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Contribution of Kenya

to the CSTD 2017-18 priority theme on ‘The role of science, technology and innovation to increase substantially the share of renewable energy by 2030’

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PRIORITY THEME 1; THE ROLE OF SCIENCE, TECHNOLOGY AND INNOVATION TO
INCREASE SUBSTANTIALLY THE SHARE OF RENEWABLE ENERGY BY 2030.

POLICIES IN KENYA THAT ENCOURAGE RENEWABLE ENERGY PROJECTS

Introduction

The process of formulating a National policy that gave birth to the strategies outlined below entailed comprehensive audits of various laws, regulations, administrative procedures, government guidelines and circulars relating to energy; within stakeholders forums. All the energy sector organizations carried a situational analysis and prepared a position paper that formed the basis for the initial draft of the policy which was then shared and discussed with stakeholders at National and County government levels.

THE STRATEGIES

1. GEOTHERMAL

Strategies

- i. Support and fund geothermal resource assessment and development so as to manage the geothermal exploration risk and attract investors.
- ii. Promote research, development and capacity building for geothermal development by providing fiscal and other incentives.
- iii. Streamline licensing and allocation of geothermal blocks with incentives and sanctions in order to accelerate geothermal development.
- iv. Package incentives through attractive pricing to promote and encourage direct uses of geothermal resources such as utilization of heat, water, gases and minerals.
- v. Enforce compliance with the regulatory requirement to utilize the best available technologies that optimize the resource and conserve the reservoir
- vi. Promote early geothermal generation through implementation of efficient modular geothermal technologies.

2. HYDROPOWER

Strategies for big hydros

- i. Develop a hydro risk mitigation mechanism to address risks such as prolonged droughts so as to cushion generators, transmitters, distributors and consumers against effects of adverse hydrology.
- ii. Establish a coordinated approach for the management of water reservoirs.
- iii. Develop a framework for coordination for use of water resource against various interests.

- iv. Finance conservation of hydro power water catchment areas.
- v. Implement hydro power projects as multipurpose projects.
- vi. Invest in increased storage capacity for hydro power reservoirs.
- vii. Finance pre-feasibility studies for identification of potential hydropower sites.

Strategies for Small hydros

- i. Finance conservation of hydro power water catchment areas
- ii. Provide incentives for public private partnerships in small hydros.
- iii. Invest in hydrological data collection, management and dissemination
- iv. Promote development of capacity and knowledge on usage of appropriate technologies
- v. Formulate and enforce standards, legal and regulatory regimes for small hydros

3. BIOMASS

Strategies

- i. Undertake a comprehensive base line study on biomass energy resources and potential, and establish status of tree cover in the country.
- ii. Develop, update and disseminate information on biomass energy resources.
- iii. Formulate and implement a national strategy for coordinating subsistence and commercial biomass production.
- iv. Promote efficient conversion and cleaner utilization of biomass energy.
- v. Promote the use of biomass briquettes as alternatives to wood fuel.
- vi. Provide incentives for private sector participation in conversion of waste to energy initiatives to reduce overreliance on Biomass energy
- vii. Undertake public sensitization and awareness programmes to enhance participation in the management, protection and conservation of the environment
- viii. Promote alternative sources of energy and technologies such as LPG, biogas and solar as substitutes for biomass.
- ix. Collaborate with other relevant ministries and stakeholders to promote sustainable afforestation programmes.
- x. Collaborate with other stakeholders to ensure efficient use of land resource for biomass, food production and other human needs.
- xi. Undertake and promote Research, Development and Dissemination (RD&D) of biomass energy technologies.

4. BIOFUELS

Strategies

- i. Undertake RD&D on biofuel feed-stock
- ii. Review the existing legal, fiscal, regulatory and institutional framework
- iii. Provide incentives for biofuel production projects and consumption
- iv. Collaborate with other stakeholders to ensure efficient use of land resource for biofuel feed-stock, food production and other human needs

- v. Create stakeholder awareness and sensitization on the importance and viability of biofuel production and consumption
- vi. Implement the bioethanol pilot program
- vii. Initiate and implement biodiesel blend pilot program

5. BIOGAS

Strategies

- i. Develop and implement public awareness programs on the benefits and potential of biogas technology
- ii. Undertake and promote R&D of biogas energy technologies
- iii. Provide appropriate fiscal incentives for local manufacture of biogas plant and equipment, large scale production, storage and distribution
- iv. Initiate capacity building programs on biogas technology in learning institutions
- v. Develop and enforce legal and regulatory requirements on biogas
- vi. Support domestic and community based biogas plants among urban, rural population and institutions
- vii. Promote the use of biogas as an alternative to wood fuel and kerosene for domestic and commercial energy needs
- viii. Roll out biogas initiatives to supply the remaining public institutions including prisons, schools and hospitals as well as biogas bottling plants across the country.

