KENYA

SCALING-UP RENEWABLE ENERGY PROGRAM (SREP)

MENENGAI GEOTHERMAL PROJECT

SREP Sub- Committee Meeting, Washington DC

November 1, 2011

Introduction

Kenya and SREP

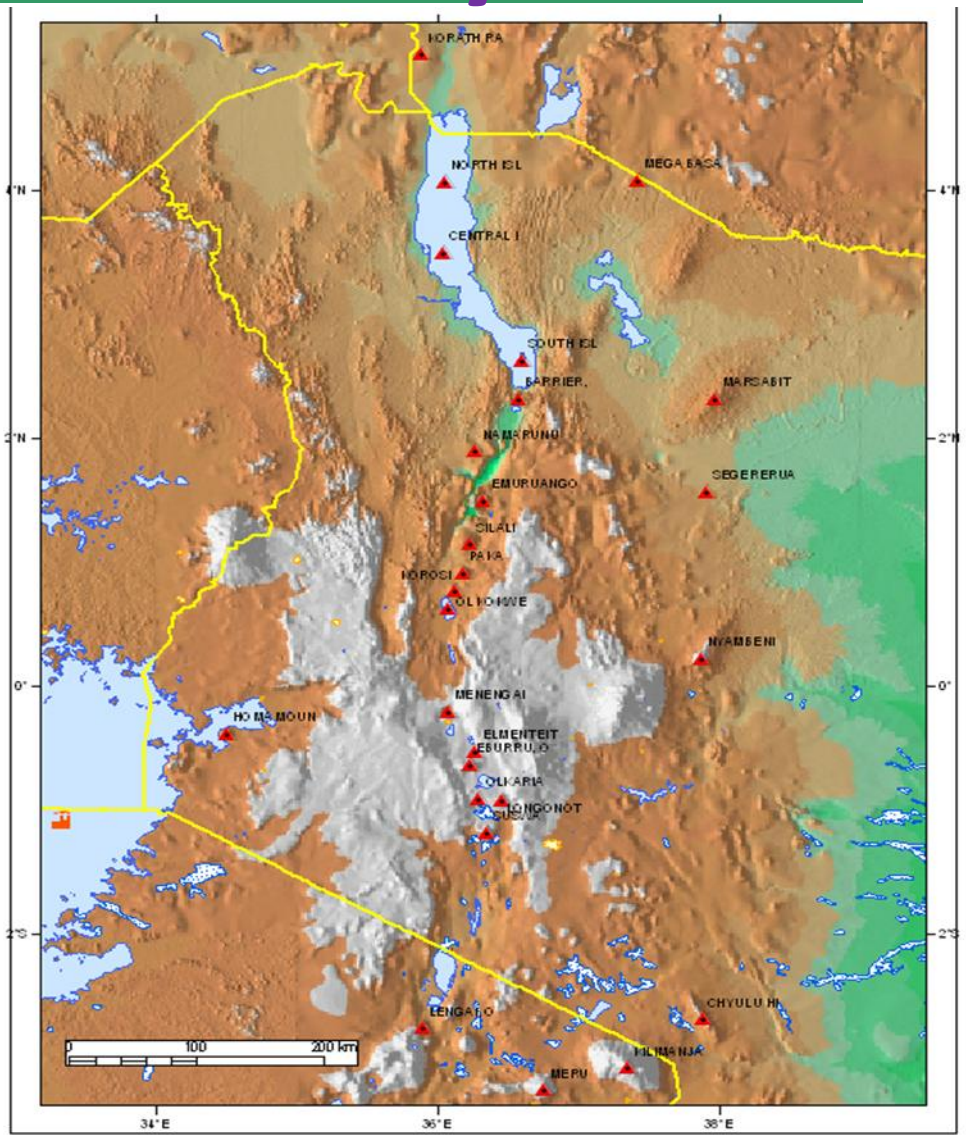
- Kenya is one of the six Pilot Countries selected to benefit from the Scaling-Up Renewable Energy Program (SREP)
- The SREP program will support Kenya's initiatives towards achieving supporting investments in energy efficiency, renewable energy and access to modern sustainable energy
- In addition SREP will spur 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
- SREP will also leverage significant amounts of financing from development partners, such as EIB and AFD, and from private sector investors

