

SCALING-UP RENEWABLE ENERGY PROGRAM (SREP)

COUNTRY INVESTMENT PLAN KENYA

SREP Sub- Committee Meeting, Cape Town

June 21, 2011





Introduction

- Kenya is one of the six Pilot Countries selected to benefit from the Scaling-Up Renewable Energy Program (SREP).
- The SREP program will support Kenya's initiatives towards achieving a transformational change that will lead the country towards low greenhouse gas (GHG) emission development pathway by harnessing the abundant renewable energy resources in country.
- Kenya has developed an Investment Plan (IP) which is in line with national renewable energy development strategy



Kenya at a Glance

Location : East Coast of Africa
Capital : Nairobi
Government type: Democratic Republic
Area: 582,646 sq. km
Population: 38.6million (2009)
GDP: \$30 billion (2010)
Growth rate: 5.6% (2010)





Country Context

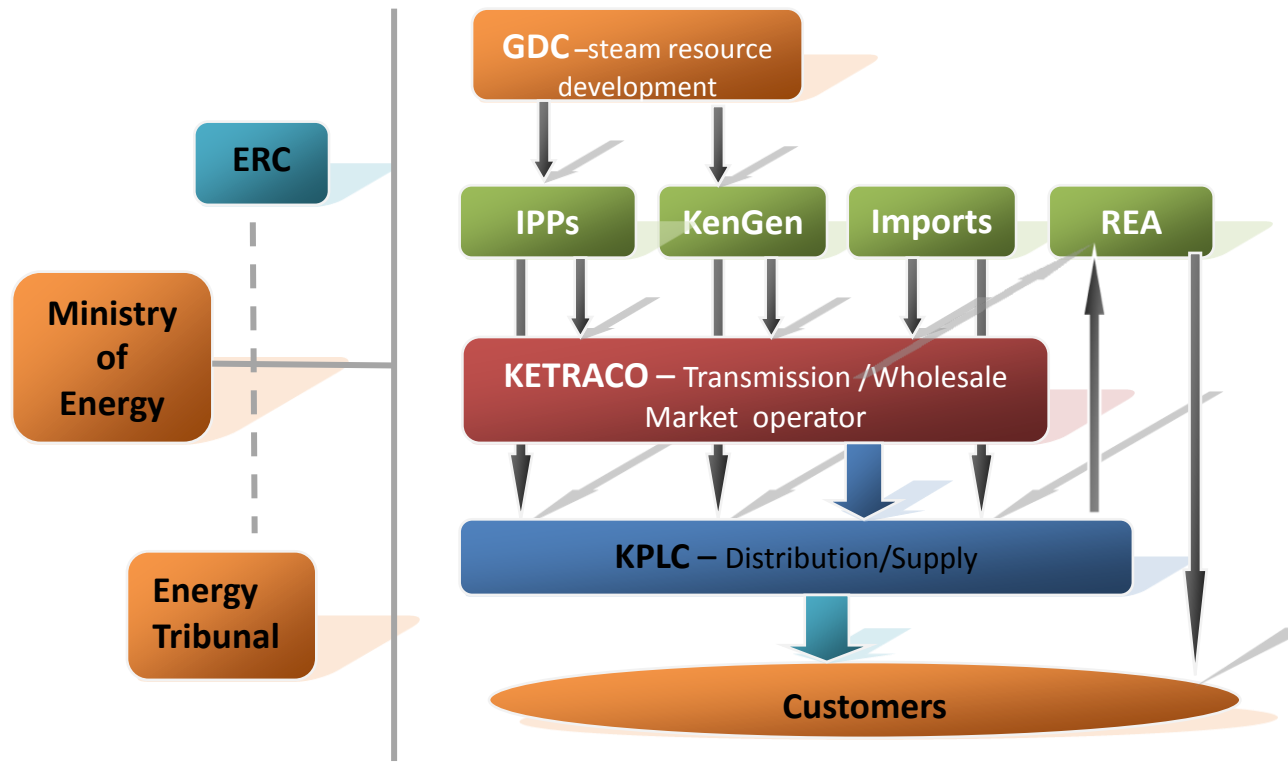


- Vision 2030
 - Long-term development strategy to transform Kenya into *“a newly industrializing, middle income country providing a high quality of life to all its citizens in a clean and secure environment”*.
 - Energy and infrastructure key to achieving the Vision
 - Private sector a key contributor to economic growth
- Energy sector restructured: Sessional Paper No. 4 of 2004 and Energy Act 2006
- Integrated power planning: Least Cost Power Development Plan
- Roadmap for rural electricity expansion: Rural Electrification Master Plan
- Carbon – neutral energy development plan: Kenya National Climate Change Response Strategy (2010)
- Gender Audit undertaken in 2007 identified constraints to be addressed in energy planning



