

CLIMATE INVESTMENT FUNDS

SREP/SC.6/5
October 26, 2011

Meeting of the SREP Sub-Committee
Washington, D.C.
November 1, 2011

Agenda Item 5

KENYA: MENENGAI GEOTHERMAL DEVELOPMENT PROJECT

Proposed Decision by SREP Sub-Committee

The SREP Sub-Committee reviewed document SREP/SC.6/5 and approves an SREP allocation of \$25.0 million for the *Kenya: Menengai Geothermal Development Project*.

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**AFRICAN DEVELOPMENT
BANK GROUP**

PROJECT: MENENGAI GEOTHERMAL DEVELOPMENT PROJECT

COUNTRY: KENYA

PROJECT APPRAISAL REPORT

September, 2011

Project Appraisal Team	Team Leader	T. BAH, Senior Power Engineer	ONEC.2	3184
	Team Members	Y. ARFAOUI, Chief Renewable Energy Specialist	ONEC.3	2308
		K. NTOAMPE, Principal Environmentalist	ONEC.3	2707
		M. HASSANE, Principal Procurement Specialist	KEFO	6243
		D. MCIVER, Principal Legal Counsel	GECL.1	2678
		F. KANONDA, Senior Financial Analyst	ONEC.2	2723
		R. ARON, Senior Social Development Specialist	ONEC.3	2792
		E. NGODE, Finance Management Specialist	KEFO	6230
		A. KLEVCHUK, Financial Modelling Specialist	OPSM	1975
	Sector Manager	E. NEGASH, Officer In Charge	ONEC.2	3081
	Sector Director	H. CHEIKHROUHO	ONEC	2140
	Regional Director	G. NEGATU	OREA	2040
Peer Reviewers	N. KULEMEKA, Chief Socio-Economist		ONEC.3	2336
	M. CISSE, Chief Investment Officer		OPSM.3	1906
	R. CLAUDET, Chief Investment Officer		OPSM.3	2666
	G. MAKAJUMA, Infrastructure Specialist		KEFO	6073

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CURRENCY EQUIVALENTS

September 2011

UA 1	USD 1.55223
UA 1	EUR 1.09822

Fiscal Year

1 January - 31 December

Weights and Measures

- | | |
|--|---|
| <ul style="list-style-type: none"> • m Metre • cm centimetre = 0.01 metre • mm millimetre = 0.001 metre • km kilometre = 1 000 metres • m² square meter • cm² square centimetre • km² square kilometre = 1 000 000 m² • ha hectare = 10 000 m² • t (t) metric tonne (1 000 kg) | <ul style="list-style-type: none"> • KOE kilogram of oil equivalent • kV kilovolt = 1 000 volts • KV_a kilovolt ampere (1 000 V_a) • KW kilowatt = 1 000 Watts • GW gigawatt (1000 000 kW or 1000 MW) • MW megawatt (1 000 000 W or 1 000 kW) • KWh kilowatt hour (1 000 Wh) • MWh megawatt hour (1 000 KWh) • GWh gigawatt hour (1 000 000 KWh) |
|--|---|

Acronyms and Abbreviations

- | | | | |
|---|---------|---|---|
| • | ADB | : | African Development Bank |
| • | ADF | : | African Development Fund |
| • | AFD | : | Agence Française de Développement |
| • | BD | : | Bidding Documents |
| • | CIF | : | Climate Investment Fund |
| • | CSI | : | Corporate Social Investment |
| • | CSP | : | Country Strategy Paper |
| • | EIA | : | Environmental Impact Assessment |
| • | EIB | : | European Investment Bank |
| • | EHS | : | Environment, Health and Safety |
| • | ESMP | : | Environmental and Social Management Plan |
| • | GDC | : | Geothermal Development Company |
| • | GDP | : | Gross Domestic Product |
| • | IPP | : | Independent Power Producer |
| • | IRR | : | Internal Rate of Return |
| • | KETRACO | : | Kenya Transmission Company |
| • | KFS | : | Kenya Forestry Services |
| • | KPLC | : | Kenya Power Lighting Company |
| • | LCPDP | : | Least Cost Power Development Plan |
| • | NEMA | : | National Environment Management Authority |
| • | NGO | : | Non-Governmental Organisation |
| • | NPV | : | Net Present Value |
| • | O&M | : | Operation and Maintenance |
| • | PAP | : | Project Affected Person |
| • | PPP | : | Public Private Partnership |
| • | PPE | : | Personal Protective Equipment |
| • | PRSP | : | Poverty Reduction Strategy Paper |
| • | SREP | : | Scale-up Renewable Energy Program |

PROJECT INFORMATION SHEET

Client Information	
Borrower/ Donee	Republic of Kenya
Executing Agency	Ministry of Energy
Implementing Agency	Geothermal Development Company (GDC)

FINANCING PLAN		
Sources	Amount (UA million)	Instrument
African Development Bank	80	Loan
SREP through African Development Bank	16	Loan and Grant
World Bank	66	Loan and Grant
SREP through World Bank	10	Loan
Agence Française de Développement (AFD)	112	Loan
European Investment Bank	24	Loan
Geothermal Development Company/ Government of Kenya	189	Equity
Total Project Cost	497	

KEY ADB FINANCIAL INFORMATION			
	ADF Loan	SREP Loan	SREP Grant
Loan Currency	Unit of Account (UA)	USD	USD
Interest Type	N/A	N/A	N/A
Interest Rate Margin	N/A	N/A	N/A
Service Charge	0.75% yearly on the disbursed and outstanding.	0.1%	N/A
Commitment Fee	0.50% yearly on the amount undisbursed and unpaid.	N/A	N/A
Tenor	50 years	40 years	N/A
Grace Period	10 years	10 years	N/A

KEY FINANCIAL & ECONOMIC OUTCOMES		
	Financial	Economic
Net Present Value	USD 39.9 million	USD 324.6 million
Internal Rate of Return	8.3%	16.7%

TIMEFRAME – MAIN MILESTONES	
Concept Note Approval	07 June 2011
Project Approval	30 November 2011
Effectiveness	June 2012
Last Disbursement	June 2017
Completion	December 2016
Last Repayment	June 2062

PROJECT SUMMARY

Project Overview: The Menengai Geothermal Development Project is situated within the Eastern sector of the African Rift system, about 180 km Northwest of Nairobi in Kenya. The project aims at meeting Kenya's rapidly increasing demand for power while diversifying sources of power supply by developing the country's huge geothermal potential. More specifically, the project aims to develop the Menengai geothermal steam field to produce enough steam for 400 MW power generation that will be generated by the private sector as an Independent Power Producer (IPP) or a Public Private Partnership (PPP). The project will be completed by December 2016 and will cost UA 497 million.

The project will reduce poverty in the area by providing 912 skilled and about 300 unskilled jobs to the local communities hence uplifting the livelihood of these communities both temporarily and for longer term. The project will ensure an employment ratio of 30% women which will be high for small town standards in Kenya. The transfer of the potable water facility to the community/municipality will have a direct effect in the empowerment of women and the girl child who normally collect water for domestic purposes. Finally, the project will provide additional reliable, clean and cheap power generation capacity to Kenyan households and industries.

Needs Assessment: In order to meet the demand despite the unreliability of the hydropower generation capacity (due to extreme drought during the last 3 to 4 years), the Government of Kenya is currently obliged to rely on providers of emergency generation capacity. This emergency capacity, while having the advantage of a relatively rapid installation time, is very expensive. As a result, load shedding frequently occurs in Kenya, particularly during the dry season. This situation has underscored the high cost of reliance on hydropower and the consequent need to diversify sources of power supply.

Geothermal power generation, whose potential is estimated at a total of 7,000 MW, is the Government of Kenya's preferred choice for the future due to the fact that it is a base load, indigenous and relatively reliable and cheap solution. The Government of Kenya plans to increase the geothermal generation capacity from the current 198 MW to 1,700 MW by 2020 and 5,530 MW by 2031.

Bank's Added Value: The provision of African Development Fund (ADF) financing for the project will leverage significant financing from other development partners under the umbrella of the Scale-up Renewable Energy Program (SREP) which is a component of the Climate Investment Funds (CIF). It is also expected to overcome various barriers to the development of Kenya's geothermal potential, such as drilling risk, need for significant investment costs, crowding-in of the private sector, etc.

Knowledge Management: The project will have a catalytic replication effect that will come from the capacity building and knowledge creation that the project will leverage. The learning in geothermal resource development, including development of geothermal IPPs, will be shared in Kenya and in other countries in Sub-Saharan Africa especially countries with significant geothermal resource development potential such as Uganda, Rwanda and Ethiopia.

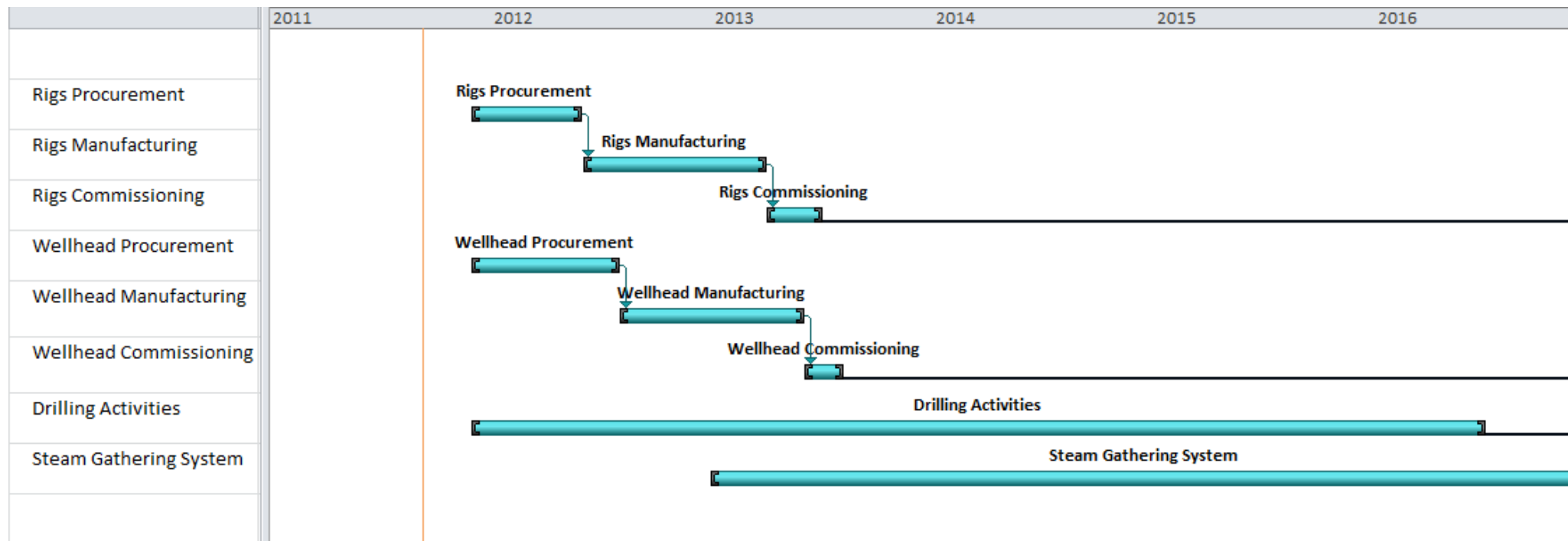
RESULTS-BASED LOGICAL FRAMEWORK

Country and project name: Menengai Geothermal Development Project (Kenya)						
Purpose of the project: To meet Kenya's rapidly increasing demand for power by developing the Menengai geothermal steam field for 400 MW power generation						
RESULTS CHAIN		PERFORMANCE INDICATORS			MEANS OF VERIFICATION	RISKS/MITIGATION MEASURES
		Indicator (including Core Sector Indicator)	Baseline	Target		
IMPACT	Sustainable economic growth and improved living conditions and wellbeing of the population	Gross Domestic Product (GDP) growth	5.6% in 2010	At least 7% by 2020	- Human Development Report - National economic statistics	- The political risk is mitigated by the adoption of the new constitution leading to presidential elections in 2012.
	Reduction in CO ₂ emissions	Tonnes of CO ₂ emissions	11.24 million tonnes in 2010 ¹	Reduction of 1.95 million tonnes per year starting 2018 (when the power plant is completed)	- National statistics - Project post-evaluation report - Public utility companies records	- A variety of factors could lead to delays in the contracting, construction and start-up of power plants by private investors. The preliminary interest expressed by consulted private investors and the involvement of a transaction advisor in the project will mitigate that risk.
OUTCOMES	Increase in geothermal power generation capacity	Geothermal power generation capacity installed in the country in MW	198 MW in 2010	598 MW in 2018 (when the power plant is completed)		- There is a risk that the transmission line will not be constructed on time to evacuate the power from the power plant once constructed. GDC and KETRACO will jointly undertake detailed feasibility study for this.
	Geothermal field development	- Number of wells drilled - Quantity of steam produced (tonnes)	n/a	By end 2016: - 120 wells drilled - 27.8 million of tonnes of steam produced annually	- Progress reports from the implementing agency - Supervision mission reports from AfDB - Disbursement and financial	- There is a risk that once developed, the field is not maintained and operated according to the industry standards. This risk is however mitigated by GDC's expertise and past experience in Olkaria. Capacity building will also

¹ http://unstats.un.org/unsd/environment/air_co2_emissions.htm

	Consultancy services	<ul style="list-style-type: none"> - Number of studies - Number of trainees on drilling technologies, geoscience and donor procurement and finance (disaggregated by gender) - Laboratory and field equipment 	n/a	<p>By end 2016:</p> <ul style="list-style-type: none"> - 1 feasibility study - 60 trainees on drilling technologies, 6 on geoscience and 10 on donor procurement and finance (30% of all trainees will be women) - 1 functional laboratory 	<p>reports from the implementing agency</p> <ul style="list-style-type: none"> - Project completion report 	<p>be provided to GDC under the project.</p> <ul style="list-style-type: none"> - As more rigs are added, and operations become more complex, it will become more challenging for GDC to provide the required labour and expertise. To mitigate this risk, GDC is undertaking a considerable amount of training of new personnel, some of which will be financed by the project. - There is a risk of implementation delays and associated cost overrun. The sensitivity analysis carried out on the financial and economic indicators suggest that the project can withstand implementation delays and related cost overrun of 4 months and 20 months respectively before affecting the financial and economic viability of the project. - There is a probability of hitting dry wells during the exploration and appraisal drilling campaigns. This risk is being mitigated by the exploration studies as well as the experience and expertise of GDC. - There is a risk that the Menengai resource may prove insufficient to support the planned 400 MW development. An independent preliminary heat resource estimate suggests that developing the resource to the proposed level (400 MW) should be feasible.
	Environmental and social management	Execution of the environmental and social management plan	n/a	<p>By end 2016:</p> <p>Environmental and social management plan executed</p>		
KEY ACTIVITIES	COMPONENTS				INPUTS	
	<p>A. Site civil works</p> <p>B. Equipment</p> <p>C. Well drilling</p> <p>D. Steam gathering system</p> <p>E. Consultancy services</p> <p>F. Environmental and social management</p>				Total Cost : UA 497	

PROJECT IMPLEMENTATION SCHEDULE



REPORT AND RECOMMENDATION OF THE MANAGEMENT OF THE ADB GROUP TO THE BOARD OF DIRECTORS ON A PROPOSED LOAN TO KENYA FOR THE MENENGAI GEOTHERMAL DEVELOPMENT PROJECT

Management submits the following Report and Recommendations on a proposed ADF loan of UA 80 million, and Scale-up Renewable Energy Program (SREP) (through ADF) loan of US\$ 7.5 million and grant of US\$ 17.5 million (total SREP financing approximately equivalent to UA 16 million) to Kenya for the Menengai Geothermal Development Project.

1 STRATEGIC THRUST AND RATIONALE

1.1 Project Linkages with Country Strategy and Objectives

1.1.3 The Country Strategy Paper (CSP) for Kenya (2008-2013) seeks to support two strategic pillars: (i) infrastructure development for enhanced economic growth; and (ii) creation of employment opportunities to reduce poverty. Under the first pillar, the country aims to address problems related to its erratic supply of electricity, its inadequate road network, and insufficient water and sewerage services. The CSP is aligned with the country's long-term development strategy, Vision 2030, and its five-year (2008-2013) Medium Term Plan (MTP) which recognizes the importance of well-developed economic infrastructure in transforming Kenya into a globally competitive economy. The Vision 2030 acknowledges that Kenya's energy costs are currently higher than the average costs in other competing African economies. In order to spur growth and attract investment, Kenya must generate cost effective electricity and increase efficiency in energy consumption. In recognition of the importance and reliability of geothermal power and the energy requirements to meet the Vision 2030 objectives, the government has embarked on an ambitious generation expansion plan to increase the installed capacity through enhanced geothermal development.

1.1.4 The proposed project is in line with the CSP as it aims to expand electricity infrastructure as foreseen by pillar one of the strategy (infrastructure development). Furthermore, active participation of the private sector, which has an important role to play in generating growth and creating jobs, is required to implement the MTP and Vision 2030. The proposed project, being structure as a Public Private Partnership (PPP), will crowd-in private sector participation. The country's comparative socio-economic indicators are provided in Appendix I. The country's development agenda and sector brief is also provided in Annex A.

1.2 Rationale for Bank Involvement

1.2.1 Kenya's planning for power generation and transmission is undertaken on the basis of a 20 year rolling Least Cost Power Development Plan (LCPDP) updated on a yearly basis. According to the latest LCPDP, the country currently has a total installed electricity generation capacity of 1,424 MW and a reliable capacity of 1,397 MW under average hydrological conditions. Of the total installed capacity of 1,424 MW, hydropower accounts for about 50%, with thermal capacity accounting for 34% and geothermal capacity accounting for 13%. The remaining 3% installed capacity is provided through wind, cogeneration and isolated grid technologies. The unsuppressed peak demand currently stands at 1,146 MW. This leaves no reserve margin for reduced hydropower generation due to low hydrology (as it has been experienced lately) or for plant outages. In fact, due to extreme drought during the last 3 to 4 years, nearly half of the hydropower generation capacity was not available.

1.2.2 In order to meet the demand despite the unreliability of the hydropower generation capacity, the Government of Kenya is obliged to rely on providers of emergency generation capacity. This emergency capacity, while having the advantage of a relatively rapid installation time, is very expensive (average cost of about USD 23 cents per kWh compared to an average tariff of about USD 16 cents per kWh). As a result, load shedding frequently occurs in Kenya, particularly during the dry season. This situation has underscored the high cost of reliance on hydropower and the consequent need to diversify sources of power supply.

1.2.3 Candidate generation sources considered in the LCPDP consist of geothermal, hydro, wind, coal, oil-fired and nuclear power plants. The optimal development program is dominated by geothermal, coal and wind power generation as well as power imports. Geothermal power generation, whose potential is estimated at a total of 7,000 MW, is the Government of Kenya's preferred choice for the future due to the fact that it is a base load, indigenous and relatively reliable and cheap solution. The LCPDP indicates that geothermal capacity should be increased from the current 198 MW to 1,700 MW by 2020 and 5,530 MW by 2031. Developing Kenya's geothermal potential will also provide base load generation capacity and will make it possible to develop the country's huge wind energy potential (which needs to be backed by base load power).

1.2.4 It is against this background that on 23 March 2011, the Government of Kenya officially requested the Bank to consider financing this project, whose first phase involves developing the Menengai geothermal field to generate up to 400 MW of power out of an estimated potential of 1,650 MW. The provision of African Development Fund (ADF) financing for the project will leverage significant financing from other development partners under the umbrella of the Scale-up Renewable Energy Program (SREP) which is a component of the Climate Investment Funds (CIF). It is also expected to overcome various barriers to the development of Kenya's geothermal potential, such as drilling risk, need for significant investment costs, crowding-in of the private sector, etc. Moreover, the relatively cheap geothermal energy is likely to make Kenya a preferred destination for investors bringing with it the attendant benefits such as increased taxation revenue and improved economy development to the country and to the region.

1.2.5 The project is also consistent with the priorities of ADF-12 which are focused on poverty reduction through growth driven by investment in three basic operational priorities: infrastructure, governance and regional integration. By supporting the implementation of this project, the Bank will contribute to the provision of basic infrastructure needed for supporting economic growth and poverty reduction in Kenya.