Investment Plan

- The Government of Kenya prepared and submitted Investment Plan under the SREP Program on the following projects:
  1) *Scaling up Hybrid Mini-Grid Systems in rural areas to increase electricity access*
  2) *Development of market incentives for Solar Water Heating (SWH)*
  3) *Acceleration of shift to geothermal base load through development of 200 MW of Geothermal*
- Kenya's Investment Plan was presented to SREP Subcommittee on September 8, 2011 and endorsed albeit on condition that a Supplemental Document be prepared to address comments and reviews from Stakeholders.
- Supplemental Document submitted on October 12, 2011 together with the Project Appraisal Report for the 400 MW Menengai Geothermal Project

Geothermal Resources in Kenya

- Potential estimated at 7,000 – 10,000 MW
- Prospecting began in 1950s
- First plant (45 MW) commissioned between 1981 & 1985
- Currently 202 MW: KenGen – 150 MW; IPPs - 52 MW
- **Advantages**: Green; Unaffected by climate variability ; High plant availability ; Indigenous



Electricity Demand Projections

- Current electricity peak demand - 1,191 MW
- Effective installed capacity - 1,429 MW (under normal hydrology)
- 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".
  - *The Vision 2030 envisages a GDP growth rate of 10% starting 2012. Electricity demand to grow in tandem.*
- Least Cost Power Development Plan projects electricity demand of more than 15,000 MW by 2030. It is expected that at least 5,000 MW of geothermal generation to partly meet this demand
- Geothermal most preferred option by Government for supply provision

Sources for Meeting Demand

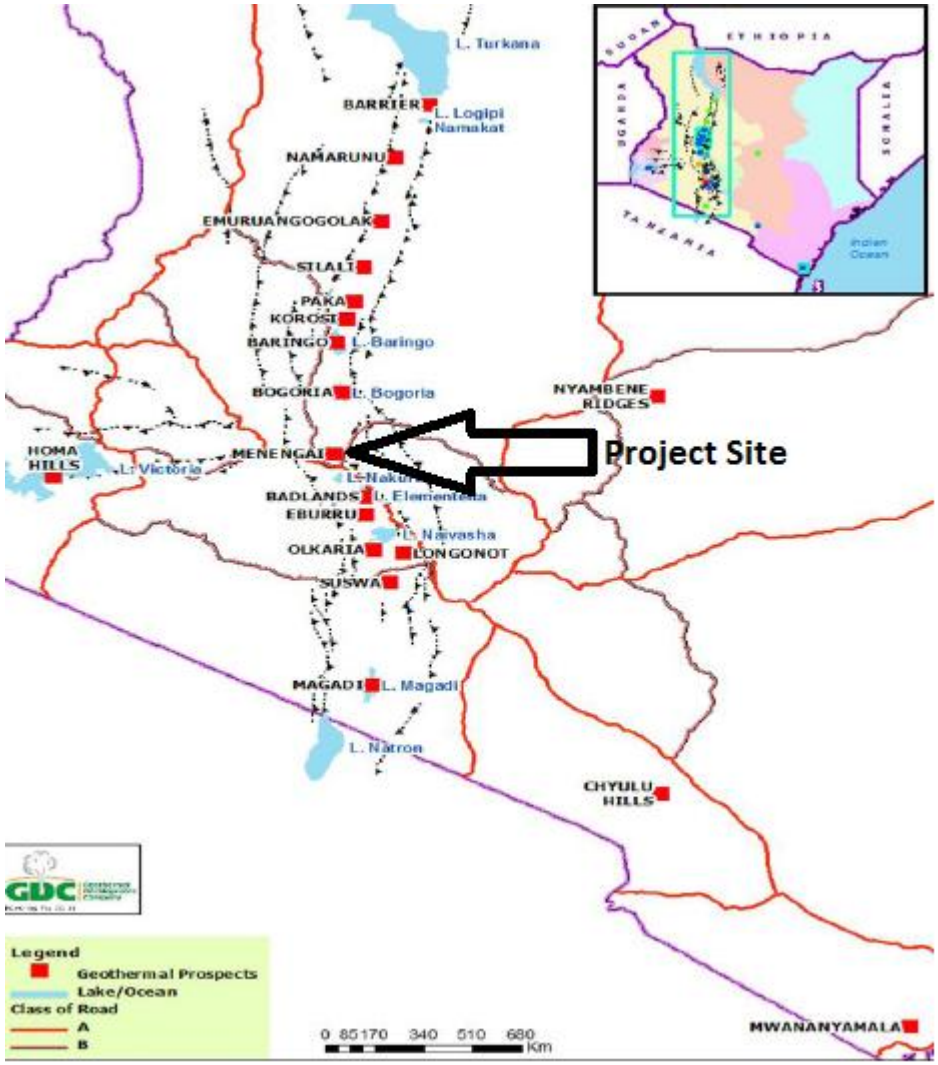
Alternative	Reasons for unsuitability
Hydropower	• Unreliability due climate variability • Limited potential for scale-up
Thermal	• High operation costs; Highly dependent on oil prices; Negative environmental and social impacts.
Coal	• Viability of local deposits not determined; Importing poses shipping logistics; Scale-up potential limited
Wind	• Needs to be backed-up by base load capacity
Solar	• Solar PV mainly for domestic installations
Imports	• National security
Nuclear	• high capital investment and long lead times; security, safeguards and safety issues
Private sector	• Drilling risk is a barrier to private sector investment.