Power Sector Overview

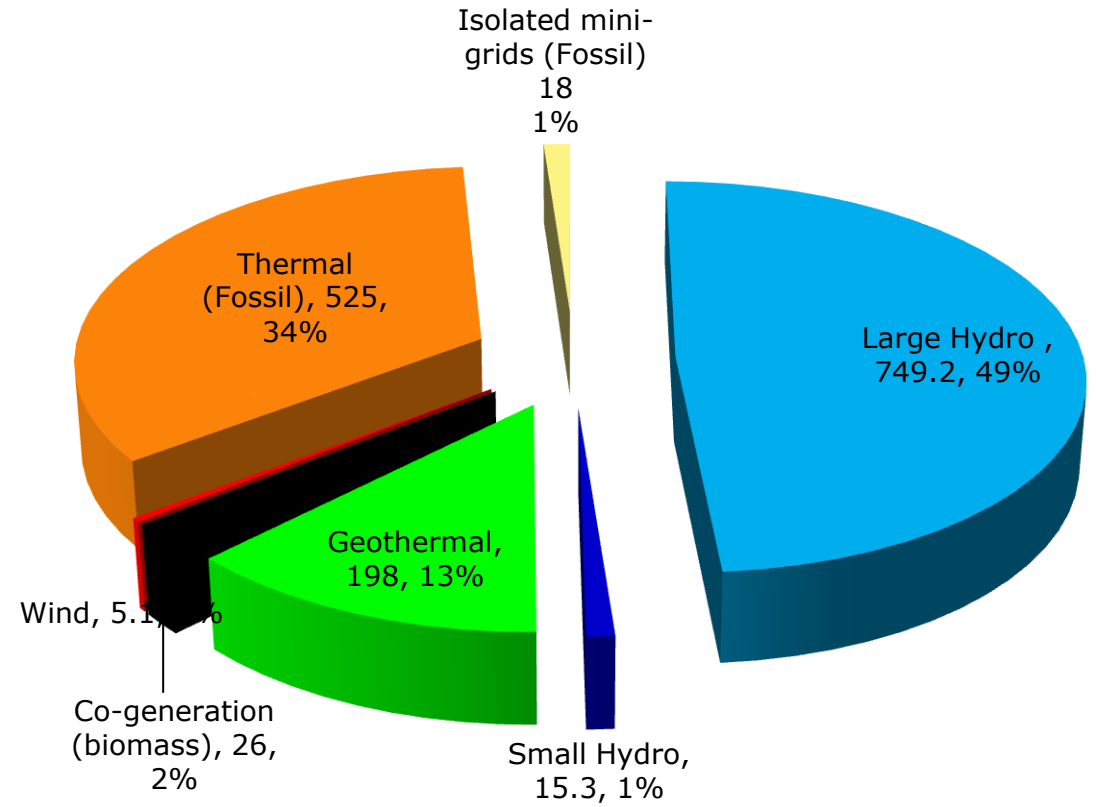
- Power sector unbundled - generation, transmission and distribution
- Market liberalized – 6 IPPs + 1 Public generator.
- Electricity peak demand - 1,191 MW
- Effective installed capacity - 1,429 MW (under normal hydrology)
- 1 national grid and 14 isolated mini-grids
- Connectivity – 23%





Power Mix and Costs

- Base load generation is hydro and geothermal
- Climate change effects have led to unreliability of hydro generation
- Expensive thermal power plants used for base load leading to high tariffs
- Average tariff ~15 US cents/kWh
- Cross –subsidy
- Government subsidizes emergency power to keep tariffs reasonable
- Per capita consumption ~ 134 kWh