1.3 Aid Coordination

1.3.1 In Kenya, the Bank collaborates with other development partners through the Development Partners Group (DPG), the Harmonization, Alignment and Coordination Group (HAC), and sector donor groups. One of the principal results of this wide coordination is the signing of the partnership principles of the Kenya Joint Assistance Strategy by the Government of Kenya and 17 development partners in 2007. The partnership accounts for 90% of official donor assistance to Kenya. The most active development partners in the energy sector in Kenya are the AfDB, World Bank, European Investment Bank (EIB), Agence Française de Développement (AFD), Japan International Cooperation Agency (JICA), and Germany's Kreditanstalt für Wiederaufbau (KfW).

1.3.2 To mobilize and coordinate the enormous resources required for the energy sector, the Ministry of Energy has established a sector working group. This group is currently chaired by the AFD and includes most of the development partners active in the energy sector in Kenya. The group's objective is to increase the programmatic flow of donor funds for the energy sector, consistent with the 2005 Paris Declaration on Aid Effectiveness. A list of similar projects financed by the other development partners in the country is provided in Appendix III.

2 PROJECT DESCRIPTION

The objective of the project is to meet Kenya's rapidly increasing demand for power while diversifying sources of power supply by developing the country's huge geothermal potential. More specifically, the project aims to develop the Menengai geothermal steam field to produce enough steam for 400 MW power generation that will be generated by the private sector as an Independent Power Producer (IPP) or a Public Private Partnership (PPP). The scope of the proposed project is limited to the financing by the Government of Kenya and its development partners of the upstream activities involving the development of the steam field and the production of steam. This will enable the mitigation of the drilling risk and enable the crowding in of the private sector for the construction of the power plant.

2.1 Project Components

2.1.1 The project components and associated cost estimates are provided in Table 2.1.

Table 2.1 Project Cost Estimates by Components (Amounts in UA million equivalent)			
N°	Component Name	Estimated Cost	Component Description
A)	Site civil works	5.02	Construction of access roads
			Construction of a water reticulation system
B)	Equipment	99.00	Procurement and commissioning of drilling rigs
			Procurement and commissioning of wellhead generation units
C)	Well drilling	197.59	Acquisition of offshore drilling materials
			Acquisition of local drilling materials
			Fuel and lubricants
			Water pumping costs
			Transport (materials and personnel)
			Spare parts
			Well testing
			Drill pipe inspection
D)	Steam gathering system	105.60	Labour and administrative costs
			Engineering, procurement and construction of a steam gathering system (EPC)
E)	Consultancy services	44.20	Drilling expertise
			Slotting services
			Feasibility study
			Steam gathering supervision consultant
			Transaction advisor
			Trainings and workshops
			Project management and supervision consultant
F)	E&S management	0.57	Audit services
			Implementation of environmental & social (E&S) management plan
	Price escalation and contingencies (10%)	45.20	
	Total Project Cost	497.17	

2.2 Technical Solutions Adopted and Alternatives Considered

2.2.1 The Government through the Ministry of Energy and other partners has undertaken detailed surface studies of some of the most promising geothermal prospects in the country. The areas that have been studied in detail include Suswa, Longonot, Olkaria, and Menengai (see Map in Appendix 4). These studies indicate that 7,000 to 10,000 MW can be generated from the high temperature resource areas in Kenya. Going by the level of detailed surface exploration, infrastructure development and closeness to the load centre, Menengai has been identified as Kenya's best geothermal prospect and will therefore be developed in priority. In addition, Menengai is one of the largest geothermal prospects, with a potential power generation capacity of up to 1,650 MW.

2.2.2 Other alternative solutions were also considered and rejected for the reasons summarized in Table 2.2.

Table 2.2 Project Alternatives and Reasons for Rejection		
Alternative	Description	Reasons for Rejection
Hydropower	Construction of new hydropower plants.	<ul style="list-style-type: none"> • Extreme weather patterns including a warming trend in temperatures and increasing variability in rainfall resulting in droughts in Kenya. • Unreliability of the existing hydropower generation due to the above. • Potential negative environmental and social impacts. • Limited potential for scale-up.
Thermal	Construction of new thermal power plants.	<ul style="list-style-type: none"> • High operation costs. • Highly dependent on oil prices. • Negative environmental and social impacts.
Coal	Construction of coal fired power plants	<ul style="list-style-type: none"> • Local coal deposits have been reported in Kitui and Mwingi Districts. However, the viability of these deposits for commercial exploitation is yet to be demonstrated. • For immediate project implementation, Kenya will have to rely on imported coal which poses a number of challenges such as shipping and port handling logistics. • Potential negative environmental and social impacts. • Limited potential for scale-up.
Wind	Development of the wind potential.	<ul style="list-style-type: none"> • Needs to be backed-up by base load capacity. • Needs to be backed up by base load generation.
Solar PV or CSP	Development of the solar potential.	<ul style="list-style-type: none"> • Solar PV mainly for domestic installations. • Concentrated Solar Power (CSP) mainly used for drying and water heating. • CSP not cost effective for large scale power generation.
Power imports	Importing power from neighbouring countries	<ul style="list-style-type: none"> • National security. • Limited potential for scale-up (the capacity of the Kenya Ethiopia interconnection line will be limited to 2,000 MW).
Nuclear	Construction of nuclear power plants	<ul style="list-style-type: none"> • Nuclear generating units are characterized by high capital investment and long lead times. • Need to overcome various barriers and challenges

		ranging from political, environmental and social as well as technological.
Private sector	Geothermal field development by the private sector	<ul style="list-style-type: none"> Drilling risk is a barrier to private sector investment. Rights for geothermal resource development (one single reservoir) cannot be shared.
Olkaria field	Development of the Olkaria domes geothermal field	<ul style="list-style-type: none"> The field is located in the proximity of a conservation and recreational area, which is not acceptable from an environmental point of view. Limited geothermal resource.

2.3 Project Type

2.3.1 The proposed project is a standalone operation and will be financed through an ADF loan as well as SREP loan and grant facilities.

2.4 Project Cost and Financing Arrangements

2.4.1 The total project cost, including a 10% provision for price escalation and contingencies, but excluding customs taxes and duties, is estimated at UA 497 million, of which UA 343 million in foreign currency and UA 154 million in local currency. Table 2.3 presents the foreign and local currency project cost by component. The detailed cost by component is provided in Annex B2.

Table 2.3 Estimated Cost by Component (Amounts in UA million equivalent)				
Components	Foreign Currency	Local Currency	Total	% Foreign
A. Site preparation	0.00	5.02	5.02	0%
B. Equipment	99.00	0.00	99.00	100%
C. Well drilling	68.57	129.09	197.59	35%
D. Steam gathering system	105.60	0	105.60	100%
E. Consultancy services	39.05	5.15	44.20	88%
F. 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%

2.4.2 The project will be financed by the Bank, the World Bank, AFD, EIB, the Government of Kenya and the Geothermal Development Company (GDC). Kenya and GDC. The SREP resources will be channeled through the Bank and the World Bank. The Bank's financing will be used for the: (i) procurement and commissioning of two drilling rigs and wellhead generation units; (ii) acquisition of drilling materials; (iii) training and workshops; and (iv) project management and supervision consultancy services. The detailed use of the different sources of financing is provided in Annex B2. The sources of financing of the project are illustrated in Table 2.4.

Table 2.4 Sources of Financing (Amounts in UA million equivalent)				
Sources of Financing	Foreign Exchange	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 Développement (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

2.4.3 SREP is a program under the Strategic Climate Fund (a multi-donor Trust Fund within the Climate Investment Funds). SREP's overall objective is to support investments in energy efficiency, renewable energy and access to modern sustainable energy in a small number of low-income countries. According to the program's investment plan, approved 08/09/2011, SREP will allocate US\$ 40 million to this project, out of which US\$ 25 million will be channeled through the African Development Bank. SREP will also leverage significant amounts of financing from development partners, such as EIB and AFD, and from private sector investors.

2.4.4 The Government of Kenya is committed to developing the country's geothermal potential. Over the past two years, it has provided GDC with US\$ 73 million in budget support for 2009/2010 and US\$ 85 million for 2010/2011 and has committed to providing an additional US\$ 185 million.

2.4.5 The project cost by category of expenditure is provided in Table 2.5.

Table 2.5 Project Cost by Category of Expenditure (Amounts in UA million equivalent)				
Category of expenditure	Foreign Exchange	Local Currency	Total	% Foreign Currency
Goods (supplies and equipment)	166.98	47.88	214.86	78%
Works	105.60	5.02	110.62	95%
Consultancy services (studies, control and auditing)	33.90	0.08	33.98	100%
Non-consultancy services	5.74	86.78	92.51	6%
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%

2.4.6 The expenditure schedule by component is illustrated in Table 2.6 below.

Table 2.6 Expenditure Schedule by Component (in UA million)						
Components	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017
A. Site preparation	1.32	2.11	0.79	0.79	0.00	0.00
B. Equipment	46.20	51.15	1.65	0.00	0.00	0.00
C. Well drilling	22.26	79.68	35.90	27.98	25.52	6.24
D. Steam gathering system	0.00	26.40	26.40	35.20	8.80	8.80
E. Consultancy services	3.51	12.71	11.51	7.80	7.75	0.93
F. Environmental and social management	0.09	0.09	0.09	0.09	0.09	0.09
Total base cost	73.39	172.14	76.35	71.87	42.16	16.06
Price escalation and contingencies (10%)	7.39	17.21	7.64	7.19	4.22	1.60
Total project cost	80.72	189.36	83.99	79.05	46.38	17.67

2.5 Project's Target Area and Population

2.5.1 The project area is situated within the Eastern sector of the African Rift system, about 180 km Northwest of Nairobi in Kenya (see map in Appendix 4). The direct project beneficiaries are located in the Bahati, Kiamaina, Wanyororo, Kabatini, Engoshura, Solai, Banita, Mashiaro, Menengai Hill, Valley Farm, Kiamunyi/Olive, Ol Rongai & Kwa Gitau

communities within the project area. These beneficiaries include local households, businesses, and industries. Given that the power which will be generated by the project will feed into the national grid, additional direct project beneficiaries include households, businesses, and industries in communities located in other regions of Kenya outside the project area. Project outcomes will include, for example, access to reliable and affordable energy, a spur in direct and indirect employment opportunities, the promotion of socio-economic initiatives through the use of geothermal resources, and the transfer of the potable water facility to local communities/municipalities.

2.6 Participatory Approach

2.6.1 The main participatory processes undertaken during project identification emanated from the development of Vision 2030 and Kenya's first five-year Medium-Term Plan (MTP: 2008-2012), which prioritised the development of infrastructure. Design and implementation modalities benefited from the public consultations that were conducted as part of the Environmental Impact Assessment (EIA) study. In fact, the EIA study involved interviews with communities, stakeholders and project-affected people. The EIA study made an adequate analysis of the project's environmental, social, and economic impacts and of the consultations with the public. The project benefited from insights of various stakeholders during project preparation and design.

2.6.2 In addition, during the preparation of the SREP investment plan, a consultation workshop was held. The workshop registered the participation of key stakeholders in the country, including national institutions / authorities, development partners, Civil Society Organizations (CSOs), local communities as well as the private sector. The workshop participants welcomed the SREP program and the array of activities included in its investment plan, in particular the proposed project. The workshop participants validated the proposed investment plan.

2.6.3 There were also intensive consultations among development partners during the preparation of the project with a view of building synergies with other programs in the sector in the country.

2.7 Bank Group Experience and Lessons Reflected in Project Design

2.7.1 The Bank has been very active in the energy sector in Kenya recently. In 2008, the Bank approved UA 39.77 million in financing for Kenya under the Nile Equatorial Lakes Subsidiary Action Program (NELSAP) regional interconnection project; in 2009, the Bank approved UA 50 million in financing for the Mombasa-Nairobi Transmission Line Project; and in 2010, the Bank approved UA 46.70 million in financing for the Power Transmission System Improvement Project. The Bank, along with other development partners, is also actively involved in preparing the Ethiopia and Kenya Power Systems Interconnection Project. Furthermore, through AfDB's private sector window (OPSM), the Bank is considering financing Independent Power Producers (IPPs) for the Lake Turkana Wind Power Plant and the Thika Thermal Power projects. The Bank's portfolio in Kenya is provided in Appendix II.

2.7.2 Several lessons can be drawn from the Bank's interventions in Kenya. The first is that project readiness and quality at entry are key success factors. For this reason, the Bank ensures that the projects selected by the Government of Kenya for financing are supported by

appropriate feasibility studies. The proposed project is supported among others by a geothermal resource assessment study, a business plan and an environmental impact assessment study. The second lesson is that ineffective institutional arrangements very often lead to implementation delays resulting in cost overruns. In this regard, the project will support the hiring of a transaction advisor to assist the implementing agency in putting in place the right institutional framework and creating an enabling environment for private sector participation. The third lesson is that the non-availability of counterpart funds at an early stage of implementation, especially for the compensation of project-affected people, could delay project implementation. This risk will be mitigated by making sure that before construction starts, counterpart funds for compensation are budgeted and are placed in an escrow account from which the project-affected people will be compensated. The lessons learned by the Bank on past projects are detailed in Annex B1.

2.7.3 Finally, GDC has been drilling wells for the ongoing 280 megawatts (MW) Olkaria IV project, financed by the Government of Kenya and other development partners. The main lesson from this on-going project is that the steam produced by a well should be exploited as it becomes available by installing wellhead generation units. This ensures that power is generated and used immediately instead of having to wait for the construction of a full-fledged power plant, which normally takes up to five years after all the wells have been drilled and the availability of the steam is proven.

2.8 Key Performance Indicators

2.8.1 The key outcome indicators will be the geothermal power generation capacity installed in the country in MW and the tonnes of CO₂ emissions avoided. Key output indicators will be then number of wells drilled in the Menengai field, quantity of steam produced (tonnes), the execution of one feasibility study, number of people trained, procurement of laboratory and field equipment and the execution of the environmental and social management plan.

2.8.2 The source of data to confirm these indicators will be statistical reports produced by GDC and the Ministry of Energy. The progress during implementation will be monitored by the timely commencement of the works, regular disbursements, consultations with the Project Implementation Team (PIT), timely submission of quarterly progress and environmental monitoring reports as well as annual audit reports.

3 PROJECT FEASIBILITY

3.1 Financial and Economic Performance

3.1.1 The financial and economic analysis is based on model developed by the Bank in collaboration with the Geothermal Development Company. The results from financial analysis indicate that the project is financially viable. The project FIRR is estimated at 8.3%, while the FNPV at the company's weighted average cost of capital (discount rate of 11% real) is USD 40 million. The project is therefore able to fully cover all the investment costs related to exploration, drilling, construction of the steam gathering infrastructure and operating and maintenance costs. The base case assumes that GDC avails the steam to the energy generators at a price of USc 3.00/KWh. On a levelled basis, it is estimated that the steam price will be USc 2.89/KWh and USc 3.91/KWh for the power generation plant. This results in a total electricity generation cost of USc 6.79/KWh from the Menengai field. This

compares favourably to the gazetted Feed in Tariff for geothermal energy of USc 8.5/KWh (including cost of steam generation and cost of the power plant) for generations plants of up to 70MW and is clearly cheaper than the average tariff of about USc 16.00/KWh as of June 2010.

3.1.2 The economic analysis considers the benefits of the project from the country point of view. The key financial and economic indicators are summarized in Table 3.1 below.

Table 3.1		
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		

3.1.3 The analysis looks at the energy delivered to the system as the end output of the project as compared to other sources of generation in Kenya. The overall associated costs necessary for generation of power include both the steam field development (facilitated by the current project) costs and the capital expenditure and operating and maintenance (O&M) costs of the generation plants that will be using the steam produced from the project. The average cost of alternative generation sources for the system is taken as USc 9.0/KWh for off-peak power, which is a very conservative assumption because the minimum O&M cost (variable O&M and fuel) expected for new power plants stands at USc 12.4/KWh, according to KPLC. Peak energy is valued at USc 20.0/KWh, which includes both the O&M and capital expenditure costs of peaking capacity. The results of the economic analysis point to strong economic rationale behind the project, which is able to deliver highly competitive base-load energy and helps the power system in Kenya to diversify from hydro and oil dependency. The economic net present value, discounted by the economic opportunity cost of capital of 12% real, is highly positive with an estimated NPV of USD 324.6 million and EIRR of 16.7% real.

3.1.4 Sensitivity tests were also performed linking the identified risks to the project's financial and economic viability. Unfavourable variations considered included changes to the base case scenario with respect to investment cost, operating and maintenance costs, individual well energy capacity, drilling success rate and the price of steam. Results show that both the financial and economic results are robust. The detailed calculations of the financial and economic analysis as well as a detailed discussion of the sensitivity tests are provided in Annex B7.

3.2 Environmental and Social Impact

3.2.1 Many of the potential impacts associated with the project can be negated or minimized through proper management. Notably, the project does not have significant impacts on socially and ecologically sensitive environments. However, due the importance of risk of accident, the project is classified as category 1 in line with the Bank's Environmental and Social Assessment Procedures. The ESIA summary was posted on the Bank's website on 01 August 2011. A detailed environmental and social analysis is provided in Annex B8.

3.2.2 **Environment:** The impacts associated with the project include clearing and levelling of sites using heavy machinery which may interfere with ecological niches for the few resident species in the area leading to habitat loss. Disturbance of the plant community may induce changes in species composition due to increased chance of alien vegetation species.

Clearance of vegetation will expose the soil to wind and water erosion. Drilling fluids may result in the contamination of water and soil. Drilling and well testing also result in the generation of hydrogen sulphide and other non-condensable gases (NCG) and this will be in addition to exhaust gases (carbon dioxide (CO₂), carbon monoxide (CO), nitrogen oxide (NO_x), sulphur dioxide (SO_x), Particulate Matter) and dust from machineries during mobilization and by traffic movement during drilling.

3.2.3 Mitigation of the impacts will include restoration of the drilled area immediately through re-vegetation. GDC has also commenced a nursery that provides tree species provided by the Kenya Forestry Services (KFS) for free to the surrounding communities. Gabion boxes will be used to prevent soil erosion and air pollution. Drilling water will be recycled and the collected water will be stored in lined ponds to avoid pollution of soil and groundwater. Visual impacts due to the infrastructure will be lessened by the fact that the project site is in a depression and the equipment will have neutral, non-reflective colors that blend with the natural vegetation. The impact of increased dust, noise and air pollution levels will be lessened by the fact that the nearest settlement is approximately 5 to 7 km away and noisy machinery will be equipped with silencers. The risks posed by the drilling and operation would be decreased by adhering to procedures entailed in the Environment, Health and Safety (EHS) policy and using adequate Personal Protective Equipment (PPE) as per the policy. Employees will constantly be sensitized through awareness and training to ensure protection of flora and fauna in the Caldera. The cost of implementing both social and environmental impacts is estimated at 99,000,000.00 KSH.

3.2.4 The positive environmental impacts of the project emanate from the fact that it is a clean energy project. It will assist Kenya in expanding the use of renewable energy and will displace expensive and environmentally hostile thermal generation. It will provide reliable power supply as opposed to the existing hydropower which has been negatively affected by droughts in the recent past.

3.2.5 **Climate Change:** The project is a clean energy project with no significant and direct impact on climate change. On the contrary, it is expected that the project will result in significant reduction in CO₂ emissions (1.95 million tonnes per year starting 2018). However, that does not protect the project against climate change effects and in this case the infrastructure is designed to withstand likely natural disasters and accidents. As a result of the project, the nursery has been providing trees for free for replanting in the neighbouring communities; these include species planted for firewood hence protecting the caldera while at the same time balancing green-house gas emissions.

3.2.6 **Gender:** Currently males dominate the commercial, industrial, building stone quarrying, ballast crushing and sand harvesting sectors. However, this project will ensure an employment ratio of 30% women which will be high for small town standards in Kenya. The 30% employment ratio is highlighted in the new Kenyan constitution. The employment ratio will serve to enhance women's participation in the traditionally male dominated fields, enabling them to acquire the required skill sets. The emergence of employment opportunities would translate into an increase in incomes/ revenues available to the households which women are part of and to the small and microenterprises they will be employed by and/or create themselves. The transfer of the potable water facility to the local communities/municipalities will have a direct effect in the empowerment of women and the girl child who normally collect water for domestic purposes.