MENENGAI GEOTHERMAL PROJECT

Project Overview

- **Location**: Situated 180 km Northwest of Nairobi within the Eastern sector of the African Rift system in Kenya
- **Objective**: Meeting Kenya's rapidly increasing demand for power; diversify sources of power supply; inject up to 400 MW of electricity from geothermal to the National Grid
- **Target Completion Date:** December 2016
- **Estimated Project Cost:** USD 847 million.
- **Other Project Benefits**:
  - Poverty reduction through employment of local communities
  - Empowerment of women and the girl child through provision of portable water facility to the community

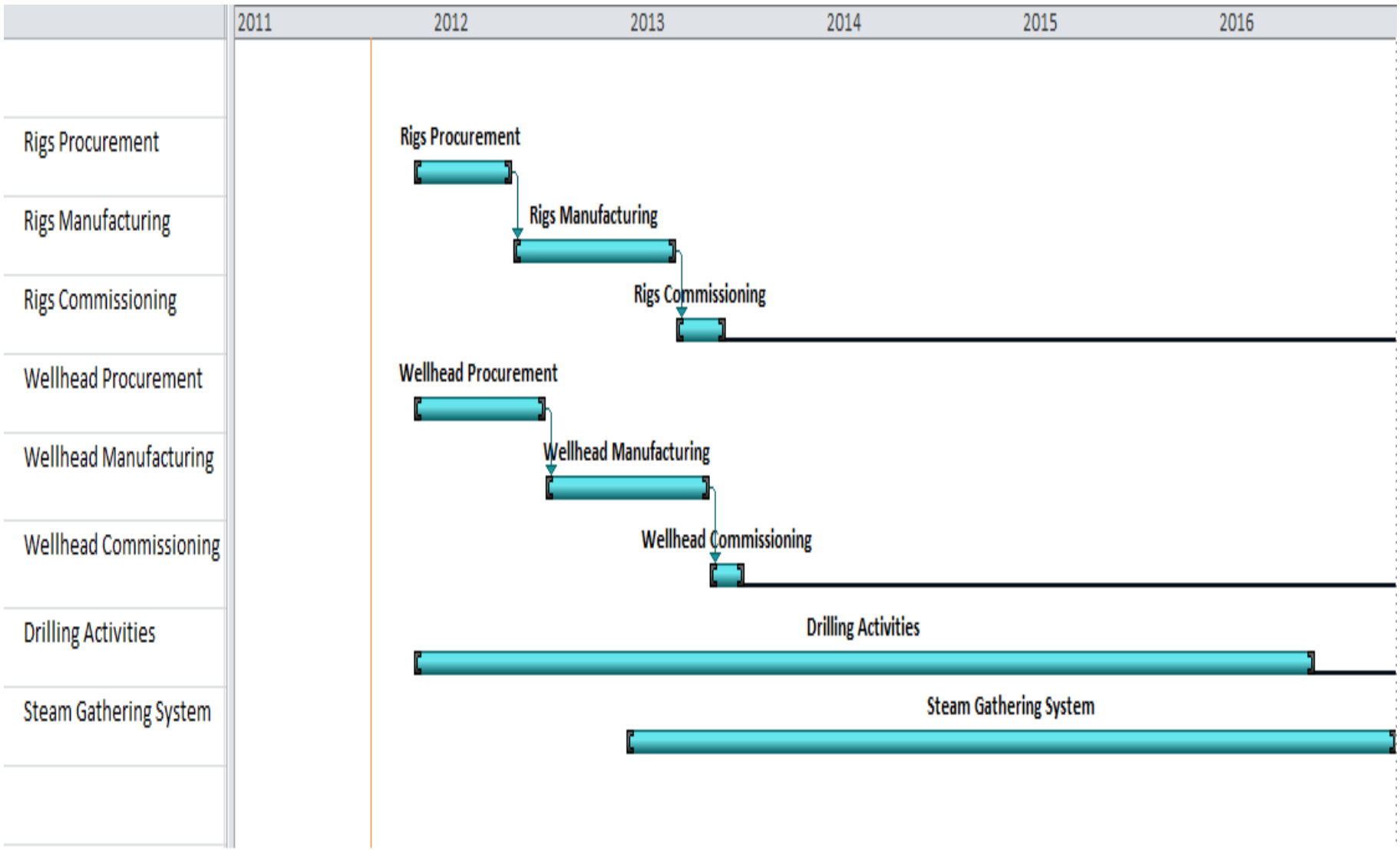
Project Location



Project Components

Component	Component Description
Site civil works	Construction of access roads & water reticulation system
Equipment	Procurement and commissioning of drilling rigs & wellhead generation units
Well drilling	Acquisition of drilling materials; Fuel and lubricants; Transport (materials and personnel); Labour and administrative costs; Spare parts
Steam gathering system	Engineering, procurement and construction of a steam gathering system (EPC)
Consultancy services	Drilling expertise; Slotting services; Feasibility study; Steam gathering supervision consultant; Transaction advisor; Trainings and workshops; Project management and supervision consultant; Audit services