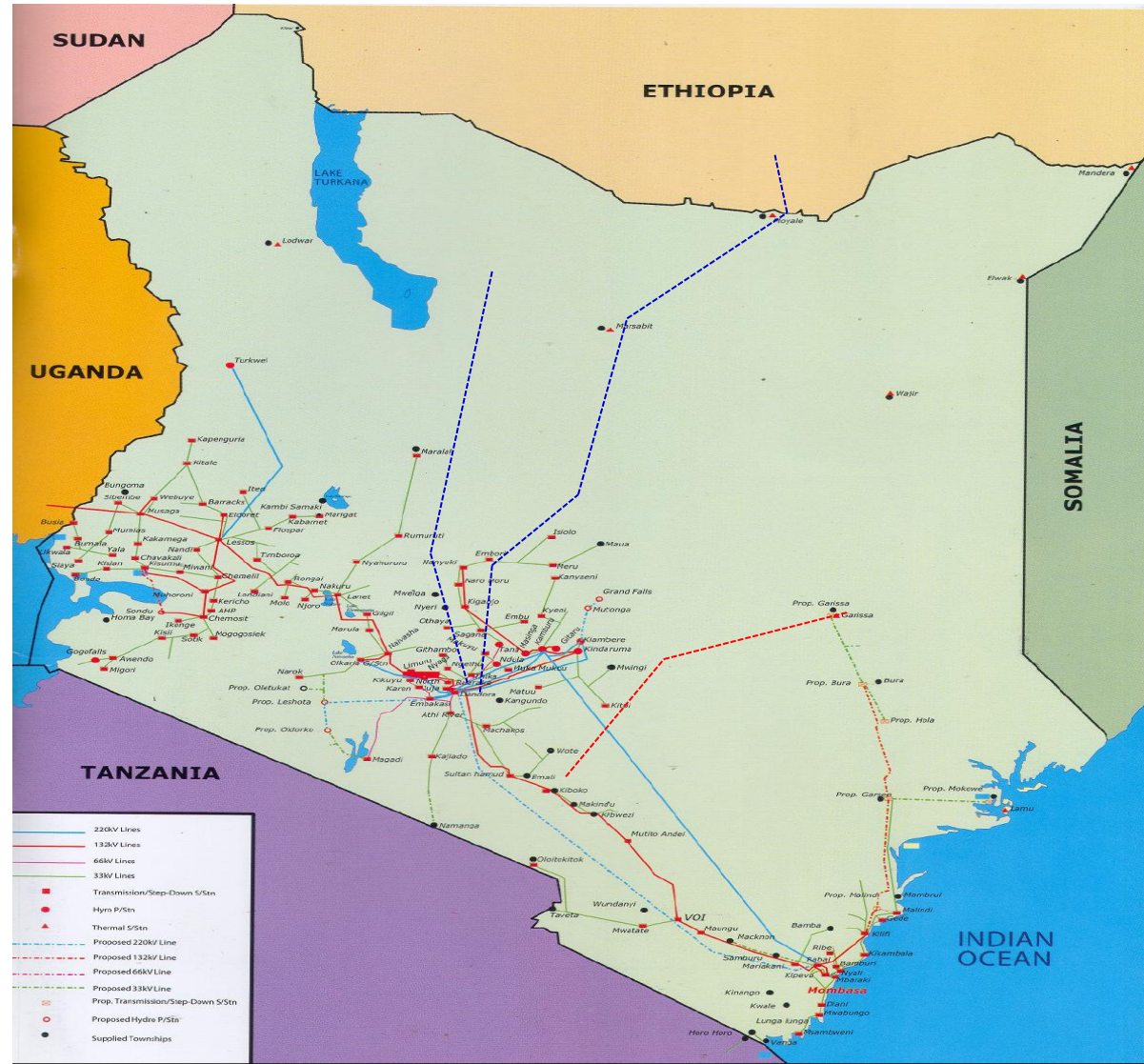


Power mix for main grid and isolated mini-grids



Grid Map

- National grid covers only about 25% of the country
- Grid concentrated only in the south - high potential agricultural areas
- North is Arid and Semi-Arid Lands





Energy Sector Strategy

- Policy objective is to ensure adequate, quality, cost effective and affordable supply of energy through indigenous resources while protecting the environment
- Interventions to accelerate RE development include:
 - Rapid expansion of electricity generation capacity;
 - Developing renewable energy programmes targeting the low income population;
 - Increasing the market penetration of renewable energy systems;
 - Enhancing energy security through diversification of energy sources; and
 - Promotion of energy efficiency and conservation.
- Guiding principle for electricity infrastructure expansion is to promote equitable access to quality energy services at least cost while protecting the environment.



Renewable Energy Sector Context

Government is committed to promoting development of renewable energy resources:

- Feed -In -Tariff Policy
- Wind Atlas developed in 2003; installation of Data Loggers and Wind Masts
- Program for Solar PV installations in public institutions in Arid and Semi-Arid Land areas
- Regulations for Solar Water Heating developed
- Developed Solar Photo Voltaic Systems Regulations
- Carrying out feasibility studies for small hydro power sites
- Promotion of improved cook stoves
- Establishment of Geothermal Development Company
- Green Energy Facility to be set up to finance development of clean energy projects



Feed-in-Tariff Policy

- Allows sale of RE generated electricity to a distributor at a pre-determined fixed tariff for a given period of time (20 yrs).