3.2.7 GDC intends to utilize geothermal resources to promote socio-economic initiatives in surrounding communities, such as fish farming, improved pasture land, milk processing, and grain storage. Given women's prominence in some of these activities, the project will contribute to economically empowering women by strengthening their capacities to undertake such activities. While men will benefit from the project, the project will serve to leverage greater opportunities to enhance the benefits to be shared by women.

3.2.8 **Social:** The project will create approximately 912 skilled jobs and 300 unskilled jobs. Aside from direct employment opportunities, the project will also result in indirect employment opportunities, such as small, medium, and microenterprises seeking to cater to GDC's operations. It will provide additional reliable, clean and cheap power generation capacity to connect households and industries within and beyond the project area to the Kenyan electricity grid. The project will reduce poverty in the area due to the fact that unskilled jobs will be given to the local community members hence uplifting the livelihood of the local community both temporarily and for longer term and at the same time reducing the risk of HIV/AIDS. Land use around the project area is farming. The land obtained from the 22 individuals adjacent to the road reserves were mostly quarry areas and with the widening of the road, GDC dug some of the quarry for use in the caldera and rehabilitated all areas to an extent that all those areas are now used for farming. This project has therefore increased the yield of maize harvesting. Furthermore, houses in the area were mostly mud houses and the compensation payments have allowed most of them to build brick houses.

3.2.9 The upgrading of the access roads will improve access to Menengai caldera for security operation and tourism purposes. Menengai caldera is a tourist attraction noted particularly for its scenic beauty; moreover, geothermal development in itself is a tourist attraction feature and this will create opportunity to enhance the touristic nature of the area. GDC intends to utilize geothermal resources to promote initiatives which would be of immense socio-economic importance to surrounding communities. Through the provision of steam and water generated during its main activities, GDC will seek to promote, among others, aloe vera farming, watermelon farming, pyrethrum and fish farming, improved pasture land, milk processing, afforestation, and grain storage. All of the above-mentioned impacts form a sound basis for the project's contribution to poverty reduction in the project zone of influence.

3.2.10 Negative impacts will include temporary change in population due to influx of people in search of employment. Drilling and well testing result in increased dust, noise and air pollution levels. There will be some increase in vehicular movement to the project area through the access roads and this could result in elevated dust and noise because the road is not tarred. Drilling operations always present an element of danger. For all identified social impacts, the proponent has developed an ESMP designed to thoroughly mitigate these risks.

3.2.11 **Involuntary Resettlement:** There are no PAPs in the project area. None of the land on the project site is inhabited or utilized by any person. No crop cultivation occurs on the proposed project site (inside Menengai caldera), and thus there will be no acquisition of farmland. Land access rights, specifically for water boreholes and access roads, are being sought for landowners whose parcels will be required for the purposes of better accessing the project site. The existing road leading to the Caldera was very narrow for the big machinery to pass especially at junctions hence it had to be widened. In so doing pieces of land had to be taken from 22 people. Processing of the parcels of land affected by the road expansion is at an advanced stage as the properties are currently with the Government District Surveyors for

preparation of mutation forms and new numbers for the divided parcels. 90% deposits were paid and the remaining 10% will be paid upon successful land registration. The land was bought at a cost price of 250,000.00 KSH per acre at market property rates.

4 PROJECT IMPLEMENTATION

4.1 Implementation Arrangements

4.1.1 The Republic of Kenya will be the Borrower and the Ministry of Energy (MoE) will be the Executing Agency and beneficiary of the proposed loan. The Geothermal Development Company (GDC) will serve as the Implementing Agency.

4.1.2 GDC is a special purpose vehicle fully owned by the Government of Kenya (GoK) created in 2008. It is charged with: conducting the surface exploration of geothermal fields; conduction exploration, appraisal and production drilling; developing and managing proven steam fields; and entering into steam-to-energy sales agreements with the Kenya Electricity Generating Company Limited (KenGen) and/or Independent Power Producers (IPPs) for the generation of 5,000 MW of power within the next 20 years. GDC employed more than 560 personnel in May 2011, most of who had been involved in developing the geothermal field in Olkaria (total installed capacity of 198 MW in the country). GDC has developed tremendous expertise in the geothermal sector over the past couple of years.

4.1.3 The key motivation underlying the creation of GDC and GoK acting as the borrower instead of GDC is to facilitate the sustainable development of the country's geothermal resource. The GDC does not have a balance sheet to support sustainable borrowing of the required amounts to develop the geothermal project. This is the same arrangement which is being used to develop the country's electricity transmission infrastructure through the Kenya Transmission Company (KETRACO).

4.1.4 The project will be implemented by GDC through a dedicated Project Implementation Team (PIT). The PIT will 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 including the review of the annual work plans and budgets. As such, GDC will be responsible for: (i) procurement, including purchases of goods, works, and consulting services; (ii) project monitoring, reporting and evaluation; and (iii) financial management and record keeping, accounts and disbursements. The consultant will be responsible for supervising the project implementation and periodic reporting to the financiers.

4.1.5 The PIT will be headed by a project manager and comprised of one drilling / mechanical engineer, one accountant, one procurement expert, one socio-economist, one environmentalist and one Monitoring and Evaluation (M&E) specialist who will be assigned to the project subject to Bank approval. The establishment of the PIT with qualifications and experience acceptable to the Bank is one of the conditions for first disbursement of the ADF loan. Implementation of the ESMP will be the responsibility of the main contractor under the supervision of the consulting engineer. The contractor shall employ an officer responsible for implementation of social/environmental requirements. This person will maintain regular contact with GDC's principal Environmental Officer. The implementation arrangements are detailed in Annex B3.

4.1.6 **Procurement:** All procurement of goods, works and acquisition of consulting services financed by the Bank will be in accordance with the Bank's Rules and Procedures: "Rules and Procedures for Procurement of Goods and Works", dated May 2008; and "Rules and Procedures for the Use of Consultants", dated May 2008, using the relevant Bank Standard Bidding Documents, and the provisions stipulated in the Financing Agreement. GDC will be responsible for the procurement of goods, works, service contracts and consulting services. An 18 month procurement plan will be prepared by GDC before the negotiations of the project's loan agreement. The procurement plan will be updated at least annually or as required to reflect project implementation needs and improvement in institutional capacity. The procurement arrangements are detailed in Annex B5.

4.1.7 **Financial Management:** The project's financial management transactions will be managed within the existing set-up at GDC. Actions outlined in the Financial Management Action Plan will be undertaken by both GDC and the Bank to strengthen the financial management systems. In order to ensure that the project is effectively implemented, GDC will ensure that appropriate staffing arrangements are maintained throughout the life of the project. The results of the financial management assessment indicate that the overall risk rating for this project is moderate. The proposed financial management arrangements put in place meet the Bank's minimum requirements for project financial management as per S17 of Articles Establishing the ADB and are therefore adequate to provide, with reasonable assurance, accurate and timely information on the status of the project.

4.1.8 The Bank is in compliance with the 2005 Paris Declaration and the 2008 Accra Agenda for Action in so far as the use of Country Financial Management Systems is concerned as they shall be used to a great extent in the implementation. We shall also liaise with fellow development partners namely, the World Bank, Agence française de développement and European Investment Bank in order to harmonize, to the extent possible, financial reporting and auditing time-lines, amongst others.

4.1.9 **Disbursements:** GDC will utilize the Bank's four disbursement methods explained in the Bank's Disbursement Handbook. An initial disbursement will be deposited in the project Special Account (SA) in foreign currency opened in the Central Bank of Kenya based on a six month cash flow forecast for the project and based on the agreed work plan through the initial withdrawal application to the Bank after the effectiveness of the project. Actual expenditures will be replenished through submission of withdrawal applications (at least monthly) supported by Statements of Expenditures (SOE) while direct payment method will be used for payments to contractors or service providers upon recommendations of their satisfactory performance by the project authorized consultant and officials. The Bank's Disbursement Letter will be issued stipulating key disbursement procedures and practices.

4.1.10 A detailed assessment of the financial management and disbursement arrangements is provided in Annex B4.

4.1.11 **Audit:** The accountant within the PIT with the assistance of the supervising consultant will be responsible for preparing separate financial statements and reports for the project. The project will also be part of the work program of the internal audit department of GDC. GDC has received a no objection from the Kenya National Audit Office (KENAO) to competitively recruit external auditors. Independent external auditors will therefore carry out the audit and report on the financial statements in accordance with the Bank's requirements.

The charges related to the project audit are part of project costs and will be funded by the Borrower. The detailed audit arrangements are provided in Annex B6.

4.2 Project Monitoring and Evaluation

4.2.1 The monitoring and evaluation of the performance of the project will be realized at three levels. The first is the 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. The second level is the monitoring of the financial performance of GDC. The third level concerns the environmental and social indicators.

4.2.2 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 and will be field supervised from headquarters at least once a year from 2012 through to 2016. The Kenya Field Office (KEFO) will also carry out field supervisions once a year or on a need basis.

4.2.3 GDC will be assisted by the supervision consultant and will report quarterly on the project's implementation progress. A mid-term review of the project will be undertaken by the Bank approximately 24 months after the effectiveness of the loan. The execution of the environmental and social management plan will also be monitored. The supervision consultant shall also prepare and submit to the Executing Agency and the Bank final commissioning reports at the completion of their assignments. Within six months of the completion of the project, the Bank, together with the Executing Agency will prepare and submit a Project Completion Report (PCR).

4.2.4 Finally, a Monitoring and Evaluation (M&E) specialist with appropriate qualifications and experience will be part of the PIT. The M&E specialist will be the focal point for all data collection and analysis and would liaise with supervising engineers, the environmental specialists and to other PIT members to ensure that all project data is collected and of good quality, analyzed and submitted to the Bank in time.

4.3 Governance

4.3.1 The Board of Directors (BoD) appointed by the Minister of Energy provides strategic direction and guidance to GDC. The Board is composed of members with different complimentary skills and relevant experience to carry out its duties. Functions of the BoD are governed by set Policies and Procedures.

4.3.2 This project will be implemented by GDC, to a great extent using the Country's PFM system. The Managing Director and Chief Executive Officer of GDC shall designate a project coordinator for the day-to-day management of the project. The Internal Audit Department of the company will assist in monitoring and evaluating the internal controls. External oversight will be provided by the Government's Auditor General. The Bank will provide some oversight especially during supervision missions.

4.3.3 In Kenya, corruption remains a source of risk for any investment. However, the Government has passed a considerable amount of legislation and has established many entities dedicated to implementing reforms to combat corruption. All the Anti-Corruption measures that pertain to GDC and the government will apply to this project

4.4 Sustainability

4.4.1 The project is transformative in the sense that it focuses on gradually changing the base source of electricity from hydropower to geothermal power, also a renewable energy source but more sustainable than the drought-prone hydro-based system. The project is also sustainable from a financial and economic point of view, with low operating costs due to low marginal costs for indigenous fuel. Furthermore, geothermal power generation is characterized by high availability and low environmental impacts.

4.4.2 The project will remove the barriers related high drilling risk and will enable the development of geothermal power generation in Kenya and in the Rift Valley region where the geothermal potential is significant. The GoK's involvement and the experience they gained in the geothermal sector over the years will provide comfort to potential investors for power generation to participate in the development of the sector in a sustainable way. The GoK has also shown its commitment to the project and in the past two years, it has provided GDC with USD 73 million and USD 85 million through budget support for the year 2009/2010 and 2010/2011 respectively.

4.4.3 **Tariffs:** Kenya's retail tariff is bundled and incorporates the combined cost of the different functional components (generation, transmission and distribution) and ensures sustainability as it is based on the revenue requirements of KPLC which is responsible for the retail of electricity throughout the country. The revenue requirements are based on prudently incurred costs including power purchase costs, transmission, distribution and retailing costs as well as a reasonable rate of return on the capital invested to provide the services. In the case of geothermal power generation, the steam generation cost will be a pass through cost for the power producer and GDC will be paid directly by KPLC for the steam supplied for power generation. To ensure the affordability of electricity to end users, the domestic tariff category is divided into three consumption blocks with increasing energy charges. As of the end of 2010, the average tariff was about USD 16.00 cents/kWh.

4.4.4 **Private sector participation:** Over the years, the GOK has introduced key sector reforms including the unbundling of KPLC in the 1990's, establishment of the Energy Regulatory Commission (ERC), development of Feed in Tariffs Policy and the creation of the Geothermal Development Company. This has been instrumental in crowding in private sector participation. There are currently five Independent Power Producers (IPP), 4 thermal and 1 geothermal with effective grid capacity of 347 MW (26% of total power generation). IPPs are expected to play a more important role in the future. There are on-going Power Purchase Agreement (PPA) negotiations with four new potential IPPs.

4.4.5 The geothermal IPP, Olkaria III (48 MW) is owned and operated by Orpower4 Inc. It was financed by IFC, Ormat International and KfW. The Olkaria III project is the first private geothermal power plant in Kenya. A 20 year Power Purchase Agreement was awarded to Ormat by KPLC in 1998 under a World Bank supervised international tender for the field and plant development up to 100 MW. The first phase of the project included the drilling of 5 appraisal wells and construction of a 12 MW binary geothermal power plant, which is entirely owned and financed by Ormat. Ormat has since increased its capacity to 48 MW.

4.4.6 The GoK and GDC are pursuing a commercialization program that will focus on engaging the private sector to invest in the geothermal power generation through a Build, Own and Operate (BOO) structure. GDC will be responsible for the steam production and will sell the steam to private operators. To provide clarity on the steam resource and project costs, a feasibility study will be undertaken and will be shared with all bidders. A steam sales agreement will be negotiated and signed by both parties.

4.4.7 In this regard, GDC has already issued an expression of interest and more than 20 potential investors have expressed interest, among which some reputable companies specializing in power generation. The development of geothermal energy opens a new dimension for public-private partnerships in the energy sector. The approach GDC has adopted allows the public resources to explore and establish the steam gathering network, thus mitigating and addressing many risks for which private investors might be unwilling to take. Once GDC lays down the steam gathering infrastructure, this unlocks the generation investment decisions for private capital and attracts much needed funding into the sector. As a consequence, private sector participation reduces the dependence on the donors' and public resources in the sector. It is expected that the construction of the power plant by the private sector will be completed by 2018.

4.4.8 **Off taker credit risk:** KPLC has a good track record in terms of meeting its contractual obligations and there have been no major payment issues with the Kenyan IPPs to date. KPLC's financial position has been further strengthened with GoK taking a majority stake in the utility this year. On future IPPs that will generate the power from the steam produced by this project, it is expected that KPLC will provide a letter of credit from a local bank as liquidity support which will be backstopped by a Partial Risk Guarantees (PRG). A GoK Support Letter will also be considered to provide assurances that KPLC will be permitted to manage its operations on a sound commercial basis. The Bank could consider providing PRG for future IPPs.

4.4.9 **Power evacuation:** The power plant will be connected to the grid through planned and funded transmission lines located in the vicinity of the Menengai site. Detailed study for the evacuation of power from Menengai will be undertaken jointly by Kenya Electricity Transmission Company Ltd (KETRACO) and GDC. The implementation of the transmission line could be included in the scope of the power generation component to be developed by the private sector.

4.4.10 **Regional integration:** The Kenyan system will be interconnected within the Eastern African Power Pool (EAPP) via Lessos-220 kV to Uganda (2014), Isinya-400 kV to Tanzania (2015) and Susway-500 kV (HVDC) to Ethiopia (2016). These interconnections will open the power market in the region, and the project could benefit from trading opportunities with those neighbouring countries.

4.5 Risk Management

4.5.1 The project involves some degree of risks. GeothermEx, a Schlumberger company and one of the leading consultancy firms in the geothermal sector, with more than 35 years of geothermal resource consulting in similar projects worldwide and considerable experience in Kenya, has assisted the project team in identifying and assessing the risks that might affect its successful execution. A summary of the findings of GeothermEx is provided in Annex C1.

4.5.2 The major risks and mitigation measures are:

- Counterpart funding risk: The non-availability of counterpart funds from the Government of Kenya and/or GDC at the early stage of implementation could delay the project. Both the Ministry of Energy and the Ministry of Finance are strongly committed to the project and have provided assurances to the project team of the government's strong support to this project and of its commitment to making the necessary funds available. The Government of Kenya has provided all the funding since the creation of GDC in 2009. GDC contribution in the cash flow projections is based on revenues earned from steam sales from the Olkaria I & IV projects planned to be completed in 2016.
- Resource Risks: There is a risk that the Menengai resource may prove insufficient to support the planned 400 MW development. This could result in a scale down the project size and/or a shortfall in steam supply and/or cost or schedule overruns as efforts are made to resolve the resource shortfall. The presence of an exploitable geothermal resource has however been clearly demonstrated by the results of some of the first completed and tested wells. An independent preliminary heat resource estimates a total resource of at least 1,650MW which supports the decision to develop the resource to the proposed level (400 MW).
- Drilling risk: This risk relates to the probability of hitting dry wells during the exploration and appraisal drilling campaigns. This will directly result in delays in achieving the intended generation and cost overruns. This risk will be mitigated by the exploration studies as well as the experience and expertise of the implementing agency, GDC. GDC has successfully explored and drilled in several locations in Kenya and this track record gives comfort to donors and potential private investors.
- Operation and maintenance risk: This is the risk that once developed, the field is not maintained and operated according to the industry standards. This risk is however mitigated by GDC's expertise and past experience. GDC recruited its core team from Kengen that was responsible for the operation and maintenance of geothermal power plants in Kenya since the first power plant was commissioned in 1981. Capacity building will also be provided to GDC under the project.
- 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. Sensitivity analysis suggests that the project financial performance can withstand implementation delays of up to 6 months and still retain its economic viability. However a capex cost overrun is a sensitive parameter, and tests indicate that a 10% increase will result in the project being marginally unviable. However, the cost overruns are likely to result from the drilling operations. The drilling cost estimates are however conservative and adequate contingencies have been put in place for the operations.
- GDC capacity risk: As more rigs are added, and operations become more complex (including the possible installation and operation of wellhead generation units, and the construction of steam gathering system, it will become more challenging for GDC to provide the required labor and expertise. To mitigate this risk, GDC is undertaking a considerable amount of training of new personnel, by mixing new employees in on the drilling operations as work proceeds (such that the present drilling operations are reportedly somewhat over-staffed, due to the inclusion of the trainees). The project will also finance training and workshops for GDC staff.

- Private sector / plant construction delay risk: A variety of factors, some of them largely outside the control of GDC (such as delays in bidding process and delays in the private investors obtaining financing) could lead to delays in the contracting, construction and start-up of power plants by private investors. The preliminary interest expressed by consulted private investors and the involvement of a transaction advisor in the project will mitigate that risk.
- Transmission line construction delay risk: There is a risk that the transmission line will not be constructed on time to evacuate the power from the power plant once constructed. GDC and KETRACO will jointly undertake detailed feasibility study and the construction of the power evacuation infrastructure will be completed in time of the first electricity generation.

4.6 Knowledge Building

4.6.1 The project will have a catalytic replication effect, which will come from: (i) financing and investment resources leveraging; and (ii) learning and demonstration.

- a. Leveraging of resources: ADF resources will leverage financing from the World Bank and other development partners (AFD and EIB) as well as the private sector in a ratio of 1 to 8. It will catalyze downstream geothermal IPPs with a potential to harness up to 7,000 MW of geothermal capacity in the country.
- b. Learning and Demonstration: In addition, the catalytic replication effect of the project will come from the capacity building and knowledge creation that the project will leverage. The learning in geothermal resource development, including development of geothermal IPPs, will be shared in Kenya and in other countries in Sub-Saharan Africa especially countries with significant geothermal resource development potential such as Uganda, Rwanda and Ethiopia.

5 LEGAL FRAMEWORK

5.1 Legal Instrument

5.1.1 The legal instruments for the project are:

- 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.

5.2 Conditions for Bank Intervention

A) Conditions Precedent to Entry into Force

5.2.1 The entry into force of the ADF loan agreement and the SREP loan agreement shall be subject to the fulfilment by the Government of Kenya (GoK) of the provisions of Section 12.01 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 Section 10.01 of the General Conditions Applicable to Protocols of Agreement for Grants of the African Development Fund (the “Grant General Conditions”).