E&S management	Implementation of environmental & social (E&S) management plan

Implementation Schedule



Project Cost by Component

Estimated Cost by Component (Amounts in UA million equivalent)				
Components	**Foreign Currency**	**Local Currency**	**Total**	**% Foreign**
Site preparation	0.00	5.02	**5.02**	0%
Equipment	99.00	0.00	**99.00**	100%
Well drilling	68.57	129.09	**197.59**	35%
Steam gathering system	105.60	0	**105.60**	100%
Consultancy services	39.05	5.15	**44.20**	88%
Environmental and social management	0	0.57	**0.57**	0%
Total base cost	**312.22**	**139.75**	**451.97**	**69%**
Price escalation and contingencies (10%)	31.22	13.98	**45.20**	69%
Total project cost	**343.44**	**153.73**	**497.17**	**69%**

Financing Arrangements

Sources of Financing (Amounts in UA million equivalent)				
Sources of Financing	**Foreign Currency**	**Local Currency**	**Total**	**% Total**
African Development Bank (AfDB)	80	0	**80**	16%
SREP – AfDB	16	0	**16**	3%
World Bank	66	0	**66**	13%
SREP – World Bank	10	0	**10**	2%
Agence Française de Développent (AFD)	112	0	**112**	23%
European Investment Bank (EIB)	0	24	**24**	5%
Government of Kenya / GDC	59	130	**189**	38%
Total Project Cost	**343**	**154**	**497**	**100%**
Percentage (%)	**69%**	**31%**	**100%**	n/a