Technology Type	Plant Capacity (MW)	Max. Tariff (US\$/kWh)	
		Firm Power	Non-Firm Power
Geothermal	Up to 75	0.85	-
Wind	0.5-100	-	0.12
Biomass	0.5-100	0.08	0.06
Small Hydro	0.5-0.99	0.12	0.10
	1-5	0.10	0.08
	5.1-10	0.08	0.06
Biogas	0.5-100	0.08	0.06
Solar	0.5-10	0.2	0.1



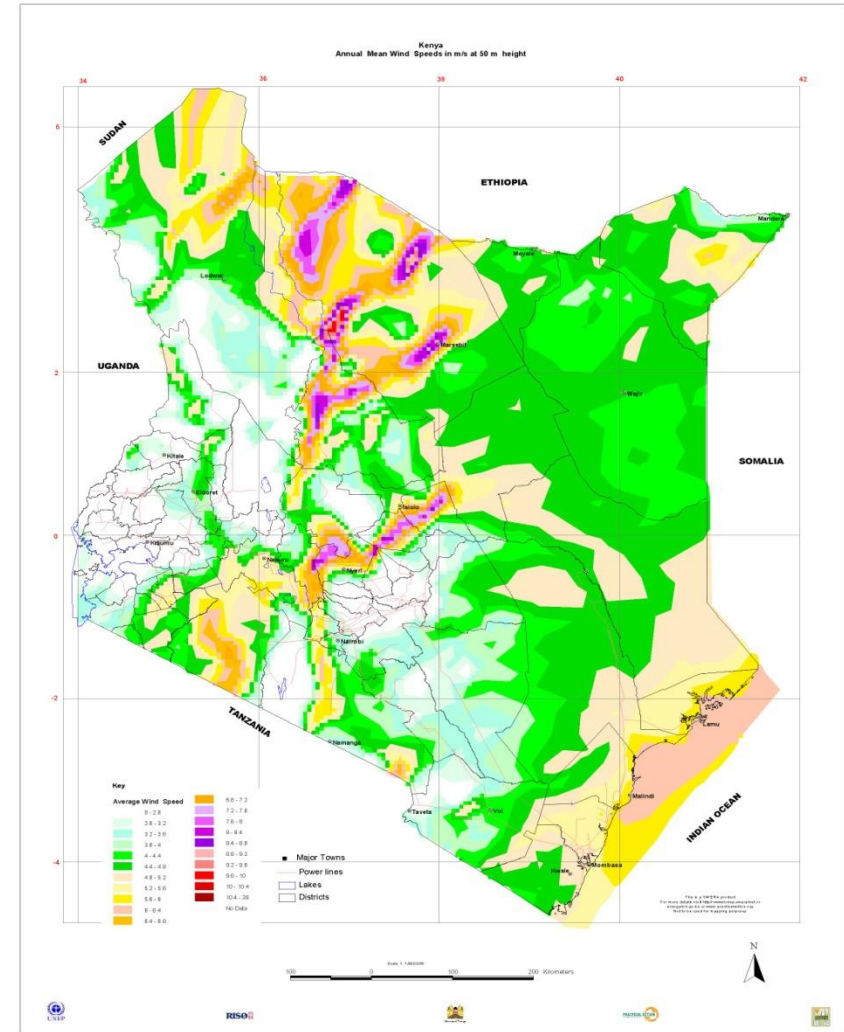
Overview of Renewable Energy Resources - I

Wind

- Potential as high as 346 W/m^2 in some parts of the country
- Current installed capacity 5.1 MW
- 20 Proposals for installation of 1,008 MW under FITs approved and 300 MW under negotiated terms

Small Hydro

- Potential 3,000 MW;
- 15.3 MW exploited and grid connected ; other exploited capacities under private and community grid systems especially in tea estates
- 16 Proposals of 81 MW under FITs approved