B) Conditions precedent to first disbursement of the loan

5.2.2 The first disbursement of the Loans and the Grant shall be subject to the fulfilment by the Government of Kenya of the appropriate provisions of Section 12.02 of the Loan General Conditions and Section 10.02 of the Grant General Conditions, respectively, and the following operational conditions:

- i) Evidence satisfactory to the Bank of the firm commitment of the co-financiers or evidence satisfactory to the Bank that the Borrower has made appropriate arrangements to cover any financing gap resulting from the failure to obtain the commitment of a co-financier;
- ii) Evidence of the establishment of the Project Implementation Team (PIT). The qualifications and experience of the PIT staff shall be acceptable to the Bank;
- iii) Evidence of the opening of a special account for the project; and
- iv) Evidence satisfactory to the Bank that all land and rights in respect thereto required for carrying out the project has been acquired and that the owners of all such land have been compensated.

C) Other Conditions

5.2.3 The Government of Kenya (GoK) undertake to fulfil the following other conditions:

- i) GoK shall implement the Project in accordance with the provisions of (a) the Kenyan environmental and social legislation and conditions of the environmental license issued by NEMA, (b) the ESMP, and (c) the Loan Agreement.
- ii) GoK shall submit quarterly progress reports on the implementation of components of the project and the ESMP.

5.3 Compliance with Bank Policies

5.3.1 This project complies with all applicable Bank policies.

6 RECOMMENDATION

6.1.1 Management recommends that the Board of Directors approve the proposed ADF loan of UA 80 million, and the Scale-up Renewable Energy Program (SREP) (through ADF) loan of US\$ 7.5 million and grant of US\$ 17.5 million (total SREP financing approximately equivalent to UA 16 million) to Kenya for the Menengai Geothermal Development Project, subject to the conditions stipulated in this report.

Appendix I: Country's Comparative Socio-Economic Indicators

Kenya - Development Indicators				
Social Indicators	Kenya		Africa	Developing countries
	1990	2010 *		
Area ('000 Km²)	593		30 323	80 976
Total Population (millions)	23,4	40,9	1 031,5	5 658,7
Population growth (annual %)	3,4	2,6	2,3	1,3
Life expectancy at birth, total (years)	59,8	55,6	56,0	67,1
Mortality rate, infant (per 1,000 live births)	65,8	60,4	78,6	46,9
Physicians per 100,000 People	4,5	...	58,3	109,5
Births attended by skilled health staff (% of total)	...	...	50,2	64,1
Immunization, measles (% of children ages 12-23 months)	41,0	74,0	71,1	80,7
School enrollment, primary (% gross)	100,6	112,7	102,7	107,2
Ratio of girls to boys in primary education (%)	96,6	97,7	91,7	96,2
Literacy rate, adult total (% of people ages 15 and above)	...	86,5	64,8	80,3
Access to Safe Water (% of Population)	41,0	59,0	64,5	84,3
Access to Sanitation (% of Population)	39,0	31,0	41,0	53,6
Human Develop. (HDI) Rank (Over 169 Countries)	...	128	n.a	n.a
Human Poverty Index (% of Population)	...	29,5	...	...
Economy	Kenya			
	2000	2008	2009	2010
GNI per capita, Atlas method (current US\$)	420	730	760	...
GDP (current Million US\$)	12 604	30 031	29 394	34 733
GDP growth (annual %)	0,5	1,7	2,6	5,0
Per capita GDP growth (annual %)	-2,1	-0,9	0,0	2,3
Gross Domestic Investment (% of GDP)	17,6	20,3	20,9	21,0
Inflation (annual %)	10,0	14,7	10,5	4,1
Budget surplus/deficit (% of GDP)	0,8	-5,2	-5,4	-5,8
Trade, External Debt & Financial Flows	2000	2008	2009	2010
Export Growth, volume (%)	-4,9	7,0	-4,6	9,5
Import Growth, volume (%)	6,8	9,3	5,3	0,6
Terms of Trade (% change from previous year)	0,2	-2,2	2,5	-7,8
Trade Balance (mn US\$)	-1 259	-5 649	-5 729	-7 250
Trade balance (% of GDP)	-10,0	-18,8	-19,5	-20,9
Current Account (mn US\$)	-284	-1 983	-1 558	-2 695
Current Account (% of GDP)	-2,3	-6,6	-5,3	-7,8
Debt Service (% of Exports)	27,3	4,5	5,0	5,4
External Debt (% of GDP)	40,0	24,0	26,6	25,0
Net Total Inflows (mn US\$)	858,6	1 381,6	2 310,9	...
Net Total Official Development Assistance (mn US\$)	509,2	1 362,7	1 778,0	...
Foreign Direct Investment Inflows (mn US\$)	110,9	95,6	140,5	...
External reserves (in month of imports)	2,2	1,8	2,5	...
Private Sector Development & Infrastructure	2000	2005	2009	2010
Time required to start a business (days)	...	54	30	33
Investor Protection Index (0-10)	...	5	5	5
Main Telephone Lines (per 1000 people)	9,3	8,0	16,7	16,7
Mobile Cellular Subscribers (per 1000 people)	4,1	128,8	420,6	420,6
Internet users (000)	3,2	31,0	86,7	86,7
Roads, paved (% of total roads)	13,6	13,8	...	...
Railways, goods transported (million ton-km)	1 492	1 399	...	...

Source: ADB Statistics Department, based on various national and international sources

* Most recent year

Last Update: May 2011

Appendix II: ADB Portfolio in Kenya

Sector	Project Name	Source of Funding	Approval	Signature	Effective	Net Commitments (UAm)	Disbursement Ratio (%)	Closing Date	Project age
Agriculture	Asal-Based Livest.& Rural Livelihood. Sup. Pr	ADF	17-Dec-03	3-Jun-04	22-Sep-04	18,41	89,8	30-Dec-12	7,9
	Asal-Based Livest.& Rural Livelihood. Sup. Pr	ADF-G	17-Dec-03	3-Jun-04	22-Sep-04	3,17	95,7	30-Dec-12	7,9
	Rural Livelihoods Rehab & Recon	ADF	29-Apr-09	4-Jun-09	8-Sep-09	15,00	45,3	30-Jun-13	2,5
	Kimira-Oluch Smallholder Irrigation Deve	ADF	31-May-06	14-Jul-06	21-Sep-06	22,98	55,2	30-Sep-13	5,4
	Kimira-Oluch Smallholder Irrigation Deve	ADF-G	31-May-06	14-Jul-06	14-Jul-06	1,15	41,0	30-Sep-13	5,4
	Smallscale Horticulture Development Pro	ADF	5-Sep-07	26-Nov-07	13-Mar-08	17,00	12,1	31-Dec-14	4,1
	Green Zones Development Support Project	ADF	12-Oct-05	30-Nov-05	27-Feb-06	25,04	66,0	31-Dec-13	6,1
Agriculture Sub Total						102,75	50,6		4,9
Power	Mombassa Nairobi Transmission Line	ADF	6-May-09	4-Jun-09	22-Jan-10	50,00	14,8	31-Dec-13	2,4
	Power Transmission Improvement Project	ADF	6-Dec-10	23-Mar-11	0-Jan-00	46,70	0,0	30-Jun-15	0,8
Power Sub Total						96,70	7,4		1,6
Environment	Ewaso Ngiro North Nat Res Cons Project	ADF	22-Apr-05	16-Jun-05	27-Sep-05	13,59	41,8	31-Dec-12	6,5
	Ewaso Ngiro North Nat Res Cons Project	ADF-G	22-Apr-05	16-Jun-05	16-Jun-05	2,89	45,0	31-Dec-12	6,5
Environment Sub Total						16,48	43,4		6,5
Social	Community Empowerment Project (Ceisp)	ADF	17-Dec-07	23-Feb-09	2-Jul-09	17,00	15,2	31-Jul-14	3,8
	Support For Tivet Project	ADF	16-Dec-08	23-Feb-09	7-Apr-09	25,00	9,2	31-Dec-13	2,8
	Education III Project	ADF	17-Dec-03	3-Jun-04	24-Nov-04	24,26	17,8	30-Dec-12	7,9
	Education III Project	ADF-G	17-Dec-03	3-Jun-04	24-Nov-04	6,75	35,1	30-Dec-12	7,9
	Rural Health Project III	ADF	7-Jul-04	6-Sep-04	15-Mar-05	17,18	51,6	29-Feb-12	7,3
	Rural Health Project III	ADF-G	7-Jul-04	6-Sep-04	15-Mar-05	6,00	97,5	29-Feb-12	7,3
Social - Sub Total						96,19	37,7		6,2
Transport	Nairobi-Thika Highway Improvement Project	ADF	21-Nov-07	26-Nov-07	11-Jul-08	117,85	48,1	31-Dec-12	3,9
	Nairobi-Thika Highway Improvement Project	ADF-G	21-Nov-07	26-Nov-07	26-Nov-07	3,15	16,3	31-Dec-12	3,9
	Rehabilitation Of Timboroa Eldoret Road	ADF	24-Nov-10	23-Mar-11	Not Yet	35,00	0,0	29-Feb-16	0,9

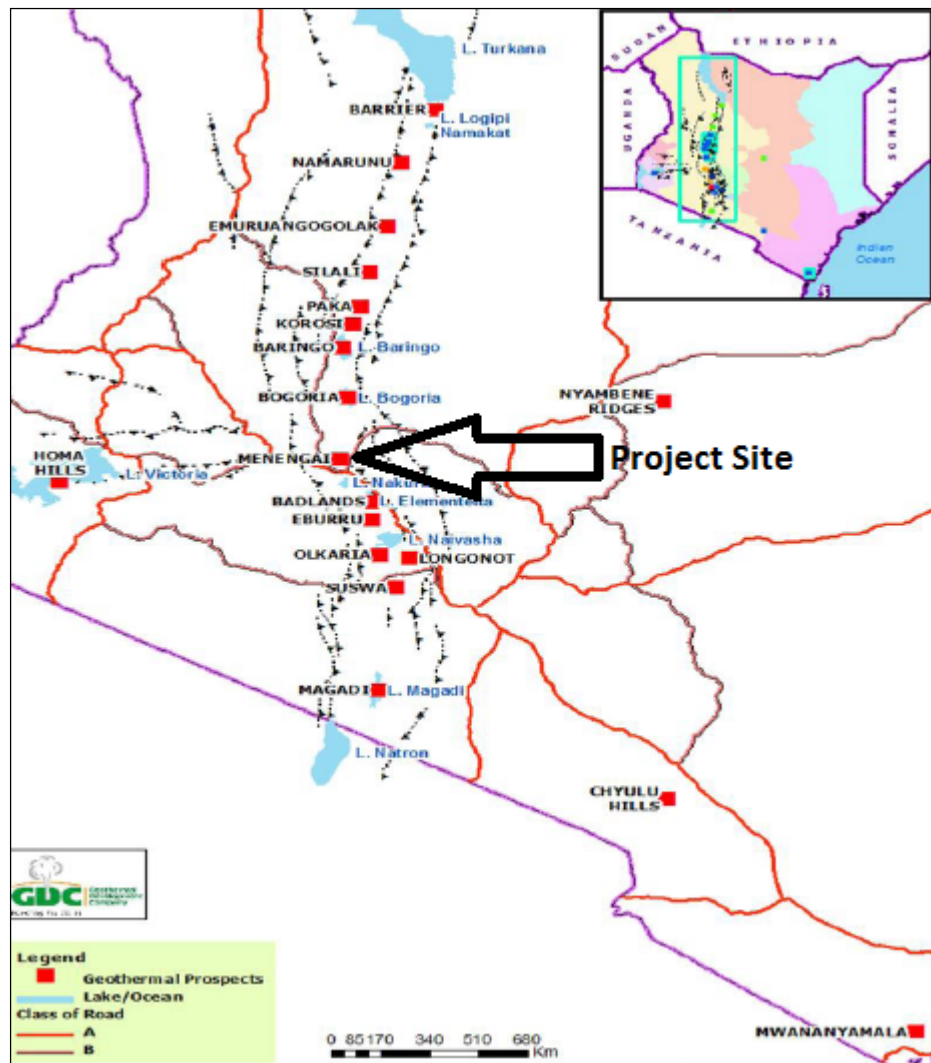
	Kenya/Ethiopia: Mombasa-Nairobi-Addis Rd	ADF	13-Dec- 04	4-Feb-05	7-Apr- 05	33,60	83,4	31-Dec- 11	6,9
Transport - Sub Total						189,60	36,9		3,9
Water Sup/Sanit	Water Services Boards Support Project	ADF	21-Nov- 07	26-Nov- 07	18-Nov- 08	35,19	5,6	31-Dec- 12	3,9
	Small Med Towns Water Supply & Waste Wat	ADF	3-Nov- 09	5-Apr-10	14- May-10	70,00	0,0	31-Dec- 14	1,9
	Nairobi Rivers Basin Rehabilitation And	ADF	6-Dec- 10	23-Mar- 11	Not Yet	35,00	0,0	31-Dec- 15	0,8
	Integrated Land & Water Management	AWF	13-Jan- 09	27-Aug- 09	15-Jun- 10	1,69	16,9	31-Dec- 11	2,8
Water Sup/Sanit - Sub Total						141,88	36,8		4,3
Multinational	Nelsap Interconnection Project - Kenya	ADF	16-Jun- 10	20-Sep-10	Not Yet	39,77	0,0	31-Dec- 14	1,3
	Kenya/Ethiopia: Mombasa-Nairobi-Addis Rd	ADF-G	13-Dec- 04	16-May- 05	16- May-05	1,35	52,8	30-Jun- 12	6,9
	Mombasa-Nairobi-Addis Corridor li - Ken	ADF	1-Jul-09	11-Dec- 09	2-Apr- 10	125,00	6,1	31-Dec- 15	2,2
Grand Total						826,09	20,6		3,4

Appendix III: Similar Projects in Kenya

Donor	Title	Main GoK priority	Status	Period of implementation	Commitment in credit currency ('000 000)	Currency
AFD/PROPARCO	Mumias Sugar co-generation	Promotion of renewable energies	Completed	2007/2009	35,00	USD
AFD/PROPARCO	Rabai Thermal Plant	Generation capacity expansion	Completed	2008/2011	23,00	EUR
AFD/PROPARCO	Lake Turkana Wind Farm	Promotion of renewable energies	Planned	2011/2015	35,00	EUR
Proparco	Olkaria III	Promotion of renewable energies	Ongoing	2008/2010	15,00	USD
AFD	Olkaria II-3rd Unit	Promotion of renewable energies	Completed	2007/2010	20,00	EUR
AFD	Olkaria I and IV Project	Promotion of renewable energies	Ongoing	2010/2014	150,00	EUR
AFD	Support to the development of renewable energy and geothermal energy	Promotion of renewable energies	Ongoing	2010/2014	56,00	EUR
AFD	Renewable Energy and Energy Efficiency credit line	Promotion of renewable energies	Ongoing	2011/2015	30,00	EUR
AfDB	Lake Turkana Wind Power	Promotion of renewable energies	Planned	2012-2014	50,00	EUR
AfDB	Thika Thermal Power Project	Generation capacity expansion	Planned	2011-2012	26,00	EUR
EIB	Olkaria II Extension	Promotion of renewable energies	Ongoing	2006-2007	50,00	USD
EIB	Olkaria I and IV Project	Promotion of renewable energies	Ongoing	2010/2014	119,00	EUR
Government of PRC/CHINA EXIMBANK	Olkaria I and IV Geothermal Project	Promotion of renewable energies	Ongoing	2010/2013	95,00	USD
Go Spain	Ngong II Wind Project	Promotion of renewable energies	Ongoing	2010/2011	20,00	EUR
IDA /WB	Energy Sector Recovery Project	Various	Ongoing	2005/2010	80,00	USD
IDA/WB	Energy Sector Recovery Project Additional financing	Various	Ongoing	2009/2013	80,00	USD
IDA/WB	Electricity Expansion Project	Various	Ongoing	2010-2015	330,00	USD
IDA/IFC/MIGA	Partial Risk Guarantee Project	Generation capacity expansion	Planned		-	USD
MIGA/WB	OrPower4 (Olkaria III)	Promotion of renewable energies	Ongoing		-	USD
JICA	Sondu-Miriu Hydropower Project Sang'oro Power Plant	Generation capacity expansion	Ongoing	2007-2012	5 620,00	Yen
JICA	Olkaria I Unit 4 and 5 Geothermal Power Project	Generation capacity expansion	Ongoing	2010-2013	29 516,00	Yen
KfW	Olkaria IV appraisal drilling (geothermal)	Promotion of renewable energies	Planned	2006-20011	10,60	EUR
KfW	Hydropower Plant Kindaruma	Generation capacity expansion	Ongoing	2009-2013	39,10	EUR
KfW	Olkaria I and IV Project	Promotion of renewable energies	Planned	2010-2014	60	EUR

KfW/DEG	Olkaria III (geothermal)	Promotion of renewable energies	Ongoing	2007-2010	20	USD
KfW/DEG	Olkaria III (geothermal)	Promotion of renewable energies	Planned	2011-2014	0	USD
UNEP/GEF	Cogen for Africa	Promotion of renewable energies	Ongoing	2007/2013	5,25	USD
UNEP/GEF	Greening the Tea Industry in East Africa (GTIEA)	Promotion of renewable energies	Ongoing	2007/2011	2,85	USD
UNEP/GEF	African Rift Geothermal Development Facility (ARGE)	Promotion of renewable energies	Ongoing	2010/2015	2,85	USD
UNDP	Access to Clean and sustainable energy services	Promotion of renewable energies	Completed	2006 - 2010	0,10	USD
UNIDO	Africa Adaptation Programme	Promotion of renewable energies	Ongoing	2010-2011	1,44	USD

Appendix IV : Map of Project Area



TECHNICAL ANNEXES

A. Country's Development Agenda, Sector Brief and donor's Support

DEVELOPMENT AGENDA

A1.1 Kenya is a regional hub for trade and finance in East Africa. The economy is mostly market-based, with some state-owned entities in infrastructure, and external trade has been liberalized. The economy depends on agriculture and tourism, which makes it vulnerable to external shocks, and partially explains the fluctuations in growth historically characterizing the Kenyan economy. Tourism is the largest foreign exchange earner, followed by agricultural exports (flowers, tea and coffee).

A1.2 The development agenda for Kenya is outlined in its recently adopted Vision 2030. This ambitious vision outlines the country's development priorities for the period 2008 to 2030, and identifies three pillars – economic, social and political – critical to the transformation of the economy to middle-income status by 2030. The economic pillar specifically, aims to facilitate the attainment of an annual GDP growth rate of 10% by 2012 and maintain it over the next 25 years. This goal will be achieved through projects and programs as outlined in the five-year Mid-term Plans (MTP); and will be supported by strategies to ensure justice, social cohesion, equity and environmental sustainability (social pillar), as well as development of sustainable democratic institutions (political pillar). The MTP for 2008 to 2012 in particular focuses on economic growth and employment creation as the basis for poverty reduction and shared prosperity.

A1.3 The Vision identifies several foundations necessary to anchor the identified pillars of development, including among others, energy and infrastructure development. With regards to energy, the Vision recognizes the need to generate more energy at a lower cost, improve efficiency in energy consumption, implement institutional reforms in the energy sector, and exploit new sources of energy. The MTP also places specific emphasis on rural infrastructure development, as a means to address regional inequalities and unlock Kenya's agricultural potential. Rural electrification, for example, is a strategic focus for the Government of Kenya, both for economic and environmental reasons. It is important to note that the flagship projects earmarked for GDP growth (tourism, value-added agriculture, manufacturing, provision of offshore business process services, and of financial service) rely to a large extent on the presence of reliable power within the Kenyan economy.

ENERGY SECTOR BRIEF

A1.4 Kenya's National Energy Policy² defines the policy framework for providing cost-effective, affordable and adequate quality energy services on a sustainable basis over the period 2004-2023. The policy also points out the importance of regional power interconnections for supply security, particularly during periods of severe droughts, and for investment decisions on least cost generation capacity additions. The long term strategy for

² Sessional Paper No. 4, Ministry of Energy 2004

the expansion of the interconnected power system is summarized in regularly updated least cost power development plans (LCPDP) showing both demand forecasts and supply targets.