6. SOLAR

Strategies

- i. Undertake awareness programs to promote the use of solar energy
- ii. Enforce regulations on standards
- iii. Undertake regular review of standards for solar energy technologies and equipment
- iv. Provide incentives to promote the local production and use of efficient solar systems
- v. Enforce regulations on building codes on water heating and lightning
- vi. Provide a framework for connection of electricity generated from solar energy to national and isolated grids, through direct sale or net metering
- vii. Enhance penalties for theft and vandalism of solar systems
- viii. Support hybrid power generation systems involving solar and other energy sources to manage the effects caused by the intermittent nature and availability of solar energy
- ix. Roll out installation of solar PV systems in all the remaining public facilities in the off grid areas
- x. Procure and distribute solar lanterns to light up rural, peri-urban and urban areas
- xi. Undertake R&D on solar technologies.

7. WIND

Strategies

- i. Develop institutional capacity for wide spread use of wind energy
- ii. Continually review and enforce regulations and standards for wind energy technology
- iii. Collect and compile wind energy data and update the wind atlas
- iv. Provide incentives for wind energy development
- v. Support hybrid power generation systems involving wind and other energy sources
- vi. Provide a framework for connection of electricity generated from wind energy to national and isolated grids, through direct sale or net metering
- vii. Plan and invest in transmission lines to facilitate evacuation of power from areas with high wind potential to major load centres
- viii. Undertake Research Development and Dissemination (RD&D).

8. MUNICIPAL WASTE

Strategies

- i. Develop and implement legal and regulatory framework for exploitation of municipal waste
- ii. Develop and implement a framework for collaboration to manage and exploit the municipal waste.
- iii. Develop programs for data collection and dissemination on the potential of municipal waste.
- iv. Provide incentives for conversion of municipal waste to energy
- v. Undertake pilot programmes for the generation of electricity using municipal and industrial solid waste
- vi. Provide integrated solid waste management plan and roadmaps

9. CO-GENERATION

Strategies

- i. Provide incentives for investment in efficient and emerging cogeneration technologies.
- ii. Promote community programmes and projects in production and supply of agro-waste.
- iii. Support co-generators in implementing capacity building programmes in cogeneration technologies.
- iv. Carry out public awareness and sensitization programmes in cogeneration.
- v. Formulate and implement a national strategy for coordinating development of co-generation.
- vi. Undertake R&D in co-generation technologies
- vii. Support PPP arrangements to accelerate investment in cogeneration
- viii. Formulate and implement information dissemination strategy to investors on issues relating to licensing, taxation and feed in tariff policy
- ix. Develop and implement regulatory framework for certification of cogeneration project

10. FEED-IN TARRIFS

Strategies

- i. Encourage the private sector through Feed-in-Tariff to develop potential sites to generate electricity for their own consumption and for export of any surplus to the national grid.
- ii. Formulate and implement promotion campaigns to attract potential investors.
- iii. Periodic review and implementation of FIT policy
- iv. Undertake periodic studies on the capital expenditures and operating costs of the different types of technologies and develop sufficient analytical tools to inform the level of tariffs for different technologies
- v. Develop and regularly review model power purchase agreements for the various modes of generation
- vi. Provide capacity building programs and financial assistance to community based projects
- vii. Expand the scope of FiT to include emerging technologies.

11. OTHER RENEWABLES

(ocean energy, biomass gasification, bio-refinery technologies and concentrating solar power)

Strategies

- i. Develop and implement legal and regulatory framework
- ii. Carry out RD&D on potential of emerging renewable energies
- iii. Provide incentives for exploitation and utilization of emerging renewable energy technologies.