Overview of Renewable Energy Resources – II

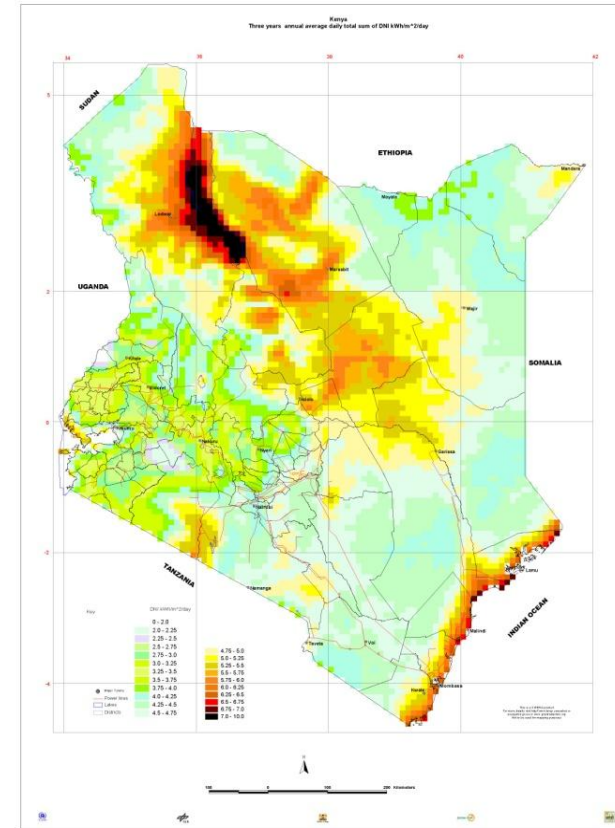


Solar

- Daily insolation 4-6 kWh/m²
- Government targeting use of Solar PV Technology to supply isolated mini-grids
- Approximately 8 MW of Domestic Solar PV installation
- Estimated Solar Water Heating Units currently in use – 140,000

Biomass

- Provides for more than 85% of rural household energy needs
- Forest cover less than world recommended 10% largely due to land use activities and overdependence on woodfuel
- Approximately 20,000 institutions consuming ~270 tons each of woodfuel per year
- Total potential for cogeneration using sugarcane bagasse – 193MW, however only 35MW are exploited