Table A1.1: Installed Capacity by Type for Least Cost Plan (Base Case) 2011-2031

Year	Hydro	Nuclear	MSD	Import	Cogen	GT-KERO	GT-NG	Geothermal	Coal	Wind	Total	Peak Load	Reserve Margin	% LOLP
2010	741	-	333	-	26	60	-	198	-	5	1,363	1,227	11	39.304
2011	761	-	453	-	26	60	-	198	-	5	1503	1302	15	43.244
2012	782	-	453	-	26	60	-	206	-	5	1,532	1,520	0.7	47.758
2013	782	-	705	-	26	60	-	241	-	186	2,000	1,765	13.2	23.389
2014	814	-	705	200	26	-	-	608	-	535	2,888	2,064	39.9	0.177
2015	839	-	705	200	26	-	-	843	20	535	3,168	2,511	26.1	1.707
2016	839	-	705	600	26	-	-	843	320	535	3,868	2,866	34.9	0.096
2017	839	-	1,025	600	26	-	-	1,028	320	535	4,373	3,292	32.8	0.078
2018	1,039	-	1,025	600	26	-	-	1,168	620	635	5,113	3,751	36.3	0.082
2019	1,039	-	969	800	-	-	-	1,448	620	735	5,611	4,216	33.1	0.147
2020	1,039	-	969	1,000	-	-	360	1,728	620	735	6,451	4,755	35.6	0.028
2021	1,039	-	895	1,000	-	-	540	2,008	920	835	7,237	5,388	34.3	0.038
2022	1,039	1,000	895	1,000	-	-	540	2,008	920	835	8,237	6,048	36.2	0.115
2023	1,039	1,000	835	1,000	-	-	540	2,288	1,220	935	8,857	6,784	30.5	0.251
2024	1,039	1,000	1,155	1,200	-	-	720	2,708	1,220	935	9,977	7,608	31.1	0.104
2025	1,039	1,000	1,315	1,200	-	-	1,080	3,128	1,220	1,136	11,118	8,528	30.3	0.082
2026	1,039	2,000	1,315	1,600	-	-	1,080	3,548	1,220	1,336	13,138	9,556	37.5	0.019
2027	1,039	2,000	1,315	1,800	-	-	1,080	3,968	1,220	1,336	13,758	10,706	28.5	0.071
2028	1,039	2,000	1,315	2,000	-	-	1,260	4,340	1,820	1,636	15,410	11,994	28.5	0.073
2029	1,039	3,000	1,315	2,000	-	-	1,620	4,690	1,820	1,736	17,220	13,435	28.2	0.063
2030	1,039	3,000	1,635	2,000	-	-	1,980	5,110	2,420	2,036	19,220	15,026	27.9	0.064
2031	1,039	4,000	1,955	2,000	-	-	2,340	5,530	2,720	2,036	21,620	16,905	27.9	0.037
Total	5%	19%	9%	9%	0%	0%	11%	26%	13%	9%				

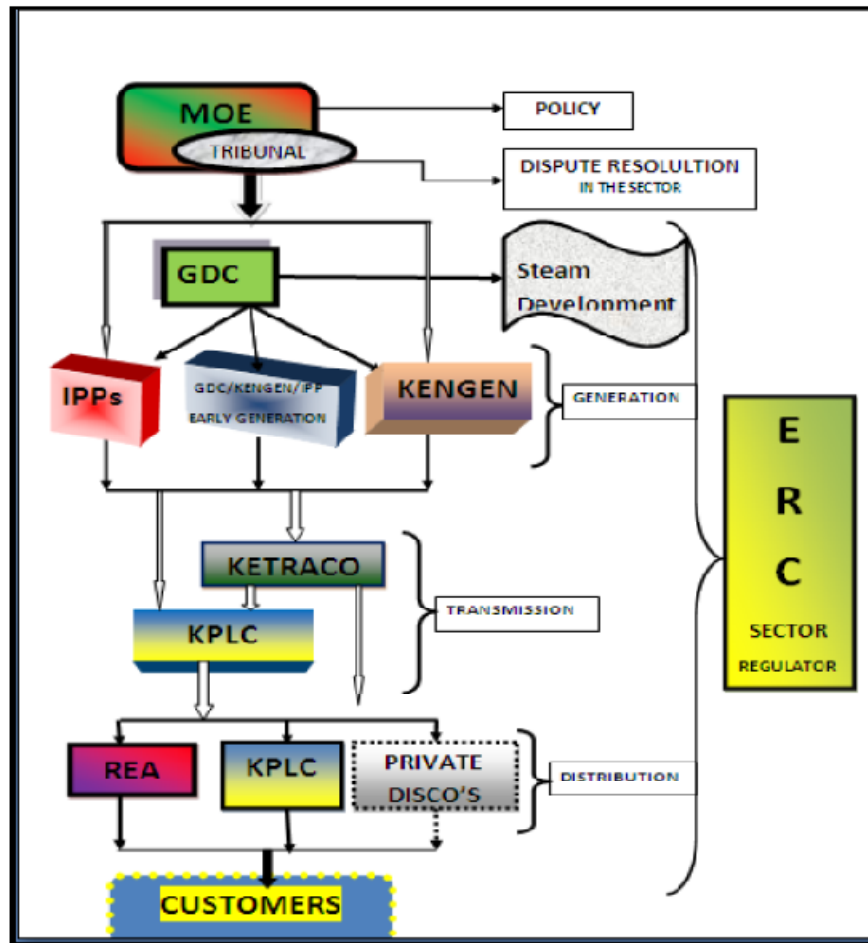
A1.5. As indicated in the 2011-31 LCPDP (see table A1.1), electricity demand in Kenya is expected to grow by between 9% and 14% annually, reflecting about 200 000 new customers every year. Most of these will be urban residential and rural customers with an estimated consumption of 120 kWh per month per new customer. To meet the new demand, plans are in place to increase electricity supply. The interconnected system of Kenya currently has an installed capacity of 1,363 MW, and system peak demand of 1,227 MW which leaves a very low margin to guarantee reliability. The forecast demand is 1,302 MW in 2011 rising to 16,905 MW in 2031. The optimal development program under the LCPDP indicates that geothermal capacity should be increased from the current 163MW to 5,530 MW in the planning period, equivalent to 26% of the system peak demand by 2031. The study indicates that imports will be required to supply substantial capacity ranging between 200 MW in 2014 and 2,000 MW in 2031, capped at a maximum of 15% of forecast annual peak demand. The system expansion plan over the 20 year plan period indicates that 26% of the total installed capacity will be obtained from geothermal, 19% from nuclear plants and 13% from coal plants while imports will provide up to 9% of capacity. Hydro plants, Medium Speed Diesel (MSD) plants, Gas Turbines (GTs) and wind plants

will provide 5%, 9%, 11% and 9% of the total capacity, respectively. The present value of the system expansion cost over the 20 year planning period amounts to USD 41.4 billion (committed projects excluded).

SECTOR INSTITUTIONAL FRAMEWORK

A1.6 The energy sector in Kenya is partially deregulated, encompassing both private players and state-owned enterprises. The sector's institutional framework is illustrated in Figure A.1.1 below.

Figure A1.1 : Power Sector Institutional Structure



A1.7 The responsibility for electricity generation is shared by the Kenya Electricity Generating Company Ltd. (KenGen) which supplies 995 MW (about 74% of total energy generation), and IPPs which provide the balance in competition with KenGen. KenGen was formally state-owned but has been partially privatized with Government owning 70% of the shares. Currently, five licensed IPPs operate in this market collectively producing 347 MW of thermal and geothermal power. The 2010 LCPDP indicates that several additional new players are expected in this market, as new IPP plants will be commissioned in the next few years. In addition to the major players, KPLC also operates a few isolated thermal stations as part of the Rural Electrification Program; and Aggreko Ltd is responsible for emergency power generation.

A1.8 Transmission is the responsibility of KPLC, currently the only licensed electricity provider. KPLC is a listed company in the Nairobi Stock Exchange., KPLC purchases power from KenGen and from IPPs under power purchase agreements, and is entitled to import around 20 MW of non-firm power from Uganda under an agreement with Uganda Electricity Transmission Company Ltd. (UETCL). KPLC also has some cross-border trade on a limited scale with TANESCO of Tanzania, and plans are under way to establish an interconnection with Ethiopia. To work around liquidity constraints facing KPLC, GOK recently created a Government-owned company, the Kenya Electricity Transmission Company (KETRACO), to serve as custodian of all new transmission lines. KETRACO will maintain power purchase contracts with KenGen and the IPPs, and a management contract will be established with KPLC, who will perform transmission operations and maintenance on KETRACO's behalf. Under this system, transmission remains predominantly a Government function.

A1.9 Distribution is also done by KPLC, with the exception of grid-based and off-grid rural electrification, which is the responsibility of the Rural Electrification Authority (REA). REA is a state-owned enterprise established under the 2006 Energy Act. The REA is responsible for planning rural electrification according to guidelines provided by the Ministry of Energy, and manages the Rural Electrification Program Fund for these objectives. REA works closely with KPLC who remain involved in implementing and operating rural electrification projects as a contractor to REA and under REA's coordination.

A1.10 To encourage the development of renewable energy sources, the Government in 2008 established the Geothermal Development Company (GDC) to take primary responsibility for the exploration and development of geothermal resources. GDC is tasked with confirming the viability of potential geothermal resources through a program of technical studies and exploratory drilling, and offer geothermal resources to potential power developers through competitive tendering.

A1.11 Oversight agencies in the power sector of Kenya are the Ministry of Energy (MoE) and the Energy Regulatory Commission (ERC). MoE is responsible for overall management of the energy sector and its institutions. Fields under the responsibility of the Ministry include hydro and thermal energy for electricity production, renewable energy, geothermal and fossil fuels exploration and development, and petroleum products. The Ministry is also mandated to develop the national energy policy, including the policy for energy import and export marketing.

A1.12 The ERC is responsible for economic and technical regulation (including tariff setting) of the power sector, including renewable energy, and downstream petroleum sub-sectors. Functions of the ERC include reviewing and setting tariffs and service quality standards, licensing, enforcement, dispute settlement, approving power purchase and network service contracts, and preparing an indicative national energy plan. Figure A1.1 below shows the institutional framework of the energy sector.

A1.13 In pursuit of the goal of regional integration and the need to build synergies with other regional countries in power development, the GoK has committed itself to entering into mutually beneficial regional interconnections. The regional power market is progressively evolving into a power pool with anticipated interconnections with Ethiopia, Tanzania and

other Southern African Power Pool countries and the strengthening of the interconnection with Uganda.

TARIFFS

A1.14 The electricity price for KenGen is determined through Long-term Power Purchase Agreements that were entered into with KPLC and approved by the ERC in June 2009. The KenGen remuneration is made up of the capital recovery charge, fixed operation and maintenance charge and the variable operation and maintenance charge. KenGen is entitled to receive the first two components in full as long as it meets the contractual target for generating plant availability. Only the Variable Operation and Maintenance Charge (VOMCR) component is based on the volume of power generated. In addition, for thermal generation plants, fuel costs are automatically passed through. Thus the structure provides incentives for KenGen to maximize the availability of its generation plants and reduce operating costs but bears some exposure to hydrological risk when it is not able to meet availability targets.

A1.15 Tariffs are adjusted automatically for monthly changes in generation related fuel costs and exchange rate depreciation. Fuel costs and exchange rate losses or gains are thus a pass-through for the utilities. In addition, adjustments for inflation take place every six months. The annual tariff revision also takes into account the target for annual distribution losses. This system has the features of a price-cap: tariffs are based on a formula defined ex ante. KPLC has a strong incentive to improve its performance between tariff reviews. Any cost reduction or increase in sales will directly improve KPLC's operating income. At the same time, the tariff mechanisms adequately protect the company from most of the major risks it cannot control (variation in the cost of generation and exchange rate). However the indexing of local cost inflation is only partial thus exposing KPLC to changes in the inflation rate. More importantly, KPLC is exposed to the demand risk, which would not necessarily be the case with a revenue-cap system. Because of this exposure to the volume of energy sold, the effect on consumer demand of macroeconomic factors such as oil price or economic growth has an impact on KPLC. The company is also exposed to sector-specific risks, in particular to the availability of generation to meet demand. The current situation in which there is significant un-served demand is penalizing KPLC. In future, any above-average costs arising from the recently approved feed-in tariffs for renewable energy will also be passed through to customers.

The structure of retail tariffs in Kenya is as summarised in Table A1.2 below:

Table A1.2: Structure of Retail Tariffs in Kenya

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

DONOR SUPPORT

A1.16 At present, Kenya's power system suffers challenges relating to shortages, systems losses and maintaining reactive power balance. Recognizing these challenges, the Bank's CSP for Kenya for the period 2008-2012 identifies energy as a focal point of support. Programs in the energy sector are supported through Pillar 1 of the CSP which focuses on improving infrastructure services for competitiveness and enhanced regional integration. Pillar 1 is one of two pillars of support proposed in the CSP, and accounts for 60% of Kenya's ADF XI allocation.

A1.17 Between 2009 and 2010, the donor coordination framework has been reorganised with the Government taking on a position of greater leadership. The new framework includes a Development Partnership Forum (DPF), co-chaired by the Prime Minister and the World Bank, as the highest organ (mainly reviewing progress on ongoing reforms); a Donor Co-ordination Group (DCG) (mainly bringing together High Commissioners, Ambassadors and Heads of Agencies to discuss a common position on reforms and international dynamics); and an Aid Effectiveness Group (AEG) (whose main function is to review policy and respond to Paris Aid Effectiveness indicators). The latter has replaced the HAC since 2010. The Government and Donors have also established an Aid Effectiveness Secretariat (AES) located within the Ministry of Finance to facilitate the work of the other organs. The leading multilateral donors are the World Bank, European Commission and the Bank. Major bilateral donors include China, Kreditanstalt für Wiederaufbau (KfW) of Germany and Agence Francaise de Développement (AFD) of France (see Appendix III). The World Bank focus is mainly in infrastructure, social services, public sector reforms and private sector development. The European Commission has emphasized decentralization, governance and rural development besides investments in infrastructure and public finance management.

A1.18 In light of Kenya's need for enormous investments in the energy sector, concessional financing from the Bank and other development partners is essential to complement resources from the Government, KenGen, KPLC and private sources. To mobilize and coordinate these resources, the Ministry of Energy has established a sector-working group (SWG) for the energy cluster of development partners. This group, currently chaired by AFD includes the Bank, the European Investment Bank (EIB), KfW, World Bank, the Japan International Cooperation Agency (JICA), the Swedish International Development Agency (SIDA), the Embassy of Spain, the United States Agency for International Development (USAID), United Nations Industrial Development Organization (UNIDO) and other development partners. This culminated in the preparation of the Electricity Access Investment Prospectus (2009-2014) by the Government. The Bank is involved in donor coordination in the country through KEFO, which participates as a member in almost all sector coordination and thematic working group meetings and is currently the lead in the Transport sector. The Energy Sector Donor Group holds regular monthly meetings with Government officials.

B. Back up of Key Arguments of the Report

B.1 Lessons learnt

Project	Date & Amount	Intervention Areas	Rating ¹	Lessons Learned ²
El Nino Infrastructure Rehabilitation Project	November 1998 UA 11.52 million	Rehabilitation of water and roads infrastructure in the affected areas of Western, Nyanza and Eastern provinces.	**** 3.0 *** ****	Adequate recognition of Country and potential project risks is essential to a reduction in implementation delays.
Rural Health Project II	July 1998 UA 8.00 million	Improving the health status of the target communities in seven districts through primary health care strategy, with a focus on community participation and support to community initiatives.	**** 2.4 *** ****	Weak monitoring and evaluation arrangements and the lack of baseline data affect project management and make project results difficult to account for. Furthermore, the lack of consultation with beneficiaries erodes project responsiveness to needs. The adequacy of project institutional arrangements needs to be assessed on a continuous basis with a view to change project reporting and project staffing arrangements if need arise.
Livestock (Pig) Project	June 1992 UA 4.61 million	Increasing supply of high quality pigs through the provision of credit to small scale pig producers and processors, institutional support strengthening, training of extension workers and farmers and the rehabilitation of the Wambugu training centre	**** 3.0 *** ****	The outcome of a project can be compromised if there is no careful planning and in-depth analysis of the weaknesses and strengths of the institutions in the borrower's country. Where project management is assigned to two or more independent institutions, provision should be made for sound co-ordination mechanisms through a memorandum of understanding that would minimise conflict management and promote smooth project implementation.

Agricultural Sector Adjustment Operation II	February 1991 UA 24.43 million	Providing balance of payments assistance to support the Government's efforts of promoting agricultural growth by removing policy constraints, stimulating investment and supporting institutional development.	**** 2.0 *** ****	Performance contracts that are signed between Governments and regulatory bodies should be designed to be more binding on both parties.
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B.2 Project Costs

B.2.1 The detailed project cost estimates by components are given in Table B.2.1 below.

Table B.2.1 Detailed Project Cost Estimates by Components (Amounts in UA million equivalent)			
N°	Component Name	Estimated Cost	Component Description
G)	Site civil works	2.38	Construction of access roads
		2.64	Construction of a water reticulation system
H)	Equipment	92.40	Procurement and commissioning of drilling rigs
		6.60	Procurement and commissioning of wellhead generation units
I)	Well drilling	48.84	Acquisition of offshore drilling materials
		3.37	Acquisition of local drilling materials
		44.51	Fuel and lubricants
		2.60	Water pumping costs
		6.17	Transport (materials and personnel)
		19.14	Spare parts
		9.93	Well testing
		0.59	Drill pipe inspection
		62.44	Labour and administrative costs
J)	Steam gathering system	105.60	Engineering, procurement and construction of a steam gathering system (EPC)
K)	Consultancy services	27.31	Drilling expertise
		1.11	Slotting services
		1.32	Feasibility study
		3.96	Steam gathering supervision consultant
		1.32	Transaction advisor
		5.15	Trainings and workshops
		3.95	Project management and supervision consultant
		0.08	Audit services
L)	Environmental and social management	0.57	Implementation of environmental management plan
	Price escalation and contingencies (10%)	45.20	
	Total Project Cost	497.17	

B.2.1 The detailed use of sources of financing by financier is given in Table B.2.2 below.

Table B.2.2 Detailed Use of Sources of Financing (Amounts in UA million equivalent)								
N°	Component Name	Estimated Cost	Component Description	AfDB / SREP	WB / SREP	AFD	EIB	GoK / GDC
A)	Site civil works	2.38	Construction of access roads	0.00	0.00	0.00	0.00	2.38
		2.64	Construction of a water reticulation system	0.00	0.00	0.00	0.00	2.64
B)	Equipment	92.40	Procurement and commissioning of drilling rigs	33.00	0.00	46.20	0.00	13.20
		6.60	Procurement and commissioning of wellhead generation units	6.60	0.00	0.00	0.00	0.00

C)	Well drilling	48.84	Acquisition of offshore drilling materials	48.84	0.00	0.00	0.00	0.00
		3.37	Acquisition of local drilling materials	0.00	0.00	0.00	0.00	3.37
		44.51	Fuel and lubricants	0.00	0.00	0.00	23.76	20.75
		2.60	Water pumping costs	0.00	0.00	0.00	0.00	2.60
		6.17	Transport (materials and personnel)	0.00	0.00	0.00	0.00	6.17
		19.14	Spare parts	0.00	0.00	19.14	0.00	0.00
		9.93	Well testing	0.00	0.00	0.00	0.00	9.93
		0.59	Drill pipe inspection	0.00	0.00	0.00	0.00	0.59
		62.44	Labour and administrative costs	0.00	0.00	0.00	0.00	62.44
D)	Steam gathering system	105.60	Engineering, procurement and construction of a steam gathering system (EPC)	0.00	74.68	15.59	0.00	15.33
E)	Consultancy services	27.31	Drilling expertise	0.00	0.00	27.31	0.00	0.00
		1.11	Slotting services	0.00	0.00	0.00	0.00	1.11
		1.32	Feasibility study	0.00	1.32	0.00	0.00	0.00
		3.96	Steam gathering supervision consultant	0.00	0.00	3.96	0.00	0.00
		1.32	Transaction advisor	1.32	0.00	0.00	0.00	0.00
		5.15	Trainings and workshops	2.29	0.00	0.00	0.00	2.86
		3.95	Project management and supervision consultant	3.95	0.00	0.00	0.00	0.00
		0.08	Audit services	0.00	0.00	0.00	0.00	0.08
F)	Environmental and social management	0.57	Implementation of environmental management plan	0.00	0.00	0.00	0.00	0.57
	Price escalation and contingencies (10%)	45.20		0.00	0.00	0.00	0.00	45.20
	Total	497.17		96	76	112	24	189

B3. Implementation Arrangements

B3.1 The Republic of Kenya will be the Borrower and the Ministry of Energy (MoE) will be the Executing Agency and beneficiary of the proposed loan. The Geothermal Development Company (GDC) will serve as the Implementing Agency.