12. CROSS CUTTING ISSUES

(Cross- cutting issues in renewable energy related to land, environment, health and safety)

- i. Establish inter-ministerial Renewable Energy Resources Advisory Committee
- ii. Establish an Agency to act as “One Stop Shop” for information and guidance to investors on renewable energy projects.
- iii. Facilitate Partnership with potential financing institutions to enable the public to access credits schemes.
- iv. Develop regulations for net metering to facilitate and encourage sale to the grid of electrical energy generated from renewable energy systems.
- v. Develop and implement master plan for renewable energy
- vi. Incentivize community based power generation
- vii. Partner with relevant institutions to support green energy certification schemes
- viii. Develop and implement resettlement action plans (RAP)
- ix. Enhance the capacity of the system operator to manage power supplies from intermittent energy sources

13. ENERGY EFFICIENCY AND CONSERVATION

Strategies

- i. Develop and implement sustainable, awareness and sensitization programmes on energy efficiency and conservation.
- ii. Implement energy efficiency and conservation initiatives in all sectors.
- iii. Develop and implement guidelines for carrying out of energy audits and advisory services in the counties.
- iv. Develop and enforce minimum energy performance standards (MEPS) and rating labels for energy efficiency and conservation equipment.
- v. Develop and implement a regulatory framework to provide for incentives and penalties to reduce high losses in generation, transmission and distribution.
- vi. Provide appropriate fiscal and other incentives to enhance uptake of energy optimization technologies
- vii. Establish Energy Efficiency and Conservation Agency (EECA) to champion and spearhead energy efficiency and conservation activities.
- viii. Enforce building codes to enhance the concept of green design in buildings.
- ix. Adopt the use of new and efficient technologies in energy efficiency and conservation.
- x. Develop, disseminate and implement a National Energy Efficiency and Conservation Plan
- xi. Undertake research and development in energy efficiency and conservation.
- xii. Collaborate in the preparation of education curricula on energy efficiency and conservation.
- xiii. Implement international co-operation programmes in energy efficiency and conservation.
- xiv. Collaborate with the private sector in energy efficiency and conservation.

14. LAND AND SOCIAL ECONOMIC ISSUES

Strategies

- i. Provide linkages with provisions of the National Land Policy, which provide a framework for access, planning, utilization and administration of land in the country
- ii. Collaborate with the relevant agencies to review and set rates payable for compensation in respect of damage caused by the renewable energy sector players.
- iii. Ensure compliance with the environmental laws on restoration and decommissioning of projects.
- iv. Collaborate with other land regulatory agencies to ensure that renewable energy infrastructure corridors are provided for in the national plan.
- v. Ensure enforcement of legal provisions on encroachment and obstruction of renewable energy infrastructure.
- vi. Develop and enforce a legal and regulatory framework on encroachment and trespass on energy and petroleum infrastructure.

- vii. Develop and implement a national Resettlement Action Plan Framework for renewable energy projects.

15. ENVIRONMENT, HEALTH AND SAFETY

- i. Develop and implement a legal and regulatory framework for enforcement of environmental rights.
- ii. Develop and implement a compliance mechanism for safety and environmental pollution.
- iii. Develop and implement Strategic Environmental Assessment (SEAs) for the renewable energy sector.
- iv. Enforce compliance with business and operating standards.
- v. Develop mechanism and strategies to empower consumers to convert to modern clean renewable energy technologies.
- vi. Empower sector regulator through adequate financial and human resource to facilitate their leadership in environmental, health, safety and quality enforcement in the renewable energy sector.
- vii. Mainstream ecosystem and biodiversity management in renewable energy sector.
- viii. Carry out public education sensitization programmes on benefit of renewable energy
- ix. Provide incentives for use of clean modern household renewable energy to eliminate the use of wood-fuel, charcoal and kerosene as an energy source
- x. Provide incentives for the uptake of renewable energy technologies
- xi. Enforce the regulatory framework for wood fuel and commercial woodlots production
- xii. Spearhead the national afforestation programme aimed at increasing the national tree cover percentage
- xiii. Support and promote conversion of cook stoves to uptake modern and clean fuels in households and institutions

16. CLIMATE CHANGE AND MITIGATION

Strategies

- i. Support the development and implementation of the national policy on climate change
- ii. Facilitate capacity building for participation in international climate change negotiations.
- iii. Formulate a collaborative framework for the implementation of climate change mitigation initiatives.

17. DISASTER PREPAREDNESS, PREVENTION AND MANAGEMENT

Strategies

- i. Establish a Disaster Preparedness, Prevention and Management (DPPM) Unit to spearhead response to accidents and disasters in the renewable energy sector.
- ii. Undertake a risk assessment of the renewable energy sector and implement the risk mitigation programmes.

