4ALL GOALS	Ensure <i>Universal Access</i> to Modern Energy Services	Double the share of <i>Renewable Energy</i> in the energy mix	Double the rate of improvement in <i>Energy Efficiency</i>
Impact on Development Nexus	<ul style="list-style-type: none"> Improved Health Services Improved Education Services Improved Access to Drinkable Water and Sanitation Empowerment of women Improved agricultural productivity Improved industrial productivity Business and Employment Creation Pillar to Post-2015 Development Goals 	<ul style="list-style-type: none"> Clean Energy Decentralization Sustainable use of biomass resources Sustainable use of watersheds and water systems Decrease variability in energy costs Increase energy security Empowerment of Women Small Business Growth Sustainable Economic Development 	<ul style="list-style-type: none"> Efficient lighting Efficient appliances and electrical equipment Reduction or elimination of Technical Losses Redistribution of Electricity that now is wasted or lost Energy efficiency labeling and other consumer information in place Improved cookstoves Cleaner Production systems

The SE4All proposition is that in order to achieve the initiative's objectives all stakeholders need to play a leadership role¹¹⁸, National Government must design and implement a set of integrated country actions (i.e.

country action plans); Private sector provides business and technical solutions and drives investment; and Civil society organizations advocate and monitor public policy and businesses actions.

¹¹⁷ Based on Sustainable Energy For All – A Global Action Agenda, April 2012

¹¹⁸ Adapted from page 7 of the Sustainable Energy For All – A Global Action Agenda, April 2012

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Annex 4: Consultation under Review and County Awareness

1. List of Technical Team Members (SE4All TT)

The TT composed of expert from the MoEP, CSOs, IT Power consultant and development partners. The functions included review of the AA, setting of the baseline year and targets, The Consultant presented AA progress to the team for comments and inputs.

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The TC composed of expert from the MoEP, CSOs, utility, Private sector, IT Power consultant and development partners. The functions included review of the AA. The review meeting held at Maanzoni Lodge between 27- 29 July 2015.

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3. Private sector consultation on SE4All priority action areas

The Private Energy Sector stakeholders' consultation held at Garcia Gardens on 19th September 2015. The meeting objective was identifying of priority action areas.

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4. List of participants attended SE4All county awareness forum

The SE4All county awareness forum started with the TT members having a meeting with Council of Governors (CoGs) that brought on board CECs energy and clustering of counties for sensitization forum. SE4All county awareness forum on going and being carried out by MoEP, CSOs and the consultant (IT Power UK across the 47 counties). The objectives of the sensitization forum are:

- Sensitization on SE4All initiatives

- Sensitization on energy policy and regulations
 - Sensitization on county energy planning framework
- SE4All sensitization has also been through distribution of SE4All brochures and publication of SE4All supplement in the daily newspaper. Both the brochures and supplement have been through support from Practical Action, SNV and UNDP. WWF supported in the facilitation for the SE4All technical committee workshop for the AA review and priority action areas identification.

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Annex 5: Process of Developing AA in Kenya

The process of development of the Action Agenda and Investment Prospectus led by the Ministry of Energy and Petroleum and included consultations from development partners, private sector and civil society organisations. The details of the process is as follows;

The key sources of information on which this AA was developed were:

- Stock taking and Gap Analysis Report¹¹⁹ produced with support from UNDP
- Review of key energy sector documents, as provided by the Ministry and obtained from other sources
- Stakeholder consultations with private sector, public sector and civil society
- Training workshop for selected key government and other country stakeholders conducted as part of the

project.

- SE4All County awareness forums

Stock Taking and Gap Analysis Report

Stock taking and gap analysis is the second stage of country process in the implementation of SE4All initiative and the key objective of the exercise is to identify the gaps and barriers to energy use and access with a view to developing an appropriate national action plan to address them.

The AA started by building on the Gap analysis report by updating information on the gaps and barriers and soliciting for possible actions to address them. Some of the gaps already identified in the Stock Taking and Gap analysis study was also used in the framing of priority reforms and priority projects below.