B3.2 GDC is a special purpose vehicle fully owned by the Government of Kenya (GoK) created in 2008. It is charged with: conducting the surface exploration of geothermal fields; conduction exploration, appraisal and production drilling; developing and managing proven steam fields; and entering into steam-to-energy sales agreements with the Kenya Electricity Generating Company Limited (KenGen) and/or Independent Power Producers (IPPs) for the generation of 5,000 MW of power within the next 20 years. GDC employed more than 560 personnel in May 2011, most of whom had been involved in developing the geothermal field in Olkaria (total installed capacity of 198 MW in the country). GDC has developed tremendous expertise in the geothermal sector over the past couple of years. The key motivation underlying the creation of GDC and GoK acting as the borrower instead of GDC is to facilitate the sustainable development of the country's geothermal resource. GDC does not have a balance sheet to support sustainable borrowing of the required amounts to develop the geothermal project. This is the same arrangement which is being used to develop the country's electricity transmission infrastructure through the Kenya Transmission Company (KETRACO).

B3.3 This project will be implemented by GDC through a dedicated Project Implementation Team (PIT). The PIT will 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 including the review of the annual work plans and budgets. The consultant will be responsible for the management and supervision of the project implementation and will provide periodic reporting to the financiers.

B3.4 The PIT will be headed by a project manager and comprised of one drilling / mechanical engineer, one accountant, one procurement expert, one socio-economist, one environmentalist and one M&E specialist who will be assigned to the project subject to Bank approval. The

establishment of the Project Implementation Team at with qualifications and experience acceptable to the Bank is one of the conditions for first disbursement of the ADF loan. Implementation of the ESMP will be the responsibility of the main contractor under the supervision of the consulting engineer. The contractor shall employ an officer responsible for implementation of social/environmental

B3.5 GDC will also constitute the operational link between the Bank and the Government of Kenya on matters related to the implementation of the project. The PIT will 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 including the review of the annual work plans and budgets. The consultant will be responsible for the management and supervision of the project implementation and will provide periodic reporting to the financiers.

B4. Financial Management and Disbursement Arrangements

B4.1 The financial management assessment report is a record of the results of the assessment of the proposed financial management arrangements for the Menengai Development Project Phase I to be implemented by the Geothermal Development Company (GDC). The objective of the assessment is to determine: (a) whether the company has adequate financial management arrangements to ensure project funds will be used for purposes intended only in an efficient and economical way; (b) project financial reports will be prepared in an accurate, reliable and timely manner; and (c) the project's assets will be safeguarded against associated risks. The financial management (FM) assessment was carried out in accordance with the Guidelines for Financial Management and Financial Analysis of Project (January 2007).

COUNTRY ISSUES

B4.2 The Kenya Public Expenditure and Financial Accountability (PEFA) second and latest available Assessment Report of March 2009 show that Government has made some progress in improving its Public Financial Management Systems between the years 2006 and 2008. As far as credibility of the budget was concerned, the situation in 2010 appears to have improved compared to 2007. There are indications that the budget has become a more credible instrument in terms of revenue and distribution of resources than was previously the case. There are however still concerns on the overview and consolidated budget reporting.

B4.3 As far as accounting, recording and reporting is concerned, the system is undergoing reforms with the introduction both of the Integrated Financial Management Information System (IFMIS) and the Integrated Personnel and Payroll System (IPPD) which however not integrated bringing about certain variances. The introduction of the IFMIS and IPPD deemed to be sound by the PEFA assessment has already brought about significant improvements in the way revenues, expenditures, financial assets and liabilities are captured. The roll-out programme for the systems is at an advanced stage but yet to be completed. There will be need to monitor the roll-out carefully, identify problem areas and mobilize support, where needed.

B4.4 An area of concern is the continuous observations from the Controller and Auditor General in his Annual reports regarding the quality of financial records, bank reconciliations and fund

accounts which to a large extent, relate to older problems and previous years some of which may have already been attended to.

B4.5 The efficiency of the Office of the Auditor General has improved through better organization, increased systematic training, the introduction of new and computer-assisted audit methods and the adoption and successive application of international auditing standards. The Kenya National Audit Office (KENAO) has also substantially increased its audit coverage and is now covering 100% Central Government departments annually although when it comes to local authorities, there is still a huge backlog. A performance audit unit has, in addition, been established at KENAO to perform risk assessment and determine audit plans. The unresolved problem remains the long delay with which Parliament attends to the audit report and the Government responses both in time and relevance, thereby undermining the value of the process.

B4.6 In conclusion, there is evidence that the PFM institutional framework in Kenya is under transition, and that a number of important improvements are being implemented as reflected in the improved rating of several of the sub-dimensions to the performance indicators. The changes have the potential to improve system performance much further. Overall performance has definitely improved between 2006 and 2008 but with still several areas to be improved on. These have been identified and the necessary corrective measures are either being implemented or in the process of being implemented with the objective of adopting international good practices. The Country Financial Management Systems shall to a great extent be used in compliance with the 2005 Paris Declaration and the 2008 Accra Agenda for Action.

RISK ASSESSMENT AND MITIGATION

B4.7 The objectives of the project's financial management system are:

- to ensure that funds are used only for their intended purposes in an efficient and economical way;
- to ensure that funds are properly managed and flow smoothly, adequately, regularly and predictably in order to meet the objectives of the project;
- to enable the preparation of accurate and timely financial reports;
- to enable project management to monitor the efficient implementation of the project; and
- to safeguard the project assets and resources.

B4.8 The table B.4.1 below identifies the key risks that the project management may face in achieving these objectives and provides a basis for determining how management should address these risks.

Table B.4.1 : Key Risks

Risk	Risk Rating	Risk Mitigation measures incorporated into project design	Risk after Mitigation
Inherent Risk			
Country- The 2008 PEFA report identified weaknesses in government PFM systems. Challenges	S	Necessary corrective measures are being undertaken with the objective of adopting good international practices. This will further strengthen the PFM reforms. Capacity building is	M

Risk	Risk Rating	Risk Mitigation measures incorporated into project design	Risk after Mitigation
in budget processes, roll-out of IFMIS and IPPD systems, quality of financial records, bank reconciliations and fund accounts as well as clearance of audit reports in Parliament		ongoing at KENAO to increase its scope to cover more public funds in their audits. A performance audit unit has, in addition, been established at KENAO to perform risk assessment and determine audit plans.	
Project Level- Inability to use funds efficiently and economically for intended purposes	S	Provide checks and balances	S
Budgeting- Some project elements may be understated due to frequent price escalations	S	Procurement is done in advance before effectiveness. This will mitigate on cost estimates. Budgets to be revised where necessary. The Principal Accountant and the FM staff will also monitor actual expenditure against budget.	M
Accounting and Information System Break-down of the system.	S	Frequent system back-ups	M
Fund release and usage- Delays especially in counterpart funding and sometimes, under-funding	S	Government will include counterpart funding in its annual budgets for the relevant years. It will then release the funding quarterly in line with country systems.	M
Internal Control- Weak vetting controls over payments to contractors	S	The GDC Financial Policies and Procedures Manual to mitigate this risk.	M
Reporting and Monitoring- Financial information may be unreliable and submitted late	M	GDC and the Bank will agree on a Reporting Format.	L

Risk	Risk Rating	Risk Mitigation measures incorporated into project design	Risk after Mitigation
External Audit- Delays in submitting audit reports	M	The Auditor General will be responsible for the audit but has the power to sub-contract competent private auditors should capacity be an issue. The audit will be carried out on TORs agreed with the Bank.	L
Overall inherent risk			Moderate
Control risk			
Entity Level Most of the Financial staff have no experience with AfDB or similar entities operations and financial practices.	S	Proposed training to be given to staff nominated by the entity on AfDB financial practices. Financial staff to be issued with Bank financial guidelines.	M
Some cross-cutting financial operations are not embedded in the entity's financial policies and procedures manual	M	The financial policies and procedures manual to incorporate all financial operations including cross-cutting items such as motor vehicle fleet management.	L
Insurance of high value assets are not given prominence in cost allocation	S	Insurance of high value assets to be given prominence in cost allocation.	M
Overall control risk			Moderate
Overall Project Risk Rating			Moderate

H – High S – Substantial M – Moderate L – Low

B4.9 The overall residual risk is assessed as moderate upon the mitigation of identified risks in the risk assessment and mitigation table above.

STRENGTHS AND WEAKNESSES OF THE MANAGEMENT UNIT

B4.10 The project financial management is strengthened by the following salient features:-

- The accounting personnel within the company are adequately qualified and experienced.
- The accounting system is computerized under SAP system.

- The project being under GDC will use the GDC's Finance Manual as its accounting policies and procedures.
- Budgeting arrangements are adequate;
- External auditing arrangements have been discussed and are adequate;
- Funds flow arrangements are adequate.

B4.11 The project financial management is weakened by the following salient features:-

- Although adequate and experienced staff exists, they do not have experience with AfDB financial practices. GDC needs to ensure that training is provided in order to enable the staff to comply with Bank requirements.
- Lack of a comprehensive financial policies and procedures manual that encompasses all aspects of financial management.

BUDGETING ARRANGEMENTS

B4.12 GDC's budgeting arrangements have been found to be adequate. There is a planning unit that is responsible for consolidation of all the budgets of the company. All other departments are involved in the budgeting process. Each department submits its budget to the Planning budget which checks and consolidates to come up with the company budget, which is approved by management, GDC's Board and submitted to the Ministry of Energy for inclusion in the National budget.

ACCOUNTING ARRANGEMENTS

B4.13 Books of Accounts and List of Accounting codes: The books of accounts to be maintained specifically for the project should thus be set up and should include: a Cash Book, ledgers, journal vouchers, fixed asset register and a contracts register. A list of location accounts codes in the Chart of Accounts for the project should be drawn in order to capture the project accounts separately. This should match with the classification of expenditures and sources and application of funds indicated in the Loan Agreement. The Chart of accounts should be developed in a way that allows project costs to be directly related to specific work activities and outputs of the project.

B4.14 Staffing Arrangements: GDC is adequately staffed with about 42 finance staff in the various company offices. The project's accounts will be prepared by a designated Project Accountant, supervised by a Team Leader, under the overall guidance of the Finance Manager.

B4.15 Information system: GDC uses the SAP accounting system which is an integrated system. The team at GDC is conversant with preparing the accounts using this accounting software.

INTERNAL CONTROLS & INTERNAL AUDITING

B4.16 Internal Controls and Financial Management Manual: There is an existing Financial Policies and Procedures Manual in use at GDC.

B4.17 Internal Audit: The company has an Internal Audit department headed by a Manager who reports to both the Managing Director and Chief Executive Officer and the Finance Committee of the Board of Directors. It will include the coverage of the project in its annual work plans. The function has in the past exhibited effectiveness.

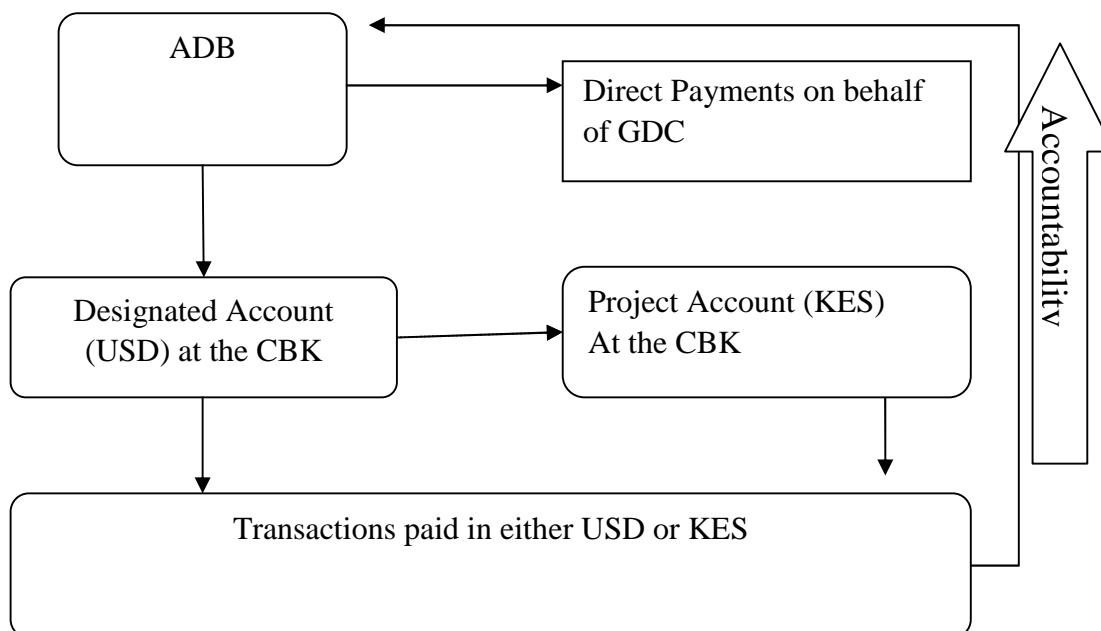
BANKING & FUNDS FLOW ARRANGEMENTS

B4.18 Bank Accounts: The following bank accounts will be authorized and maintained by the company for purposes of implementing the project:

- Special Account (SA): Denominated in US dollars where disbursements from the Bank will be deposited.
- Project Account: This will be denominated in local currency. Transfers from the Special Account (for payment of transactions in local currency) will be deposited on this account in accordance with project objectives.

B4.18 These bank accounts shall be opened at the Central Bank of Kenya in accordance with the Financing Agreement. The signatories for the project accounts will be in accordance with the with GDC's Financial and Procedures Manual.

THE PROJECT'S FUNDS FLOW CHART



B4.19 If ineligible expenditures are found to have been made from the Special Account, the Borrower will be obligated to refund the same. The Bank will have the right, as reflected in the General Conditions to suspend disbursement of the Funds if reporting requirements are not complied with.

FINANCIAL REPORTING ARRANGEMENTS

B4.20 The annual financial statements should be prepared in accordance with International Public Sector Accounting Standards for external audit. The General Conditions will require the submission of audited financial statements to the Bank within six months after the financial year end. Quarterly unaudited Interim Financial Reports (IFR) shall be submitted to the Bank no later than 45 days after the end of the quarter for monitoring and evaluation purposes.

B4.21 These Financial Statements will comprise of:

1. A Statement of Sources and Uses of Funds/Cash Receipts and Payments which recognizes all cash receipts, cash payments and cash balances controlled by the entity; and separately identify payments by third parties on behalf of the entity.
2. A Statement of Affairs/ Balance Sheet as at the end of the financial year showing all the assets and liabilities of the project.
3. The Accounting Policies Adopted and Explanatory Notes. The explanatory notes should be presented in a systematic manner with items on the Statement of Cash Receipts and Payments being cross referenced to any related information in the notes. Examples of this information include a summary of fixed assets by category of assets, and a summary of SOE Withdrawal Schedule, listing individual withdrawal applications; and
4. A Management Assertion that Bank funds have been expended in accordance with the intended purposes as specified in the Loan Agreement.

FINANCIAL MANAGEMENT ACTION PLAN

B4.22 The action plan in Table B.4.2 below indicates the actions to be taken for the project to strengthen its financial management system and the dates that they are due to be completed by.

Table B.4.2 : Actions to Strengthen Financial Management

	<u>Action</u>	<u>Date Due</u>	<u>Responsibility</u>
1.	Production and agreeing of formats for annual Quarterly financial reports	Before 30 th November 2011	GDC and ADF
2.	External Audits Terms of reference	Immediately	ADF
3.	Confirm that the Auditor General will include the project in his annual work plan	Before November 2011	GDC, Auditor General's Office and ADF
4.	Confirm that GDC's Internal Audit is going to include the project in its audit work plan.	30 November, 2011	Manager, Internal Audit Department GDC.

EFFECTIVENESS CONDITIONS AND FINANCIAL COVENANTS

B4.23 Effectiveness Conditions: Special account to be opened after financing agreement is signed.

B4.24 Financial Covenants: Financial covenants are the standard ones as stated in the Financing Agreement on Financial Management, Financial Reports and Audits in the General Conditions.

SUPERVISION PLAN

B4.25 A supervision mission will be conducted at least once every year based on the risk assessment of the project. The mission's objectives will include that of ensuring that strong financial management systems are maintained for the project throughout its life. Reviews will be carried out regularly to ensure that expenditures incurred by the project remain eligible for ADF funding.

CONCLUSION OF THE ASSESSMENT

B4.26 A description of the company's financial management arrangements above have been found to be adequate to provide, with reasonable assurance, accurate and timely accounts/information on the status of the Project as required by the Bank. Some follow up is required as detailed in the Financial Management Action Plan above.

B5. Procurement Arrangements

NATIONAL PROCEDURES AND REGULATIONS

B.5.1 Kenya enacted its Public Procurement and Disposal Act (PPDA) in October 2005 and the associated Regulations in December 2006. Both the Act and the Regulations came into effect in January 2007. Since the implementation of these instruments, substantial progress has been made in the improvement of procurement framework. Despite this progress, significant issues exist and need to be address notably on institutional set-up and capacity. Equally, the Act and the Regulations need some amendments for their improvement.

PROCUREMENT ARRANGEMENTS

B.5.2 All procurement of goods, works and acquisition of consulting services financed by the Bank will be in accordance with the Bank's Rules and Procedures: "Rules and Procedures for Procurement of Goods and Works", dated May 2008; and "Rules and Procedures for the Use of Consultants", dated May 2008, using the relevant Bank Standard Bidding Documents, and the provisions stipulated in the Financing Agreement. GDC will be responsible for the procurement of goods/works/ service contracts, consulting services, training and miscellaneous items as detailed in Table B.5.1 below.

Table B.5.1 : Summary of Procurement Arrangements (UA Million)

Description	ICB	NCB	Other *	Short List	Non-Bank funded **	Total***
A. Works						
Construction of access roads					2.38	2.38
Construction of water system					2.64	2.64
EPC – Steam gathering system					105.60	105.60
B. Goods						
Drilling rigs			[33.00]		59.40	92.40[33.00]
Wellhead generation units	[6.60]					6.60[6.60]
Drilling materials-offshore	[48.84]					48.84[48.84]
Drilling materials-local					3.37	3.37
Fuel and lubricants					44.51	44.51
Spare parts					19.14	19.14
B. Non-Consulting services						
Water pumping					2.60	2.60
Transport (material/personnel)					6.17	6.17
Slotting services					1.11	1.11
Well testing					9.93	9.93
Impl. environmental plan					0.57	0.57
C. Consulting Services						
Drilling expertise					27.31	27.31
Feasibility study					1.32	1.32
Steam gathering supervision					3.96	3.96
Transaction advisor				[1.32]		1.32[1.32]
Training & workshops				[2.29]	2.86	5.15[2.29]
Management & Supervision				[3.95]		3.95[3.95]
Drill pipe inspection					0.59	0.59
Audit					0.08	0.08
D. Operating cost						
Labour and administrative exp					62.44	62.44
Total Project	[55.44]	-	[33.00]	[7.56]	355.97	451.97[96.00]

* “Other” may be LIB, Shopping, Direct Contracting or Force Account.

***“Non-Bank financed” refers to acquisitions financed by other sources according to their procurement procedures

***The total does not include the contingencies estimated at UA 45.12 million

+Figures in brackets [] are amounts financed by the Bank Group.

GOODS

B.5.3 The Procurement packages with methods and time schedule are presented in Table B.5.2 below.