- iii. Undertake capacity building programmes.
- iv. Enforcement of legal and regulatory requirements.
- v. Develop and implement a disaster preparedness, prevention and mitigation policy.
- vi. Provide security for all renewable energy installations, which shall be gazetted as national protected zones.
- vii. Formulate a framework for weather and climate data collection and dissemination with the Metrological department.
- viii. Establish and implement hazard monitoring systems in collaboration with other statutory authorities for disaster prevention and mitigation.

18. ENERGY FINANCING

Strategies

- i. Explore and adopt all viable financing options from local and international sources to ensure cost effective utilization of all locally available energy and petroleum resources.
- ii. Create a competitive and predictable investment climate in the country to attract investments in the renewable sector.
- iii. Provide adequate fiscal incentives for renewable energy and infrastructure development.
 - a. to attract investment in renewable energy across the country;
 - b. to encourage adoption of clean and efficient renewable energy technologies.
- iv. Support investment in renewable energy through PPP arrangements.
- v. Dedicate not less than two percent of the income from energy (including renewable energy) to support training, research, development and demonstration.
- vi. Ensure a reasonable return on investments through cost reflective pricing.
- vii. Develop adequate infrastructural facilities to help enterprises involved in the development of the renewable energy
- viii. Liaise with the National Treasury to enhance the internationalization of Kenya's Capital Market by encouraging financial instruments and stocks of Kenya's renewable energy corporate units to be quoted in international financial markets to attract foreign portfolio investment capital.
- ix. Expand the scope of venture capital financing to include investments in the geothermal power sector.
- x. Review legal frameworks affecting or influencing renewable energy; including the Income Tax Act, (Cap 470), the Customs and Excise Act, (Cap 472) and the Value Added Tax Act, 2013 to provide fiscal incentives in the renewable energy sector
- xi. Provide letters of comfort to private investors and letters of guarantee to state corporations.
- xii. Continuously engage development partners to establish financial facilities for financing renewable energy and related projects at minimal interest rates especially for renewable energy efficiency projects.
- xiii. Seek financing of clean energy projects through carbon credits under clean development mechanism and other financing associated with clean renewable energy.

- xiv. Package attractive investment instruments which will be appealing to alternative investors such as savings and cooperative societies, pension schemes and venture capitalists.
- xv. Support and encourage Public Private Partnership (PPP) to facilitate private sector participation in financing, construction, development, operation and maintenance of renewable energy resources or infrastructure projects, including development of infrastructure for strategic power generation projects.
- xvi. Mobilize funds for developing strategic renewable energy resources through government appropriation, development partners, international financial institutions and strategic stocks bonds

19. COMMUNITY ENGAGEMENTS

Strategies

- i. Develop and implement a legislative framework for pro-active and sustained engagement with the governments, investors and communities in renewable energy resource areas.
- ii. Develop and implement awareness programmes for the communities to enhance constructive engagements process.
- iii. Put in place mechanisms to ensure that environment, health and safety compliance audits are regularly carried out.
- iv. Develop and implement laws and regulations to govern waste disposal and management from renewable energy resources
- v. Develop and implement a monitoring and evaluation mechanism on regular reporting on stakeholders consultations

SUCCESS STORY

GEOHERMAL AS A RENEWABLE ENERGY SUCCESS STORY OF KENYA

Currently Kenya has geothermal power production of about 565MW and aims at producing 1,900MW in the mid-term from geothermal resources whose national potential is estimated to be 10,000MW. So far the main are of exploration and exploitation is within the Rift Valley. Currently 14 potential sites have been surveyed. Further, the Government will encourage investment in the geothermal subsector so as to achieve at least 1,900MW of geothermal electric power generation by 2017 and 5,500MW by 2030, and enhance direct use of the resource. Kenya targets to produce 20,000MW by 2030-2033 and consume at least 19,200MW of the total electricity generated. This means that out of the total electricity produced Geothermal will constitute at least 27.5%.