Implementation Arrangements

- **Borrower**: The Republic of Kenya
- **Executing Agency:** Ministry of Energy (MoE) will be the and beneficiary of the proposed loan.
- **Implementing Agency**: Geothermal Development Company (GDC)
- **Project Implementation Team (PIT):** GDC to form a dedicated PIT for the project to be assisted by a consultant with experience in undertaking similar projects
- The PIT will report to the GDC Board Committee which will oversee project implementation and provide the necessary oversight
- GDC responsible for: (i) procurement, (ii) project monitoring, reporting and evaluation; and (iii) financial management

GDC Overview

A special purpose Company wholly owned by the GoK; Incorporated on December 2, 2008

Facilitate development of 5,000 MW in the next 20 years

Holistic development of geothermal resources in the Country

GDC Mandate

Upfront Works	• Remove upfront risks • Reduce costs through infrastructural development, exploration works and production drilling
Direct Use	• Promote direct uses of geothermal
Capacity Development	• Develop human capacity • Manage public resources such as rigs • Provide consultancy services
Funding	• Support GoK in fund mobilization
Power Plant	• Support Private Sector entry • Sell steam to power producers

SREP Contribution to the Project

Removal of Barriers: SREP funds will be used to drill the appraisal wells thus remove barriers to the development crowding-in of the private sector

Leveraging: Project will leverage financing from development partners

Key Performance Indicators

Outcome Indicator	Measure
Geothermal Capacity installed in	400 MW
Tonnes of CO2 emissions Avoided	1.1 million

Output Indicator	Measure
Number of wells drilled	120 wells
Quantity of steam produced	
Number of people trained	
Procurement of Equipment	2 rigs and Laboratory Equipment
Execution of ESMP	

- Source of data: Statistical reports by GDC and Ministry of Energy
- Monitoring: MDB's

Project Feasibility

- **Financial and Economic Performance:** based on model developed by the AfDB in collaboration with the Geothermal Development Company

Key Financial and Economic Performance Indicators		
FIRR and NPV (baseline scenario)	8.3% real	USD 39.9 million
EIRR and NPV (baseline scenario)	16.7% real	USD 324.6 million
N .B. Detailed calculations and assumptions are given in Annex B7		

- The project is viable able to fully cover all the investment costs related to exploration, drilling, construction of the steam gathering infrastructure and operating and maintenance costs.

Summary of Sensitivity Tests

SCENARIO		Levellized cost (USD cent/kWh)	Project FIRR, real	Equity FIRR, real	Equity ENPV, real (USD million)	Economic EIRR, real	Economic ENPV, real (USD million)	Min DSCR 12-month	Aver. DSCR 12-month
BASE CASE		6.79	8.3%	12.8%	39.9	16.7%	324.6	2.15x	2.51x
Capex	110%	7.11	7.5%	10.9%	-2.8	15.8%	277.5	2.22x	2.53x
	120%	7.42	6.9%	9.6%	-43.8	15.0%	230.5	2.27x	2.56x
Delay (months)	6	7.13	7.9%	12.1%	24.6	15.4%	246.5	2.18x	2.55x
	9	7.26	7.7%	11.9%	20.8	14.8%	210.9	2.18x	2.57x
Opex	120%	6.84	8.1%	12.5%	33.9	16.6%	317.7	2.11x	2.46x
	140%	6.88	7.9%	12.3%	27.6	16.5%	310.7	2.06x	2.41x
Well Output Index	80%	8.76	6.1%	9.3%	-37.2	11.8%	-14.4	1.75x	1.95x
	90%	8.76	6.1%	9.3%	-37.3	11.8%	-14.3	1.70x	1.95x
USD Inflation	1.5%	7.03	7.2%	11.3%	-14.6	16.9%	340.0	1.99x	2.24x
	3.0%	6.71	8.7%	13.4%	74.5	16.6%	317.9	2.26x	2.64x
Steam Price	0.020	6.79	5.1%	7.7%	-68.6	15.4%	228.6	1.43x	1.73x
	0.025	6.78	6.8%	10.4%	-14.0	16.0%	276.2	1.88x	2.11x
	0.035	6.83	9.5%	14.8%	90.2	17.6%	388.8	2.51x	2.90x
Assumed average well ouput	4	8.75	6.1%	9.3%	-36.1	11.8%	-13.0	1.75x	1.96x
	6	6.78	8.3%	12.8%	41.0	16.7%	326.1	2.16x	2.52x
Accounts receivable (days)	60	6.79	8.2%	12.7%	37.7	16.6%	322.4	2.15x	2.51x
	50	6.79	8.2%	12.7%	39.2	16.6%	323.9	2.15x	2.51x
Production Wells Success Rate	80%	8.75	6.2%	9.4%	-35.6	11.8%	-12.3	1.72x	1.97x
	85%	6.84	8.2%	12.7%	37.6	16.5%	314.8	2.15x	2.51x