Table B.5.2 : Procurement Packages for Goods

No.	Description	Estimated Cost (UA million)	Procurement Method	P-Q	Domestic preference	Review by the Bank	Expected Bid Opening
1.	Drilling rigs	33.00	LIB	No	No	Prior	February 2012
2.	Wellhead generation units	6.60	ICB	Yes	No	Prior	April 2012
3.	Drilling materials	48.84	ICB	No	No	Prior	February 2013

B.5.4 Procurement and commissioning of drilling rigs totaling UA 33 million will be carried out under Limited International Bidding (LIB) procedures. The GDC conducted in 2010 a prequalification exercise with a view to acquire two drilling rigs funded by the Agence française de développement (AFD). As a result, 11 companies were prequalified. The bidding process is finalized and the contract is awarded with a delivery schedule for 2012. The rationale in using LIB procedures under the current project for the drilling rigs is justified by the specific nature of this equipment with a limited number of supplies. The proposed LIB will consider all the 11 prequalified suppliers listed thereafter:

1. Zhongman Petroleum (China),
2. ZYT Petroleum Equipment Company Ltd (China),
3. China Petroleum Technology Development Company Ltd (China),
4. GreatWall Drilling Co. Ltd (China),
5. Drilmec Drilling Technology (Italy),
6. Industrial Group Generation (Russia),
7. Honghua Group Ltd (China),
8. National Oilwell Varco (UK),
9. Shadong Kerui Petroleum Equipment Ltd/Gulf Resources (China),
10. Herrenknecht Vertical (Germany),
11. Diestswell S.A. (France)

B.5.5 It is worth mentioning that verification of the information on capability and resources shall be confirmed during the bidding process.

B.5.6 Procurement and commissioning of wellhead generations units totaling UA 6.6 million will be carried out under International Competitive Bidding (ICB) procedures with prequalification of bidders.

B.5.7 Acquisition of drillings materials totaling UA 48.84 million will be carried out under International Competitive Bidding (ICB) procedures.

CONSULTING SERVICES

B.5.8 The consultancy assignment with selection methods and time schedule are presented in Table B.5.3 below.

Table B.5.3 : Procurement Packages for Consulting Services

No.	Assignment	Estimated Cost (UA million)	Selection Method	Review by the Bank	Expected Proposal Submission
1.	Transaction adviser	1.32	QCBS	Prior	February 2012
2.	Management and supervision	3.95	QCBS	Prior	February 2012
3.	Training and workshops	5.15	TBD annually	Prior	February 2012

B.5.9 Procurement of Consulting services for transaction adviser estimated at UA 1.32 million will be done through international short-listing using the Quality-and-Cost-based Selection method.

B.5.10 Procurement of Consulting services for management and supervision of the drilling activities estimated at UA 3.95 million will be done through international short-listing using the Quality-and-Cost-based Selection method.

B.5.11 Training and workshops: The project will formulate an annual training plan and budget which will be submitted to the Bank for prior review and approval. The annual training will include: (i) the proposed training; (ii) the justification for the training and how it will lead to effective project performance and outcomes; (iii) the personnel to be trained; (iv) the selection method of individuals or institutions conducting such training; (v) the institution that will conduct training, if already selected (vii) the estimated cost of training. Upon completion of training the trainees will be required to prepare a report on the training received. The selection of candidates for training shall be done through GDC procedures and these procedures shall ensure equal opportunity to all eligible participants.

B.5.12 When the amount of the contract is less than UA 200,000, the Borrower may limit the publication of a Specific Procurement Notice (SPN) requesting for expressions of interest to national or regional newspapers. However, any eligible consultant, being regional or not, may express his desire to be short-listed. For contract valued at more than UA200,000, advertisement of the procurement must be placed on the UNDB online and the Bank's website.

ASSESSMENT OF THE EXECUTING AGENCY

B.5.13 GDC will be responsible for the procurement of goods, works, consulting services and training services. The resources, capacity, expertise and experience of the GDC have been reviewed and are determined to require some improvements. The corrective measures which have been agreed are : the GDC agreed to recruit two seasoned procurement people with experience on Development partners' rules and procedures, the existing procurement manual will be revamped with a view to focus on planning, control and reporting while clarifying the roles and responsibilities of those involved in the procurement processes. It is worth mentioning that the recruitment of the two procurement specialists and the revision of the procurement manual need to be finalized before the negotiation of the project.

GENERAL PROCUREMENT NOTICE

B.5.14 The text of a General Procurement Notice (GPN) will be agreed with the GDC and it will be issued for publication in UN Development Business online and on the Bank's web site, upon approval by the Board of Directors of the Loan (Grant) Proposal.

PROCUREMENT PLAN

B.5.15 The Bank shall review the procurement arrangements proposed by the Borrower in the Procurement Plan for its conformity with the Loan Agreement and its Rules. The Procurement Plan shall cover an initial period of at least 18 months. The Borrower shall update the Procurement Plan on an annual basis or as needed always covering the next 18 months period of project implementation. Any revisions proposed to the Procurement Plan shall be furnished to the Bank for its prior approval. Any revisions proposed to the Procurement Plan shall be submitted to the Bank prior no objection. The Borrower shall implement the Procurement Plan in the manner in which it has been agreed with the Bank.

PRIOR REVIEW

B.5.16 All the acquisitions under this project are subject to prior review. The following documents are subject to review and approval by the Bank before promulgation: ○ General Procurement Notice, ○ Specific Procurement Notices, ○ Prequalification Documents [*if applicable*], ○ Tender Documents or Requests for Proposals from Consultants, ○ Tender Evaluation Reports, including recommendations for Contract Award (goods/works), or Reports on Evaluation of Consultants' Proposals, , ○ Draft contracts (goods/works), if these have been amended and differ from the drafts included in the tender documents, ○ Reports on Evaluation of Consultants' Financial Proposals, including recommendations for Contract award, minutes of negotiations and duly initialed contracts documents.

FREQUENCY OF PROCUREMENT POST REVIEW MISSION

B.5.17 In addition to the prior review supervision to be carried out from Bank offices, the capacity assessment of the Implementing Agency has recommended one procurement supervision mission to visit annually the project and carry out post review of procurement actions.

B6. Audit Arrangements

B6.1 The Government's Auditor General is primarily responsible for the auditing of all government projects. However, should the audit be subcontracted to a firm of private auditors, the final report will still be issued by the Auditor General, based on the tests carried out by the subcontracted firm. The private firms to be sub-contracted should be acceptable to the Bank. The audits will be done in accordance with International Standards on Auditing. Appropriate terms of reference for the external audit will be shared with GDC. Should a private audit firm be subcontracted, the audit cost will be borne by the project funds.

B6.2 The audit report, complete with a management letter will be submitted to the Bank by the Ministry of Energy no later than six months after the end of the fiscal year. A value for money audit is proposed at the project's mid-term.

B7. Economic and Financial Analysis

GDC PAST PERFORMANCE

B.7.1 The latest income statement of GDC is provided below.

**GEOTHERMAL DEVELOPMENT COMPANY LTD
STATEMENT OF COMPREHENSIVE INCOME FOR THE PERIOD
ENDED 30th JUNE 2010**

	2009 / 2010
	Ksh
Revenue	
Energy Related Income	-
Interest Income	31,366,266
Other Income	<u>9,041,296</u>
Total	40,407,562
Expenses	
Staff Costs	(378,001,939)
Administrative Costs	(367,465,689)
Establishment Costs	(28,919,129)
Operating Loss	<u>(733,979,195)</u>

B.7.2 GDC was incorporated in 2009 and the maiden reporting period was to June 2010. The company registered an operating loss of Ksh733 million. The company did not make or earn any revenue for the period except miscellaneous income from interest income (Ksh 31 million) on call deposits held with local banks and sale of tender documents (Ksh 9 million). It is expected that the company will similarly post a loss for the period to June 2011 as it has not yet started earning income from steam sales. Steam sales may start as early as 2013 if the well head generation programme takes off as scheduled or in 2014 from steam sales to the Olkaria IV plant.

B.7.3 The latest balance sheet of GDC is provided below.

**GEOTHERMAL DEVELOPMENT COMPANY LTD
STATEMENT OF FINANCIAL POSITION AS AT 30TH JUNE 2010**

	2009 / 2010	
	Ksh	Contribution
ASSETS		
Non-Current Assets		
Property Plant & Equipment	369,322,691	6.48%
W-I-P	4,178,085,672	73.35%

	<u>4,547,408,363</u>	79.84%
Current Assets		
Receivables	6,881,963	0.12%
Prepayments & Deposits	360,490,331	6.33%
Cash & Cash Equivalents	781,190,923	13.71%
	<u>1,148,563,217</u>	20.16%
Total Assets	<u>5,695,971,580</u>	
EQUITY & LIABILITIES		
GOK Grants	5,931,817,363	114.1%
Share Capital	2,000,000	0.0%
Operating Loss	-733,979,195	-14.1%
	<u>5,199,838,168</u>	
Current Liabilities.		
Trade & Other Payables	370,296,470	74.6%
Provision for liabilities & Charges	56,136,290	11.3%
Bank Overdraft	69,700,652	14.0%
	<u>496,133,412</u>	
Total Equities & Liabilities	<u>5,695,971,580</u>	

B.7.4 As of June 2010, GDC had a total asset base of Ksh 5,696 million funded mostly through a government grant of Ksh 5,931 million. Trade and other payables made up 74.64% of current liabilities with a further contribution of 14% from an overdraft. The capital (80%) has been used to build the project fixed asset base being property plant and equipment (6.48%) and work in progress of 73.3%. The Ksh 4,178 million in work in progress is mainly made up of investment in wells and boreholes and drilling rigs. Due to the high government grant, the project has a very low leverage with a debt to equity ratio of less than 2%. The company also indicated an ability to meet short term obligations with a liquidity ratio (current assets/current liabilities) of 2.3 times.

GDC CASHFLOW PROJECTIONS

B.7.5 In the next 10 years to June 2021, GDC will carry out detailed surface exploration in four fields namely Silali, Korosi, Barrier and Emuruangogolak. In addition, GDC will drill 548 wells in Olkaria, Menengai, Longonot and Silali (41 of these wells will be drilled by hired rigs under GDC supervision, in Olkaria). The total available steam for generation, at the end of the ten year period will be about 2,336 MWe. Eleven 140MW power plants with total capacity of 1,105 MWe will be installed over the ten years planning period to 2021. In addition, wellhead generators with 1095 MWe capacity will also be installed.

B.7.6 In order to achieve this milestone, GDC will procure 6 deep drilling rigs within 3 years for the new fields and still hire two rigs for drilling in Olkaria. As of end of 2013, GDC is expecting to be operating 6 rigs, 2 purchased by the GoK, 2 procured through funding from AFD and 2 purchased through the AfDB facility.

B.7.7 The total capital requirement for resource development is projected to be USD 2,675 million for the resource development. The capital cost shall be met from a GoK budget support

amounting to US\$ 389 million, net GDC's revenue from sale of steam amounting to US\$1,921 million and support from Development Partners amounting to USD 366 million. GDC will sell steam to power plant developers at a cost of KES 330/Tonne. With the sale of steam, financial projections indicate that GDC will become financially independent of GoK support after the 4th year (year ending June 2014). However the projections are quite aggressive. It is assumed that GDC will start receiving revenue from steam sales in the financial year 2010/11. However this milestone has already been missed and it is likely that the steam sales revenues will only commence in 2012/13 financial year. It is also unlikely that there will be as many as 144 5MW well head generation units installed by June 2015.

PROJECT PERFORMANCE

Financial Analysis

B.7.8 While the proposed steam gathering project is not a stand-alone financial entity but will be a part of GDC, it is still prudent to consider the financial implications for the parent company on an incremental basis. In addition, GDC is interested in internal transparency and accountability and has budgets associated with specific projects and sub-companies. The financial internal rate of return analysis of the project was therefore conducted on the basis of the incremental costs and benefits generated by the project. The Menengai Steam Project and consequent power generation project(s) are all part of the least cost investment plan for Kenya.

B.7.9 The project is expected to produce on average 5,990 GWh annually over its 35 year life time. The assumption is that the transfer price of steam produced by the project and sold by GDC to an off-taker is USD 3.0 cent/kWh and will be invoiced in US dollars and be indexed to the US inflation every year. Operating costs are based on company's estimates for similar projects. Salvage value of the plant is not included. The financial internal rate of return (FIRR) analysis was undertaken based on 2011 prices. The main project costs are equipment, civil works, drilling and testing, steam gathering infrastructure costs, and incremental O&M costs. The capital costs for calculating the FIRR include physical and price contingencies. The project Financial Internal Rate of Return (FIRR) is estimated at 8.3%. The Financial Net Present Value (FNPV) at the company's weighted average cost of capital (discount rate of 11% real) is USD 40 million with an equity FIRR of 12.8%.

B.7.10 While the project is not the direct borrower of the funds provided by AfDB and other institutions, it is expected that the project should be self-sufficient in generating sufficient stream of cash to cover the associated debt service. The financial projections indicate that the cashflows are indeed sufficient to meet the debt service comfortably, both interest and principal, with a minimum Annual Debt Service Cover Ratio (ADSCR) of 2.15x and average ADSCR of 2.80x.

B.7.11 The proposed project is a part of the least-cost expansion plan of the system, and it is estimated that the levelized cost of energy is USc 6.79 cent/kWh, which is significantly lower than the average tariff of USc 16.00/MWh and appears to be competitive compared with other base-load thermal projects. The **cash flow profile and project returns** of the project are presented in Table B.7.1 below.

Table B.7.1 : Cash Flow Profile and Project Returns

STEAM PROJECT: KEY PERFORMANCE INDICATORS (NOMINAL, USD million)																								
Fin. Year				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Wells operated	no. wells			0	2	12	34	64	94	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120
Steam capacity	MW			0	0	0	0	0	0	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400
Energy generated	GWh			0	0	0	0	0	0	1,494	2,996	2,996	2,996	3,004	2,996	2,996	2,996	3,004	2,996	2,996	2,996	3,004	2,996	2,996
REVENUE																								
Steam revenue	USD million			0.0	0.0	0.0	0.0	0.0	0.0	50.0	102.7	105.3	107.9	110.9	113.4	116.2	119.1	122.5	125.2	128.3	131.5	135.2	138.2	141.6
Carbon revenue	USD million			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
COSTS																								
Opex	USD million			0.0	0.0	0.0	-1.5	-3.0	-3.0	-3.1	-3.2	-3.3	-3.4	-3.4	-3.5	-3.6	-3.7	-3.8	-3.9	-4.0	-4.1	-4.2	-4.3	-4.4
Make-up wells drilling cost	USD million			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-5.4	-5.5	-5.6	-5.8	-5.9	-6.1	-6.2	-6.4	-6.5	-6.7	-6.9	-7.1
Make-up wells connection cost	USD million			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3.1	-3.1	-3.2	-3.3	-3.4	-3.5	-3.6	-3.7	-3.7	-3.8	-3.9	-4.0
Make-up wells testing cost	USD million			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.4
EBITDA	USD million			0.0	0.0	0.0	-1.5	-3.0	-3.0	46.9	99.5	102.0	95.9	98.6	100.7	103.2	105.8	108.8	111.2	114.0	116.8	120.1	122.7	125.8
Net Change in WC	USD million			0.0	0.0	0.0	0.0	0.0	0.0	-13.4	-0.3	-0.3	-0.4	-0.4	-0.3	-0.4	-0.4	-0.5	-0.3	-0.4	-0.4	-0.5	-0.4	-0.5
Tax paid	USD million			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.4	-23.2	-25.2	-26.0	-27.1	-29.2	-31.1	-30.4	-33.3
Operational CF	USD million			0.0	0.0	0.0	0.0	0.0	0.0	35.1	99.5	101.9	95.8	98.4	100.7	101.7	82.5	83.4	85.1	86.7	87.5	88.8	92.3	92.3
Capex	USD million			0.0	-98.8	-121.5	-283.1	-124.9	-118.8	-69.4	-26.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CF before financing	USD million			0.0	-98.8	-121.5	-283.1	-124.9	-118.8	-34.3	73.0	101.9	95.8	98.4	100.7	101.7	82.5	83.4	85.1	86.7	87.5	88.8	92.3	92.3
Equity	USD million			0.0	0.0	0.0	0.0	0.0	19.2	5.9	9.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Debt	USD million			0.0	0.0	72.0	209.5	86.5	69.9	24.3	5.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CF available for debt service	USD million			0.0	0.0	4.5	3.2	7.7	9.5	40.6	99.5	101.9	95.8	98.4	100.7	101.7	82.5	83.4	85.1	86.7	87.5	88.8	92.3	92.3
Interest and fees	USD million			0.0	0.0	-4.5	-3.2	-7.7	-9.5	-11.2	-11.5	-11.0	-10.3	-9.5	-8.7	-7.9	-7.2	-6.4	-5.6	-4.8	-4.1	-3.3	-2.5	-1.7
Principal repayments	USD million			0.0	0.0	0.0	0.0	0.0	0.0	0.0	-15.6	-31.2	-31.2	-31.2	-31.2	-31.2	-31.2	-31.2	-31.2	-31.2	-31.2	-31.2	-31.2	-31.2
Net Cash Flow	USD million			0.0	0.0	0.0	0.0	0.0	0.0	29.4	72.4	59.7	54.3	57.7	60.8	62.6	44.2	45.9	48.3	50.7	52.3	54.4	58.6	59.4
PROJECT RETURNS (REAL, USD million)																								
Fin. Year		FIRR	FNPV	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
CF before financing	USD million			0.0	-99.0	-119.4	-272.6	-117.9	-110.0	-31.7	65.1	89.3	82.3	82.9	83.2	82.4	65.5	64.9	65.0	64.9	64.2	63.9	65.0	63.8
Rigs in-use value	USD million			0.0	0.0	0.0	0.0	0.0	0.0	143.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Project CF	USD million	8.3%		0.0	-99.0	-119.4	-272.6	-117.9	-110.0	111.8	65.1	89.3	82.3	82.9	83.2	82.4	65.5	64.9	65.0	64.9	64.2	63.9	65.0	63.8
Net Cash Flow	USD million			0.0	0.0	0.0	0.0	0.0	0.0	26.6	64.8	52.4	46.7	48.7	50.3	50.7	35.1	35.7	36.9	38.0	38.3	39.1	41.3	41.1
Equity	USD million			0.0	-99.0	-53.1	-74.0	-43.6	-54.1	-46.3	-19.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rigs in-use value	USD million			0.0	0.0	0.0	0.0	0.0	0.0	143.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Equity CF	USD million	12.8%	39.9	0.0	-99.0	-53.1	-74.0	-43.6	-54.1	123.8	45.5	52.4	46.7	48.7	50.3	50.7	35.1	35.7	36.9	38.0	38.3	39.1	41.3	41.1

Economic Analysis

B.7.12 The economic analysis was carried out based on the following assumptions and conversion factors (summarized in Table B.7.2):

1. The grand purpose of the steam project is to serve as a platform for setting up generation units and converting steam into electric power, which is the ultimate benefit of the project. Consequently, the capital and operating costs of power plant(s) have to be included into the analysis. While the generation plant(s) might be formed as separate financial entities or even to be structured as IPPs, from the point of view of mobilization of economic resources, this is treated as an integrated project producing electric power. Hence, certain items, such as sale of steam between the project/GDC, to the generation plant becomes an intermediate input within an integrated project and are removed because such item would appear on both benefit and cost sides of the resource flow and would be simple cancelled out.
2. All costs and benefits were based on the 2011 financial prices and were shadow priced by the standard conversion factor as shown in the Table below.
3. Discount factor 12%, real, is assumed for the economic opportunity cost of capital.
4. For the cost calculations, taxes and subsidies are excluded.
5. Capex items are lump-summed and for the purpose of analysis and are treated very conservatively, applying an economic conversion factor of 1.087 for importable goods and services. In reality, there is a significant number of non-tradable goods and services that will be deployed during construction. The analysis will be further refined and detailed.
6. The value of economic benefits is represented by the opportunity cost of generation by alternative methods and projects in Kenya.
 - a. During the peak of the load curve (taken as 25% of the time), the plant adds much-needed peaking capacity to the system, which lowers the probability of having insufficient capacity to meet the peak load. In addition to providing the peaking capacity, the plant also substitutes for energy that otherwise would have been generated by more expensive gas turbines and other purely peaking units. The all-inclusive peak cost, which includes both peaking capacity cost and operating and fuel costs, is taken as USD 20.0 cent/kWh, which is a very conservative assumption because the system data shows that there are more expensive and inefficient units in operation.
 - b. For off-peak energy (75% of the time), the value of power is referenced to the base-load units, assuming that this new plant would be definitely more efficient than the average and older-type thermal units. It is assumed that all off-peak energy is valued at USD 9.0 cent/kWh, which is comparable to the existing and expected thermal units added to the system to provide base-load power.