Sustainable exploration and exploitation of geothermal resource is managed by Geothermal Development Company Ltd (GDC). To enhance exploitation of the vast geothermal resources that Kenya is endowed with, the Government will continue to fund the Geothermal Development Company (GDC) so as to manage the geothermal exploration risk and attract investors. Geothermal Development Company is a fully owned Government Special Purpose Vehicle (SPV)

that undertakes surface exploration of geothermal fields, explorations, appraisals, drilling, steam production and entering into steam sales agreements with investors in the geothermal electricity generation. Since inception geothermal power exploration and exploitation has undertaken various stages as shown in the table below:

PERIOD	ACTIVITIES
1956-59	<ul style="list-style-type: none"> • Two Exploratory wells drilled to a depth of ~950m • Wells never discharged and later abandoned
1967-70	<ul style="list-style-type: none"> • Government of Kenya and UNDP entered into an agreement to extensively undertake geothermal resource assessment
1971-76	<ul style="list-style-type: none"> • Decision taken to concentrate Geothermal Development at Olkaria area (80km²) • Six wells drilled with positive results
1976-85	<ul style="list-style-type: none"> • Drilling was accelerated and about 23 wells drilled • 45 MW (Olkaria I) commissioned between 1981-198 <ul style="list-style-type: none"> ○ Most financing was from World Bank
1986-98	<ul style="list-style-type: none"> • Drilling continued in Olkaria II Steam field ~ 30 wells by 1992 • Concession given to Orpower 4 company Ltd for Olkaria III field in 1998 <ul style="list-style-type: none"> ○ From 1992, financiers pulled out and no major works undertaken until 1999
1999-2006	<ul style="list-style-type: none"> • Exploratory wells drilled in 1999 in Olkaria IV field • Production drilling & commissioning Olkaria II 70MW in 2003 • Through Government of Kenya funding, appraisal drilling started in 2006
2007-date	<ul style="list-style-type: none"> • Production drilling started in Olkaria I&IV (over 50 wells drilled ~ 300MWe) • Olkaria II 3rd Unit 35MW commissioned • GDC formed in 2009 and drilling in Menengai field started in 2011 • Olkaria I&IV 280MW planned for 2014 • Olkaria Optimization study

Geothermal exploration and exploitation history (Source, Ministry of energy-Kenya)

ENVIRONMENTAL MANAGEMENT

In order to manage the environment GDC carries out Baseline Environmental conditions assessment to determine the in-situ condition and the sensitivity of the area to development. This is followed by costing possible environment impact and mitigation measures as well as potential Social Economic Impacts of the project. Lastly potential Volcano Seismic hazards of the area are determined for final decision making. At the Feasibility study stage a full environmental and Social Impact Assessment (ESIA) with disclosure is done and used as a basis for planning, monitoring and management. At the second stage of environmental management the company puts in Place

and Enforces Sound Field and Environmental Management Procedures. Three key areas of action that follow include: Reservoir monitoring and management including re-injection; Maintaining reservoir pressure and fluid mass recharge; as well rehabilitating disturbed areas. In addition the Company undertakes Community based Corporate Social Responsibility (CSR) program

CURRENT STATUS

The following is the prevailing situation in terms of geothermal power production:

- i. Kenya suffers from inadequate capacity to carry out construction works in the geothermal power sector. The number of local contractors with technical competence and financial capacity to undertake major projects is limited.
- ii. Geothermal power development projects have high risk failure and up-front costs, making them less attractive to private investors at exploratory and resource assessments stages.
- iii. Consensus-building and mutual understanding among stakeholders are crucial to energy development to interlock technical, environment, social, political, economic, and financial goodwill and buy-in by stakeholders.
- iv. The country faces high electricity connection charges and monthly end-user tariffs high exclude the poor from getting access to power while increasing the cost of doing business for commercial and industrial establishments.

STRATEGIES FOR ENHANCING GEOTHERMAL POWER PRODUCTION

- i. Increase budgetary support for energy sector to promote geothermal resources assessment, generation, transmission capacity enhancement and rural electrification expansion as well as general administration
- ii. Promote public private partnerships in the energy sector to attract private sector investments since budgetary support from the government is inadequate.
- iii. Establish fiscal incentives (taxes, duties, levies) and non-fiscal incentives (subsidies, fees, guarantees, credits) and other innovative ways of attracting investments in the energy sector.
- iv. Enhance mutual understanding among stakeholders which is crucial to energy development.
- v. Establish Special Purpose Vehicles (SPVs) to mitigate high up-front risks in energy resource explorations and assessments of commercial viability and capital investments.
- vi. Develop adequate and effective human capacity for project identification, planning and execution to enhance donor funding absorptive capacity.
- vii. Strengthen performance monitoring, accountability and project/program planning systems to improve governance and utilization of resources.
- viii. Undertake periodical review the feed-in-tariffs policy.
- ix. Develop a guiding matrix to simplify negotiations with investors on approval of energy production contracts.

- x. Put in place and enforce stringent measures to deter vandalism and theft of energy infrastructure, products and services.

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