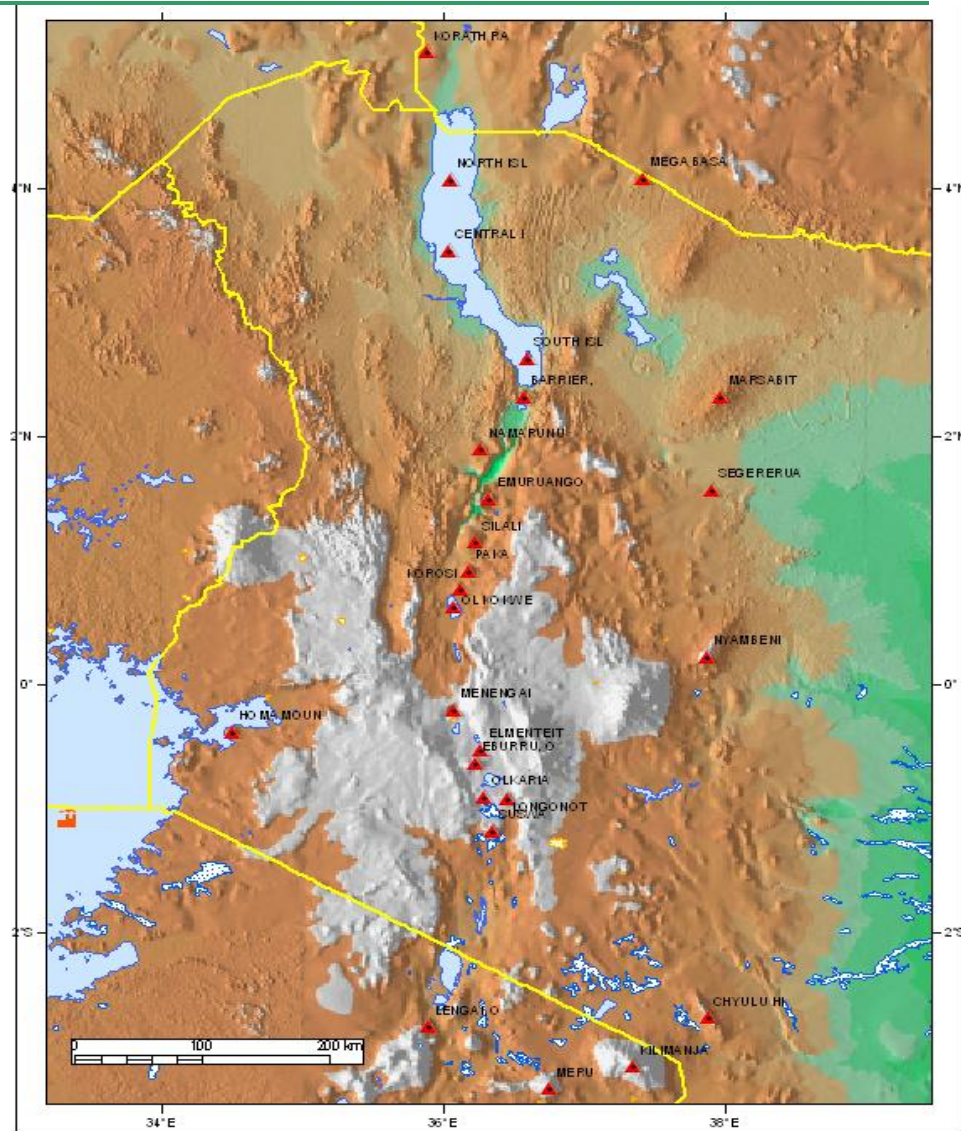


Overview of Renewable Energy Resources – III



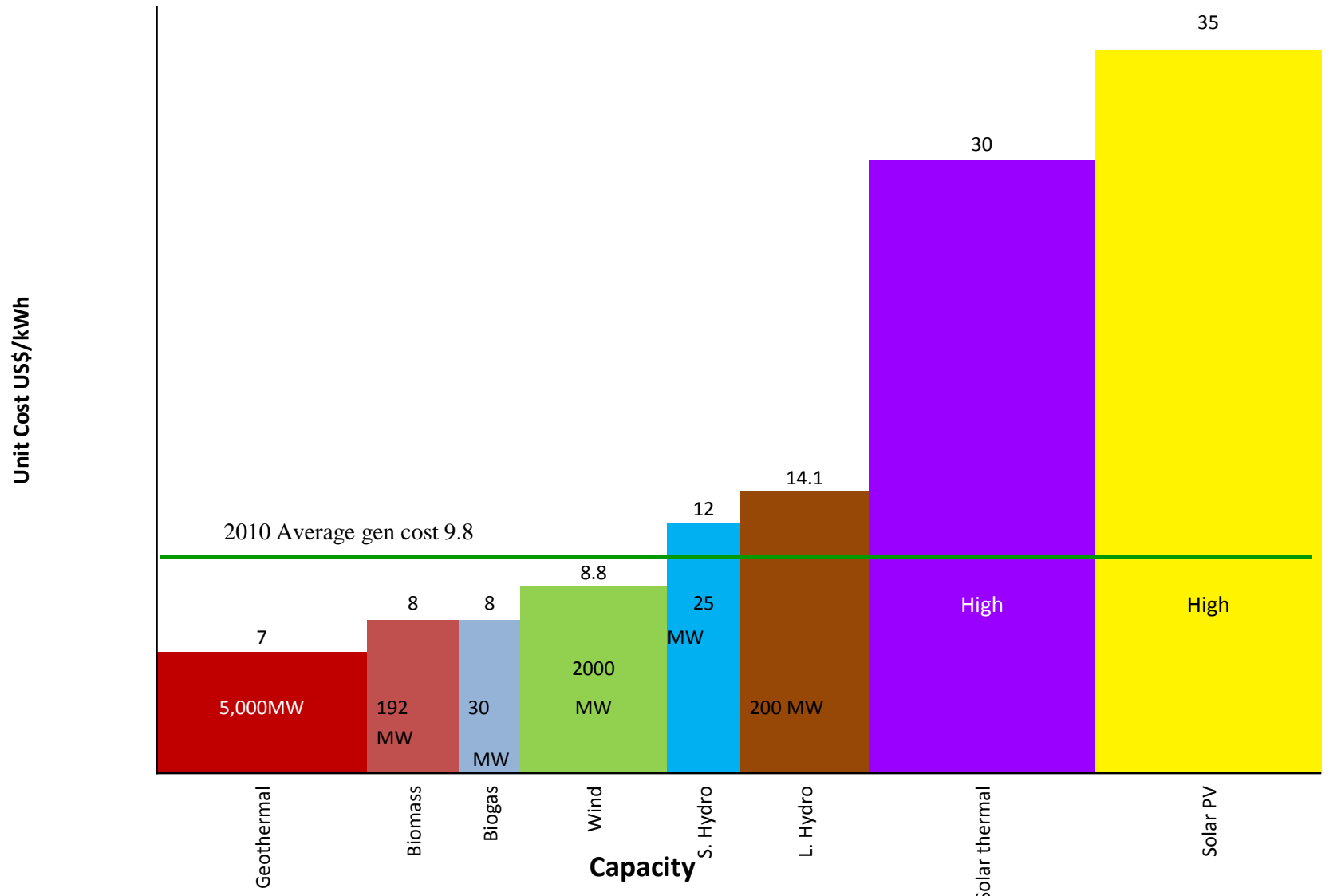
Geothermal

- Advantages: Green; Unaffected by climate variability ; High plant availability ; Indigenous
- Potential estimated at 7,000 – 10,000 MW
- Prospecting began in 1950s
- First plant (45 MW) commissioned in 1985
- Currently 202 MW: KenGen – 150 MW; IPPs - 52 MW;