Table 19: Identified Enabling Environment and Gaps from Stock Taking and Gap Analysis

SE4ALL Goal	Enabling Environment gaps	Priority Project areas
Energy Service Access	<ul style="list-style-type: none"> • Need for Financial frameworks for MFIs and project development and risk guarantees/buy downs • Need for PPP policy • Inadequate standards and enforcement of standards and regulations • Insufficient technical capacity 	<ul style="list-style-type: none"> • Inadequate LPG storage and distribution infrastructure • Inadequate off-grid and mini-grid power development
Energy Efficiency	<ul style="list-style-type: none"> • Financial frameworks for energy audits • Enhanced capacity for energy audit and operationalization & enforcement of regulations and standards • Lack of policy incentives • Limited awareness on EE cost and benefits 	<ul style="list-style-type: none"> • Institute Transmission and Distribution loss reduction • Distributed generation close to load centres.
Renewable Energy	<ul style="list-style-type: none"> • PPP model enhancement • Financial frameworks for Investment and risk guarantees/interest buy downs • Need to finalize power wheeling policy & tariffs, net metering & banking, PPA standards for large projects¹²⁰ • Adequate standards and enforcement to avoid counterfeits 	<ul style="list-style-type: none"> • Local manufacture and assembly to reduce costs and avail RE technologies • RE Resource Assessment • Mini-grids • Testing facilities for RE technologies

Document review

At the start of the project MoEP provided the team with key reports and documents relevant to the energy sector and the Kenyan government's activities and plans as they link to energy access, energy efficiency and renewable energy. The report was reviewed by both the SE4All technical team and the SE4All technical committee constituted of the MoEP, public utility, private sector, CSOs and development partners in their entirety, and supplemented by additional documents found online or through other sources.

Stakeholder consultations

Bilateral consultations were carried out at Inception Stage with some development partners, government and civil society and association organizations to gather views on what issues need to be addressed with respect to SE4All goals in the country in terms of priority project areas and reforms required. The output of this process was presented in the Inception Report and deliberated in a Coordination meeting held together with the key energy sector stakeholders headed by the MoEP.

Three workshops were held during the period of 3rd to 7th June 2014 for the private sector stakeholder, the government stakeholder and civil society. The Nairobi private sector workshop was sponsored by the BizClim project and the government and civil society workshops were fully sponsored by UNDP. The Ministry of Energy and Petroleum (MoEP) of Kenya led the organization of all the workshops and officiated at the workshops providing expectations of the Government of Kenya from the project with key ministry officials actively participating in the workshops. The SE4All Africa Hub partners NEPAD, UNDP and AfDB were all represented at the 3 workshops and provided their support and guidance.

The overall objectives of the stakeholder workshops were to consult Kenya stakeholders on:

- Creating a conducive enabling environment for both private and public investments to take place in the energy sector;
- Identifying priority areas and projects that can contribute to meeting the SE4All goals for Kenya.

The specific workshop objectives were:

- To share knowledge on the global SE4All Initiative, approach to development of the SE4All Action Agenda and Investment Prospectus, and the results of the Stocktaking and Gap Analysis study for Kenya. The latter forming the basis for the next step of identifying reforms and priority SE4All projects.
- To identify reforms to create conducive enabling environment for private and public investments in the energy sector, and priority projects to meet the SE4All goals for Kenya.

- To recommend priority actions and strategy for sustained private and public investments in the energy sector towards meeting SE4All for Kenya. The recommendations will form the basis for development of the SE4All Action Agenda and Investment Prospectus for Kenya, which will guide such future private and public investments in the sector.

The context of the discussion focused on the three SE4All goals of Energy Access, Energy Efficiency and Renewable energy, including the related seven Sectoral Action Areas (for projects) and four Enabling Action Areas (for reforms).

Further consultation was done after the AA/IP validation workshop in March 2015 to include decentralized system and energy efficiency and review of the AA/IP document.

Training workshop

The training workshop was held from 13-15th August 2014 as part of the Project Result Area 3 and was sponsored from the BizClim project budget. The Ministry of Energy and Petroleum (MoEP) of Kenya identified and invited the participants to the training workshop and a representative of MoEP officiated and chaired all 3 days of training sessions.

The HCL project team together with NEPAD conducted the training through presentations, facilitated plenary discussions and working group exercises. Representatives of the UNDP and AfDB SE4All Africa Hub attended and officiated at the workshop.

The main objective of the training workshop was to equip key Kenya stakeholders to be familiar with the process of developing a national AA and IP under the SE4All Initiative hence empowering the stakeholders to actively participate in the development of the AA & IP and to implement Kenya's priority SE4All energy projects.

The specific objectives of the workshop were:

- Share knowledge on AA and IP structures, requirements and content;
- Give stakeholders an opportunity to familiarize themselves with the development of AA and IP through a process of learning by doing; and
- Apply the reforms and priority SE4All energy projects identified in the Gap Analysis, reviews, during stakeholder workshops and consultations in the development of the AA and IP.