Environmental and Social Impact

The ESIA summary was posted on the AfDB's website on 01 August 2011

Highlight of Impacts and Mitigation

- ***Environment****:* The impacts include clearing and levelling of sites using heavy machinery - Mitigation include restoration, recycling drilling water
- ***Climate Change:*** clean energy with no significant and direct impact on climate change
- ***Gender:*** Employment opportunities to women at 30%, provision of portable water
- ***Social****:* Creation of approximately 912 skilled jobs and 300 unskilled jobs
- ***Involuntary Resettlement***: There are no PAPs in the project area.

Project Monitoring and Evaluation

- The monitoring and evaluation of the performance of the project will be realized at three levels:
  a) Monitoring of the Project‘s output and outcome by tracking progress in the implementation of the project‘s components and the achievement of key outcome indicators.
  b) Monitoring of the financial performance of GDC
  c) Environmental and social indicators
- The project will be implemented over a period of 48 months and is due for completion in December 2016.
- The Project will be launched in the second quarter of 2012

Private Sector Participation

- **Currently:** five Independent Power Producers (IPP), 4 thermal and 1 geothermal with effective grid capacity of 347 MW (26% of total power generation).
- **Olkaria III (48 MW):** Owned and operated by Orpower4 Inc., financed by IFC, Ormat International and KfW.
- **Build, Own and Operate (BOO):** Structure by GoK and GDC for IPPs
- **Feasibility Study**: To provide clarity on the steam resource and project costs. A steam sales agreement will be negotiated and signed by both parties.
- **Expression of Interest Issued**: 21 potential investors have expressed interest, among which some reputable companies specializing in power generation.

Risk Management

- **Counterpart funding risk***:* Non-availability of counterpart funds from the GoK and/or and GDC at the early stage of implementation could delay the project.
- **Resource Risks:** Risk that the Menengai resource may prove insufficient to support the planned 400 MW development.
- **Drilling risk:** Relates to the probability of hitting dry wells during the exploration and appraisal drilling campaigns
- **Operation and maintenance risk:** Risk that once developed, the field is not maintained and operated according to the industry standards. Mitigated by GDC's expertise and past experience.
- **Implementation delays and cost overrun:** There is a risk of longer than anticipated drilling times per well and/or a need to drill more wells than anticipated that would result in implementation delays and associated cost overrun

Legal Framework

Legal Instrument

- ADF loan to the Republic of Kenya;
- SREP (through the ADF) loan to the Republic of Kenya; and
- SREP (through the ADF) grant to the Republic of Kenya.

Conditions Precedent to Entry into Force

- ✓ Fulfilment by the Government of Kenya (GoK) of the provisions of the General Conditions Applicable to African Development Fund Loan Agreements and Guarantee Agreements (the "Loan General Conditions").
- ✓ The SREP protocol of agreement shall enter into force on the date of its signature by the Fund and GoK in accordance with the General Conditions Applicable to Protocols of Agreement for Grants of the African Development Fund (the "Grant General Conditions")

Technical Due Diligence

Confirmation of Resource: Exploration has provided evidence of high temperature geothermal reservoir; Estimated extent of >84 km² .

Exploratory Drilling: Four wells have been completed to date, out of which two are producing an estimated total of 15 MW

GDC's Development Strategy: GDC has assembled and organized the resources (financial and physical) to undertake the initial part of this program, The organizational capacity to undertake a portion of the program has therefore been demonstrated;

THANK YOU