Cost Comparison of Planned Resource Exploitation - 2030





Power Sector Challenges

- Inadequate supply due to slow rate of capacity addition and high demand growth
- Over-reliance on hydropower
- High cost of power
- Weak transmission and distribution network
- Long lead times in the development of power infrastructure
- Low private sector investments in power sector
- Heavy dependence on fossil fuels for electricity supply in remote rural areas.
- High cost of rural electrification
- Low countrywide electricity access and connectivity



Rationale for SREP

- GoK planning a major expansion of energy access to support planned higher levels of economic growth while committed to reducing the impact of the energy sector on climate change.
- Business as usual scenario of current hydro/thermal will result on an insecure and expensive system likely to increase production of GHG and yet there is abundant renewable energy resources to be developed
- A programmatic approach to long-term transformation of Kenya's power system is required toward expanded use of renewable energy, resulting in reduced GHG.
- IP focuses on investments and capacity-building likely to catalyze additional financing and attract private sector investment
- GoK requires external support to accelerate the development of both energy access and environmental objectives
- SREP necessary to support GoK programmes by designing innovative business models to finance high-risk high-reward projects



IP Development Process

Scoping Mission - February 7 – 11, 2011

Launch of IP Preparation ; Constitution of Task Force; Stakeholder Consultation

Draft Investment Plan

Preparation March 1 – April 11, 2011; Circulation – April 12, 2011

Receipt of Comments – April 12 - 27, 2011

Joint MDB Mission – May 3 -12, 2011

National Stakeholders Workshop – May 6, 2011

Technical Workshop May 8, 2011

Update of Investment Plan - May 17 – 20, 2011

Circulation and disclosure on Government Website – May 23, 2011

Peer Review and Joint MDB Comments June 12, 2011

Presentation to SREP Sub-Committee – June 21, 2011



Program Description

- Project Identification
 - Energy sector stakeholder s' consultations
 - Proposed and ongoing Government programs – LCPDP, Rural Electrification Master Plan
- Identified Projects
 - Hybrid Mini-Grid Systems
 - Solar Water Heating
 - Small Hydro Power Development
 - Scaling Up Improved Biomass Cookstoves in Institutions
 - Development of 200 MW of Geothermal



Selection Criteria for SREP Projects

Criteria	Hybrid Mini-Grid Systems	Solar Water Heating	Small Hydropower Development	Scaling Up Improved Biomass Cook Stoves	Development of 200 MW of Geothermal
Potential to scale up	High	High	Medium	Low	High
Potential for new direct beneficiaries	Medium	Medium	Low	High	High
Cost effectiveness	High	High	High	High	High
Contribution to base load/Strategic relevance	High	High	Low	Low	High
Leveraging for additional resources	Medium	Medium	High	Low	High
Avoiding duplication/crowding out	High	Medium	Medium	Low	Medium
Project readiness (e.g. availability of studies)	High	High	Medium	High	High
Aggregate Score	19	18	14	13	20

Key: High= 3; Medium = 2; Low = 1



Projects - Geothermal

- **Objective:** accelerate the shift to geothermal-based power as the main source of grid-based electricity.
- **Expected Result:** reduced development time for 200 MW of geothermal power capacity in 5 years compared to between 11 and 30 years in the past.
- **Means of Achievement:** channeling funds that are not merely additive to geothermal financing but play a major catalytic role in scaling up the resource base to finance more than ten-fold increase in capacity between 2015 and 2030 through demonstration of a replicable, business model for public-private partnerships.

- **Focus of SREP Funds:**

Phase A:

- **Post-exploration activities to minimize risk perception of the private sector:** well drilling, steam-field development etc in greenfield Menengai geothermal field.
- **Capacity-building for GDC** in resource confirmation, marketing geothermal steam, and contracting with private sector players.

Phase B:

- **Mobilization of financing for power plant** -- 200 MW of capacity in Menengai.
- **Construction of transmission infrastructure**, including transmission line and substations, “way leave” acquisition and a resettlement plan.