The Training workshop became an opportunity to deploy stakeholders to prioritize the priority project areas and reforms for the AA and to initiate formulation of projects for the IP.

Annex 6: Kenya Energy Institutions and their Functions

Affiliation	Institution	Role
National Government	Ministry of Energy and Petroleum (MoEP)	Formulates policy and drives sector planning
	The Energy Tribunal	Responsible for arbitration of disputes between ERC and aggrieved stakeholders in the energy sector
	Energy Regulatory Commission	Regulates all energy subsectors and protects interest of stakeholders ensuring reasonable return on investment for developers/utilities, licensing, approves PPAs between KPLC and power generators; reviews and adjusts tariffs for consumers and IPPs
	Rural Electrification Authority	Implement rural electrification through grid extension and off-grid systems such as solar and mini-hydro. REA administers and manages the Rural Electrification Fund (REF); mobilizes funds to support rural electrification, finances project preparation studies for rural electrification and recommends to government suitable policies.
	Kenya Electricity Generating Company (KenGen)	Develops and manages all public power generation facilities in the country (large and small hydro, geothermal, diesel-grid connected or off-grid)
	Kenya Power & Lighting Company (KPLC)	Public company that transmits, distributes and retails electricity to customers in Kenya
	Kenya Electricity Transmission Company (KETRACO)	Plans, designs, builds and maintains electricity transmission lines and associated substations
	Geothermal Development Corporation (GDC)	Government SPV charged with fast-tracking development of geothermal resources in the country
	Rural Electrification Authority (REA)	Its charged with accelerating access to electricity in rural Kenya
	Kenya Pipeline Company (KPC)	Responsible for operation of the oil pipeline system for the haulage and storage of petroleum products
	National Oil Corporation of Kenya (NOCK)	Is responsible for petroleum exploration and fuel marketing
Kenya Petroleum Refineries Ltd (KPRL)	Is responsible for crude oil refining in the country	
County Governments	42 county governments	Responsible for energy planning and development within their jurisdiction. In charge of electricity and gas reticulation and energy regulation