Projects - Expansion of Hybrid Mini-grids

- **Objective:** support scale-up of the ongoing program for the expansion of piloting hybrid mini-grids in rural areas.
- **Expected Result:** (a) installation of 3 MW of renewable energy systems (solar and wind) in facilities with existing diesel generators, (b) a replicable business model for installing an additional 27 hybrid mini-grids, amounting to 13 MW; (c) reduced GHG emissions in rural electrification.
- **Means of Achievement:** pilot, private-sector operation of either the mini-grids themselves or renewable energy generators as IPPs; evaluation of the lessons learned in the pilot projects; and design of a replicable model for scale up.
- **Focus of SREP Funds:** development of the detailed design and implementation modalities of the proposed hybrid mini-grid projects and the installation of equipment.



Projects - Solar Water Heating Market Expansion

- **Objective:** develop market incentives to scale up solar water heating (SWH) systems for industrial, commercial, and residential buildings in compliance with government regulations.
- **Expected Result:** installation of at least 50,000 SWH systems, lower peak load, and less use of fossil fuel-based peaking capacity.
- **Means of Achievement:** increased public awareness of the benefits of SWH systems; establishment of a financing scheme centered on a local bank to invest in and manage a SWH Fund; and building of technical capacity to install and maintain these systems.
- **Focus of SREP Funds:** guarantee financing from the bank to end users and also cover transaction costs of setting up the fund.



Financing



	Activity	GoK	SREP	AfDB/ WBG	Development Partners / Commercial Loans	Private Investors	Financing Gap	Total (MUS\$)
SREP INITIAL ALLOCATION	200 MW of Geothermal - Phase A							
	Resource Development	126.0	40.0	234.0				400.0
	Hybrid Mini -Grid Systems	1.0	10.0	10.0	42.0	5.0		68.0
SREP RESERVES	200 MW of Geothermal - Phase B							
	Power Plant Construction		14.6	75.0	200.0	100.0		385.6
	Transmission & Substations		10.4					10.4
	Solar Water Heating Component	1.0	10.0	2.0			47.0	60.0
	Total	128.0	85.0	321	242.0	105.0	47.0	928.0



SREP Transformative Impacts

- **Geothermal**
 - **Initiation of a business model** for making private sector investment the driver of geothermal power development, creating a competitive market for renewable energy.
 - **Low-carbon expansion of grid-based power**, through the business model, resulting in more secure, less costly and more environmentally friendly source of power for electricity access expansion.
 - **Increased access to the power grid** through renewable energy by increasing the installed capacity of geothermal, lowering generation costs and making electricity more affordable.
 - **Improved infrastructure for attracting investors** due to reduced outages from unavailable hydropower.
 - **Transformation of the local economy** in the Menengai area through infrastructure development (power, roads and water) and opportunities for industrial and agricultural application of geothermal steam.



SREP Transformative Impacts

■ Hybrid Mini-Grids

- Partial / full displacement of diesel-fired generators with solar or wind energy reducing, dependence on expensive and CO2-intensive fossil fuels.
- Low-carbon impact of increased remote electricity access through greater renewable energy content of power facilities in remote rural areas.
- Poverty reduction through enhanced business opportunities and improvements in the quality of education and health care, made possible by electricity.

■ Solar Water Heating

- More business opportunities in the private sector resulting from capacity building to expansion of the solar energy industry in the fields of installation and maintenance as well as marketing/sales.
- Reduced peak demand and the consequent need for expensive fossil-fuel fired peaking power plants.
- Lower GHG emissions resulting from reduced peak demand.



Monitoring & Evaluation

22 Indicators proposed:

Quantitative Indicators

Indicator	Baseline (2010)	Target
Increase in number of women and men supplied with electricity	1.5 million	2.2 Million (2015)
Decrease in GHG emissions	0	1,061 tCO ₂ /year
Increased RE supply	0	400 MW (2015);5,110 MW (2030)

Qualitative Indicators

- Improved enabling environment for RE production and use
- Increased economic viability of renewable energy sector
- Transformed energy supply and use by poor women and men in Kenya, to low carbon development pathways



Next Steps

- July: Incorporation of SREP Sub-Committee's feedbacks on the draft IP, and submission of final IP to SREP Sub-Committee for endorsement;
- August: Preparation of detailed investment proposals, financing plans, and required environmental and social impact analyses; and
- August/September: Project Preparation Joint Mission by MDBs.



THANK YOU