Figure 13: Renewable Energy Directorate chart

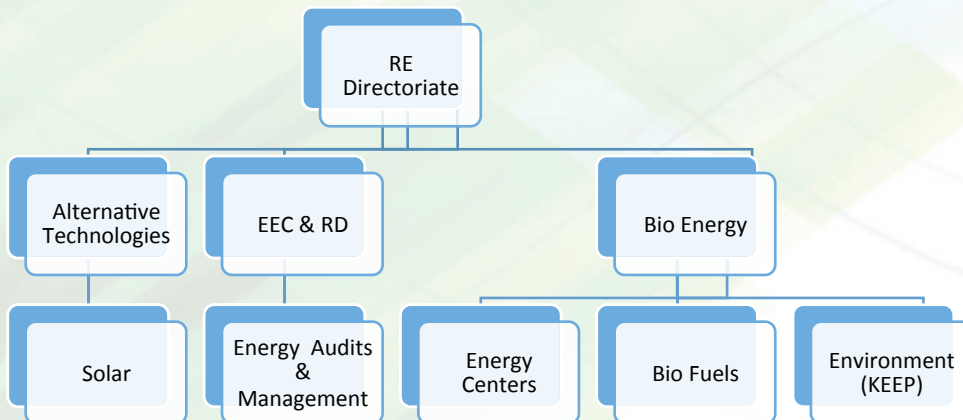
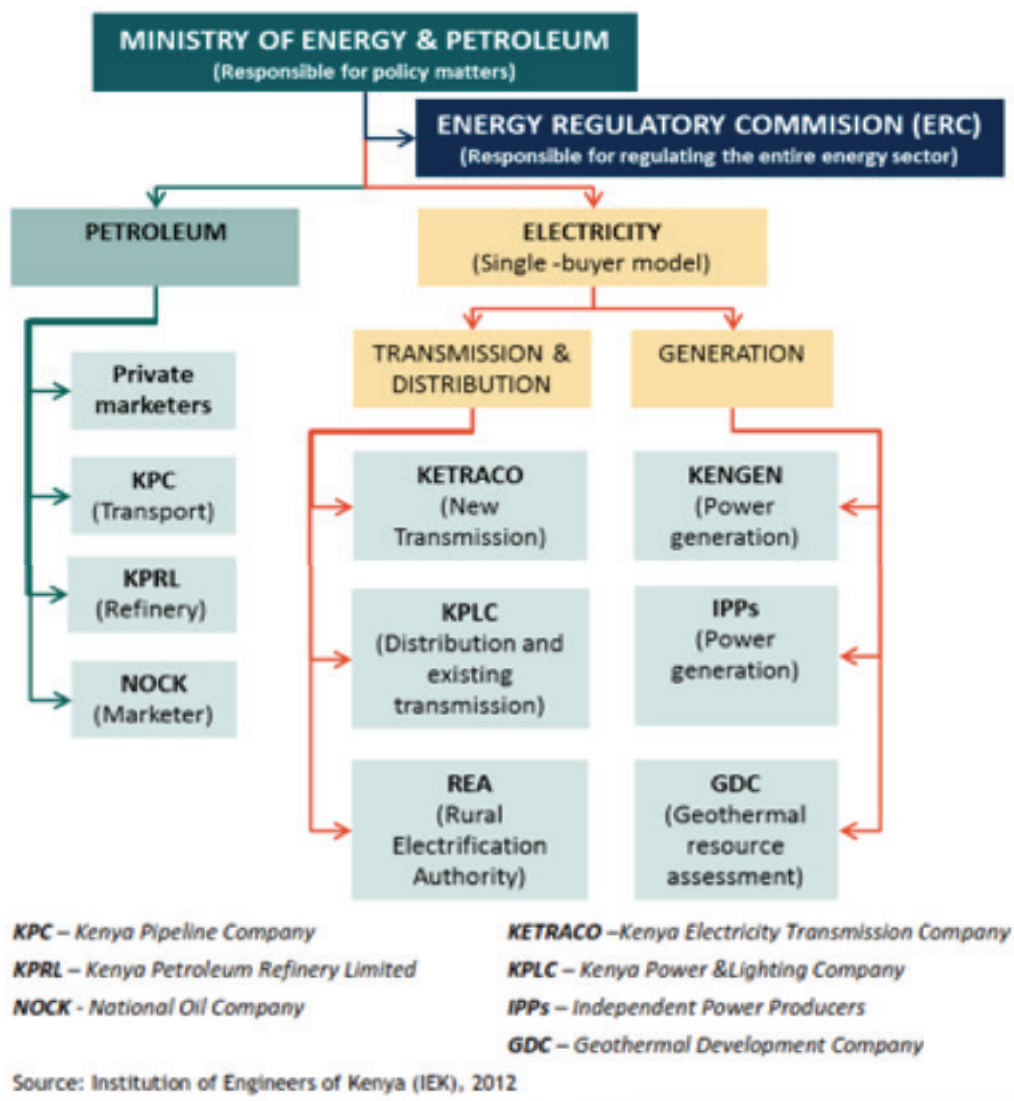


Figure 14: The Power Sector – organization chart ¹²¹



¹²¹ Institution of Engineers of Kenya (IEK), 2012

Annex 7: Energy Intensive Flagship Projects

Flagship Projects	Ref.	Completion	Energy (GWh)	Capacity (MW)
ICT Park	1	2015	2930	440
2nd Container Terminal and Mombasa free Port	2	2014	746	2
Juba-Lamu Railway	3	2014	19	9
Lamu Port including resort cities	4	2014	200	30
Special Economic Zones (Mombasa, Kisumu, Lamu)	5	2015	333	50
Iron & steel smelting industry in Meru area	6	2015	2097	315
Mombasa-Nairobi-Malaba-Kisumu railway	7	2017	27	18
Light rail for Nairobi and suburbs	8	2017	16	8
Resort cities (Isiolo, Kilifi and Ukunda)	9	2017	200	30
Total			6568	902

Annex 8: Energy Forecast In Gwh (March 2013 LCPDP 2013-2033)

YEAR	LOW SCENARIO			REFERENCE SCENARIO			HIGH SCENARIO		
	GWh	MW	Load factor	GWh	MW	Load factor	GWh	MW	Load factor
2012	8,010	1,370	66.76%	8,010	1,370	66.76%	8,010	1,370	66.76%
2013	9,387	1,606	66.74%	9,447	1,616	66.75%	9,499	1,625	66.74%
2014	10,450	1,785	66.84%	10,685	1,823	66.92%	10,850	1,851	66.92%
2015	11,572	1,978	66.78%	12,146	2,069	67.01%	12,514	2,130	67.06%
2016	12,739	2,184	66.59%	13,809	2,353	67.00%	14,478	2,462	67.12%
2017	13,989	2,410	66.26%	15,678	2,676	66.88%	16,740	2,849	67.07%
2018	15,275	2,649	65.83%	17,719	3,034	66.67%	19,282	3,288	66.94%
2019	16,689	2,913	65.39%	20,042	3,443	66.45%	22,236	3,799	66.82%
2020	18,242	3,207	64.94%	22,686	3,910	66.24%	25,671	4,395	66.68%
2021	19,941	3,530	64.48%	25,687	4,441	66.02%	29,657	5,087	66.56%
2022	21,847	3,895	64.03%	29,150	5,057	65.81%	34,357	5,904	66.43%
2023	23,933	4,298	63.56%	33,088	5,758	65.60%	39,827	6,857	66.30%
2024	26,229	4,745	63.10%	37,578	6,561	65.38%	46,208	7,972	66.17%
2025	28,754	5,242	62.62%	42,698	7,480	65.16%	53,657	9,275	66.04%
2026	31,532	5,793	62.14%	48,536	8,531	64.95%	62,355	10,801	65.91%
2027	34,588	6,404	61.65%	55,196	9,735	64.73%	72,515	12,587	65.77%
2028	37,951	7,084	61.16%	62,793	11,113	64.50%	84,389	14,680	65.62%
2029	41,651	7,839	60.66%	71,461	12,691	64.28%	98,270	17,132	65.48%
2030	45,723	8,641	60.41%	81,352	14,446	64.28%	114,502	19,940	65.55%
2031	50,204	9,541	60.07%	92,641	16,470	64.21%	133,492	23,248	65.55%
2032	55,135	10,538	59.73%	105,527	18,782	64.14%	155,712	27,122	65.54%
2033	59,135	11,318	59.65%	118,680	21,075	64.28%	179,850	31,237	65.73%

Acknowledgement**Executive summary****Chapter 1: Introduction**

- Introduction: structure of the plan document
- Location, Size, administrative and political units, demographics (population, income levels), climate, economic activities
- Objectives and rationale of the Energy plan
- Methodology used in development of the plan

Chapter 2: Energy Resource Potential

- Describe the energy resources and potential in the county including projections based on available data
- Developed energy resources in the county

Chapter 3: Current Status of Energy Use

Describe focus that would be expected to portray energy demand and use in the county

- i. Source of energy supply
- ii. Statistics on: electricity connectivity, number households, Institutions and small micro enterprises using charcoal, firewood, kerosene, LPG gas, biogas, electricity cooking

- iii. Productive use of energy

Chapter 4: Energy Demand in the County

- Analysis of current energy demand by sector
- Projected Energy Demand

Chapter 5: Policy and Regulatory Framework

- Existing policy and regulatory framework to guide energy development in the County

Chapter 6: Proposed energy development interventions

- Energy access
- Renewable energy
- Energy efficient
- Capacity building
- Financing

Chapter 7: Financing of the plan implementation

- Potential financing sources and models
- Priorities for investment

Chapter 8: Implementation Plan

- Implementation schedule
- Monitoring & Evaluation

References

Annex 10: Indicators for Kenya SE4All Initiative

Results	Indicators	
Goal		
Sustainable Economic Growth	% of reduction in deaths by indoor air pollution (deaths/year)	
	GDP per capita (US\$/person*year)	
	National electricity generation capacity (MW)	
	Poverty in rural and urban areas (%)	
SE4All Global Objective 1: Universal access to modern energy services		
Increase Electricity Access	National electricity access rate (%)	<i>Percentage of population with electricity access calculated as % of households with connections (off-grid/mini-grid households, the connection is counted based on how the energy solution can measure consumption)</i>
	Energy consumption per capita (kWh/person*year)	
Increase access to modern cooking solutions	National access rate to modern cooking solutions (%)	<i>Percentage of population with access to modern cooking solutions.</i>
SE4All Global Objective 2: Doubling share of renewable energy in global energy mix		
Increase renewable energy share in national mix	Share of RE in the national energy mix (%)	<i>Proportion of installed capacity from renewable energy sources, over the total installed capacity</i>
	On-grid RE installed capacity (MW)	
	Off-grid RE installed capacity (MW)	
	Sustainable biomass used in process heat (%)	
SE4All Global Objective 3: Doubling global rate of improvement of energy efficiency		
Reduce energy intensity	Reduction in the annual rate of energy intensity per year (%)	
	Energy losses in electricity distribution (%)	







SUSTAINABLE ENERGY FOR ALL
KENYA ACTION AGENDA