Table B.7.2 : Summary of Economic Conversion Factors

Item	Economic CF	Description
REVENUE		
Steam Project		
Steam revenue	No CF	This is an ntermediate input in production of final output: electricity.
Carbon revenue	0.000	Considered to be a proxy for environmental benefit.
IPP Project		
Energy sales	No CF	Value of energy is estimated by comparing to the alternative source of generation.
Carbon revenue	0.000	Considered to be a proxy for environmental benefit.
COSTS		
Steam Project		
Staff	0.600	Assumed. Labor.
Transport	0.931	Assumed. VAT included.
Administration	0.700	Assumed. Labor.
Repairs & Maintenance	1.087	Assumed. Importable inputs.
Electricity	1.150	Assumed. Scarcity value of 15%.
Land (lease, rates)	1.000	Assumed. No distortions.

Insurance	0.931	Assumed. VAT included.
Make-up wells drilling cost	1.087	Assumed. Importable inputs.
Make-up wells connection cost	1.087	Assumed. Importable inputs.
Make-up wells testing cost	1.087	Assumed. Importable inputs.
Net Change in WC	1.087	Assumed. Importable inputs.
Tax paid	0.000	Tax.
IPP Project		
Steam cost	No CF	This is an ntermediate input in production of final output: electricity.
Variable Costs		
Fuel	1.087	Assumed. Importable inputs.
Luboil, water, stores, others	1.087	Assumed. Importable inputs.
Water treatment chemicals	1.087	Assumed. Importable inputs.
Fixed Costs		
Salaries & wages	0.600	Assumed. Labor.
Repair & maintenance	1.087	Assumed. Importable inputs.
Other costs	1.087	Assumed. Importable inputs.
Insurance		
Business Interruption Cost	0.931	Assumed. VAT included.
Property	0.931	Assumed. VAT included.
Misc.		
O&M overhead	1.087	Assumed. Importable inputs.
Net Change in WC	1.087	Assumed. Importable inputs.
Tax paid	0.000	Tax.
Operational CF		
Steam project capex	1.087	Assumed. Importable inputs.
IPP project capex	1.087	Assumed. Importable inputs.

B.7.13 The economic resource flow and economic returns are presented in Table B.7.3 below.

Table B.7.3 : Economic Resource Flow and Economic Returns

ECONOMIC RESOURCE FLOW STATEMENT (ANNUAL) (REAL, USD million)																									
Fin. Year		PV@EOCK	Economic	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
REVENUE																									
Steam Project																									
Steam revenue	USD million	0.0	No CF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Carbon revenue	USD million	0.0	0.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
IPP Project																									
Energy sales	USD million	1,379.0	No CF	0.0	0.0	0.0	0.0	0.0	0.0	175.5	352.0	352.0	352.0	353.0	352.0	352.0	352.0	353.0	352.0	352.0	352.0	353.0	352.0	352.0	
Carbon revenue	USD million	0.0	0.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
COSTS																									
Steam Project																									
Staff	USD million	-0.4	0.600	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	
Transport	USD million	-0.9	0.931	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	
Administration	USD million	-0.3	0.700	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	
Repairs & Maintenance	USD million	-1.8	1.087	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	
Electricity	USD million	-0.6	1.150	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	
Land (lease, rates)	USD million	-2.8	1.000	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	
Insurance	USD million	-3.3	0.931	0.0	0.0	0.0	0.0	0.0	0.0	-0.4	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.9	-0.9	-0.9	
Make-up wells drilling cost	USD million	-15.2	1.087	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-5.0	-5.0	-5.0	-5.1	-5.1	-5.1	-5.1	-5.2	-5.2	-5.2	-5.2	-5.3	
Make-up wells connection c	USD million	-8.7	1.087	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.9	-2.9	-2.9	-2.9	-2.9	-2.9	-2.9	-3.0	-3.0	-3.0	-3.0	-3.0	
Make-up wells testing cost	USD million	-0.8	1.087	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	
Net Change in WC	USD million	-7.2	1.087	0.0	0.0	0.0	0.0	0.0	0.0	-13.2	-0.3	-0.3	-0.3	-0.4	-0.3	-0.3	-0.3	-0.4	-0.3	-0.3	-0.3	-0.4	-0.3	-0.3	
Tax paid	USD million	0.0	0.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
IPP Project																									
Steam cost	USD million	0.0	No CF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Variable Costs	USD million	-38.3	1.087	0.0	0.0	0.0	0.0	0.0	0.0	-4.9	-9.8	-9.8	-9.8	-9.8	-9.8	-9.8	-9.8	-9.8	-9.8	-9.8	-9.8	-9.8	-9.8	-9.8	
Fixed Costs	USD million	-33.0	0.703	0.0	0.0	0.0	0.0	0.0	0.0	-4.2	-8.4	-8.4	-8.4	-8.4	-8.4	-8.4	-8.4	-8.4	-8.4	-8.4	-8.4	-8.4	-8.4	-8.4	
Insurance	USD million	-10.7	0.931	0.0	0.0	0.0	0.0	0.0	0.0	-1.7	-3.3	-3.2	-3.1	-3.0	-2.9	-2.8	-2.8	-2.7	-2.6	-2.5	-2.4	-2.4	-2.3	-2.2	
Misc.	USD million	-4.5	1.087	0.0	0.0	0.0	0.0	0.0	0.0	-0.6	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	
Net Change in WC	USD million	-12.9	1.087	0.0	0.0	0.0	0.0	0.0	0.0	-23.8	-0.5	-0.6	-0.6	-0.7	-0.5	-0.6	-0.6	-0.7	-0.5	-0.6	-0.6	-0.7	-0.5	-0.6	
Tax paid	USD million	0.0	0.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Operational CF	USD million	1,237.6	0.000	0.0	0.0	0.0	0.0	0.0	0.0	126.0	326.2	326.1	318.0	318.8	318.2	318.1	318.1	318.9	318.4	318.2	318.2	319.0	318.5	318.3	
Steam project capex	USD million	-470.9	1.087	0.0	-107.6	-129.7	-296.3	-128.2	-119.5	86.9	-25.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
IPP project capex	USD million	-356.2	1.087	0.0	0.0	0.0	0.0	-185.6	-342.4	-171.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
CF before financing	USD million	410.5	0.000	0.0	-107.6	-129.7	-296.3	-313.8	-462.0	41.6	300.3	326.1	318.0	318.8	318.2	318.1	318.1	318.9	318.4	318.2	318.2	319.0	318.5	318.3	
Steam Project																									
Equity	USD million	0.0	0.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Debt	USD million	0.0	0.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
IPP Project																									
Equity	USD million	0	0.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Debt	USD million	116.0	1.087	0.0	0.0	0.0	0.0	49.5	89.3	94.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
CF available for debt service	USD million	526.4	0.000	0.0	-107.6	-129.7	-296.3	-264.2	-372.7	135.8	300.3	326.1	318.0	318.8	318.2	318.1	318.1	318.9	318.4	318.2	318.2	319.0	318.5	318.3	
Steam Project																									
Interest and fees	USD million	0	0.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Principal repayments	USD million	0.0	0.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
IPP Project																									
Interest and fees	USD million	0	0.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Principal repayments	USD million	0.0	0.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
CF available for DSRA	USD million	526.4	0.000	0.0	-107.6	-129.7	-296.3	-264.2	-372.7	135.8	300.3	326.1	318.0	318.8	318.2	318.1	318.1	318.9	318.4	318.2	318.2	319.0	318.5	318.3	
Change DSRA	USD million	0.0	0.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
CF available for MMRA	USD million	526.4	0.000	0.0	-107.6	-129.7	-296.3	-264.2	-372.7	135.8	300.3	326.1	318.0	318.8	318.2	318.1	318.1	318.9	318.4	318.2	318.2	319.0	318.5	318.3	
Change MMRA	USD million	0.0	1.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
CF available for distribution	USD million	526.4	0.000	0.0	-107.6	-129.7	-296.3	-264.2	-372.7	135.8	300.3	326.1	318.0	318.8	318.2	318.1	318.1	318.9	318.4	318.2	318.2	319.0	318.5	318.3	
IPP Dividend	USD million	-201.8	1.087	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-28.6	-32.9	-34.1	-34.3	-34.6	-34.5	-41.3	-26.0	-58.7	-90.4	-90.5	-90.7	-90.7	-90.7	
IPP Witholding tax	USD million	0.0	0.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Net Resource Flow	USD million	324.6	0.000	0.0	-107.6	-129.7	-296.3	-264.2	-372.7	135.8	271.6	293.1	283.9	284.5	283.7	283.6	276.9	292.8	259.6	227.8	227.7	228.3	227.7	227.7	

Sensitivity Analysis

B.7.14 The financial and economic returns of the project have been tested against the possible risk parameters during implementation or operation of the project. Investment cost overruns and implementation delays represent a second major set of factors that are critical to the viability of project. Perhaps, one of the fundamental issues remains the successful exploration of the site and assessment of the steam reservoir. Three important parameters can be considered in this regard: production wells success rate, well output in MW and well output index. All the three depend on the choice of the location of wells and strength of the steam flow from the reservoir. The base case assumes that the overall success rate for production wells is 90%, well capacity is 5 MW on the average, and well output index is 100%. The sensitivity tests show that a 10% drop from that any of these base case levels would force the levelized cost of energy to rise by about USD 2.0 cent. The risk is mitigated by mobilizing the expertise of GDC team and using state-of-the-art methods and reservoir assessment tools during the exploration and design stages of the project. The historic track record of GDC provides significant comfort in this regard. In addition, the assumptions of the 90% success rate and average capacity of 5 MW/well used in the base are very conservative as the actual drills have exhibited a much higher success ratio and size of the wells.

B.7.15 A capex overrun is a sensitive parameter, and tests indicate that a 10% increase is equivalent to about 5% increase the levelized cost, from USD 6.8 to 7.1 cent/kWh. Separately, a delay of 6 months, assuming that without any cost overrun, is capable of raising the levelized cost by roughly the same amount. A combined impact of a cost overrun and delay would be even more damaging. While both these factors represent a real threat to the project, this risk is greatly addressed by mobilization of qualified project management team by GDC for exploration, design, procurement, drilling, testing, construction and monitoring activities.

B.7.16 Steam price, assumed to be USD 3.0 cent/kWh, is an important parameter for GDC for the budgeting and financial performance. However due to the fact that this tariff is somewhat “internal”, negotiated between GDC and KPLC, and because this tariff is regulated and set in a controlled manner, it does not represent an unmanageable risk factor.

B.7.17 The results of the sensitivity tests are summarized in Table B.7.4.

Table B.7.4 : Summary of Sensitivity Tests

SCENARIO		Levelized cost (USD cent/kWh)	Project FIRR, real	Equity FIRR, real	Equity FNPV, 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 output	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

B8. Environmental and Social Analysis

B8.1 Environmental Review and Key Findings

B8.1.1 The project consists of civil works for the construction of access roads, drill sites, and drilling and testing of 3 exploration, 6 appraisal, and 27 production geothermal wells, all of which will serve for exploiting geothermal energy. Two operational rigs are currently being employed for drilling activities. Despite the yields from nearby water resources, there exists a water shortage in supporting the rigs. The project has therefore constructed four water storage tanks to ensure availability of water at all times. Further water resources will be available once the wells are functional and brine is reused. Due to the geology the boreholes extract water from the shallow aquifer. The current pumping of water from the boreholes has no negative impacts on the aquifer because pumping tests data was used to determine pumping rates and duration. There is a water treatment plant on site for potable water and it is also being used by the nearby community and the ultimate plan is to transfer it to the local municipality following certain capacity building in terms of treatment and reticulation of water.

B8.1.2 The negative environmental impacts associated with the project include clearing and leveling of sites using heavy machinery which may interfere with ecological niches for the few resident species in the area leading to habitat loss. Disturbance of the plant community may induce changes in species composition due to increased chance of alien vegetation species. Clearance of vegetation will expose the soil to wind and water erosion. Drilling fluids may result in the contamination of water and soil. Drilling and well testing also result in the generation of H₂S and other non-condensable gases (NCG) and this will be in addition to exhaust gases (CO₂, CO, NO_x, SO_x, Particulate Matter) and dust from machineries during mobilization and by traffic movement during drilling. The negative environmental impacts will be mitigated through measures embedded in the Environmental Management and Monitoring Plan (EMMP) for environmental and social impacts.

B8.1.3 The positive environmental impacts of the project emanate from the fact that it is a clean energy project with no significant and direct impact on climate change. It will assist Kenya in expanding the use of renewable energy and will displace expensive and environmentally hostile thermal generation. It will provide reliable power supply as opposed to the existing hydropower which has been negatively affected by droughts in the recent past. The project will contribute an additional 140 MWe to the national grid, thus leading to reduction in the use of fossil fuels. Mindful of the potential impacts of climate change on the project, the infrastructure is designed to withstand likely natural disasters and accidents. As a result of the project, the nursery has been providing trees for free for replanting in the neighbouring communities; these include species planted for firewood hence protecting the caldera while at the same time balancing green-house gas emissions.

B8.2 Policy, Regulatory, and Institutional Framework

B8.2.1 The project complies with national environmental regulations and legislation, international treaties and conventions, and the Bank's environmental and social policies and guidelines.

B8.2.2 GDC is expected to comply with the Environmental Management and Coordination Act (EMCA) of 1999 and the Environmental (Impact Assessment and Audit) Regulations of 2003 of Kenya. GDC prepared an ESIA, which was submitted to the National Environmental Management Authority (NEMA). An environmental license was issued by NEMA on March 4, 2009. Other national legislation relevant to the project in regulating and guiding geothermal and natural resource use in a sustainable manner include, amongst others, the Geothermal Resources Act of 1982 and supplementary legislation of 1990 and the Second Schedule of EMCA of 1999; the Electric Power Act Cap 48; the Forest Act Cap 385; the Wildlife Conservation and Management Act; the Environmental Management (Air Quality) Regulations (2008); the Occupational Safety and Health Act (2007); the Land Planning Act Cap 303.

B8.2.3 Of relevance to the project are key international treaties and conventions, which Kenya is a signatory to. These treaties and conventions include the United Nations Framework Convention on Climate Change and the 1994 Convention for Biological Diversity.

B8.2.4 The project design and implementation modalities have been developed to ensure compliance with the following Bank policies and procedures: the Environmental Policy (2004), the Policy on Poverty Reduction (2004), the Policy on Population (2002), the Gender Policy (2001), the Policy on Disclosure of information (2005), the Policy on Good Governance, the Policy on Public Consultation and Cooperation with Civil Society (2001), and the Environmental and Social Assessment Procedure for Public Sector Operations (2001).

B8.3 Monitoring of Environmental Impacts

B8.3.1 The monitoring of the project's environmental impacts will be carried out primarily through the EMMP. Mitigation of the impacts will include restoration of the drilled area immediately through re-vegetation. GDC has also commenced a nursery that provides tree species allowed by the KFS for free to the surrounding communities. Gabion boxes will be used to prevent soil erosion and air pollution. Drilling water will be recycled and the collected water will be stored in lined ponds to avoid pollution of soil and groundwater. Visual impacts due to the infrastructure will be lessened by the fact that the project site is in a depression and the equipment will have neutral, non-reflective colors that blend with the natural vegetation. The impact of increased dust, noise and air pollution levels will be lessened by the fact that the nearest settlement is approximately 5 to 7 km away and noisy machinery will be equipped with silencers. The risks posed by the drilling and operation would be decreased by adhering to procedures entailed in the EHS policy and using adequate PPE as per the policy. Employees will constantly be sensitized through awareness and training to ensure protection of flora and fauna in the Caldera. The cost of implementing both social and environmental impacts is estimated at 99,000,000.00 KSH.

B8.3.2 In addition, GDC has established an Environment, Safety and Community Liaison Department, which is staffed with competent professionals who are responsible for the daily monitoring and the EMMP implementation. GDC has developed a corporate Health, Safety and Environment Policy to guide its drilling operations. GDC is also committed to establishing, implementing and maintaining a sound environmental management system to ensure that its activities are environmentally sustainable. This will be achieved by putting in place an ISO 14001 management system. GDC will be responsible for regularly reporting to

the Bank on its efforts to address and/or mitigate environmental and social impacts, particularly through the EMMP.

B8.4 Stakeholder Consultation and Public Disclosure Process

B8.4.1 The project's public consultation process emanates from the work carried out during the preparation of the ESIA. The public consultation process served to sensitise interested and affected parties and to gather their concerns with an intention to cater for the communities because the ultimate objective of the project with regard to local communities is to ensure that they are not worse off as a result of the project. The consultation process identified relevant stakeholders as the Bahati, Kiamaina, Wanyororo, Kabatini, Engoshura, Solai, Banita, Mashiaro, Menengai Hill, Valley Farm, Kiamunyi/Olive, Ol Rongai & Kwa Gitau communities. Four public consultation meetings were held in these communities between 17 March and 4 April 2008 and a stakeholder consultation meeting was held on 24 April 2008.

B8.4.2 Stakeholders consisted of actors from diverse socio-economic and socio-cultural backgrounds. A socioeconomic assessment was carried out to better understand the stakeholders' concerns. Through the consultative meetings, the stakeholders raised the following as critical priorities: building of access roads; providing electricity and water to the area residents; freedom of passage for grazing purposes; employment for the local population; afforestation (tree nursery establishment); addressing the human-wildlife conflict; land ownership and compensation for affected parcels; enhancing security in the project area; enhancing education through corporate social responsibility scholarships and long term project benefits to the community. Primary concerns raised by stakeholders centred on land compensation for affected parcels, geological risks, qualification requirements for casual/ unskilled jobs, air quality issues, effects on tourism, industrial accidents and fire outbreaks, the safety and health of the residents from the associated impacts, threats of earth quakes and faulting, the management of gas emissions, the location of the drill sites, and the importation of labour. The design, implementation, and monitoring features of the project have been developed to meaningfully integrate the concerns, priorities, and perspectives raised by stakeholders during the consultation process.

B8.5 Gender Analysis

B8.5.1 Currently males dominate the commercial, industrial, building stone quarrying, ballast crushing and sand harvesting sectors. However, this project will ensure an employment ratio of 30% women which will be high for small town standards in Kenya. The 30% employment ratio is highlighted in the new Kenyan constitution. The direct and indirect employment opportunities will translate into additional and/or higher incomes available to households in the project zone. Women in particular would benefit from being directly employed or from establishing microenterprises seeking to cater to the needs of GDC's operations. The availability of additional economic resources would contribute toward addressing the needs of women and other vulnerable segments of the local communities.

B8.5.2 GDC's focus on making and prioritizing community investments will facilitate the provisioning of basic infrastructure facilities, which women, children, and vulnerable groups depend on accessing for the sake of their physical and mental welfare. The transfer of the potable water facility to the community/municipality will have a direct effect in the empowerment of women and the girl child who normally collect water for domestic purposes.

B8.5.3 GDC intends to utilize geothermal resources to promote socio-economic initiatives in surrounding communities, such as fish farming, improved pasture land, milk processing, and grain storage. Given women's prominence in some of these activities, the project will contribute to economically empowering women by strengthening their capacities to undertake such activities.

B8.6 Social Analysis : Socio-Economic Review and Key Findings

B8.6.1 The project's negative social impacts include temporary change in population due to influx of people in search of employment. During drilling and well testing, there could be increased dust, noise and air pollution levels for surrounding communities. There will be some increase in vehicular movement to the project area through the access roads and this could result in elevated dust level as the road are not tarred and some increased noise levels. Drilling operations always present an element of danger. Occupational health and safety of the workforce will have to be monitored by the respective Contractors' supervisors and Foremen. The negative social impacts will be mitigated through measures embedded in the EMMP.

B8.6.2 There are no PAPs in the project area. None of the land on the project site is inhabited or utilized by any person. No crop cultivation occurs on the proposed project site (inside Menengai caldera), and thus there will be no acquisition of farmland. Land access rights, specifically for water boreholes and access roads, are being sought for landowners whose parcels will be required for the purposes of better accessing the project site. The existing road leading to the Caldera was very narrow for the big machinery to pass especially at junctions hence it had to be widened. In so doing pieces of land had to be taken from 22 people. KenGen's property office has surveyed the parcels and initiated compensation negotiations with owners of affected land parcels required for the water boreholes and access roads. Compensations, which were based on market property rates agreed upon by each landowner and KenGen, have been paid. The majority of the compensation process for the concerned individuals has been undertaken. The final payments will be made once the land registration process has been completed. The land was bought at a cost price of 250 000.00 KSH per acre. The proposed geothermal wells drill sites are located on the public land (Menengai Forest) and negotiations are underway between KenGen and the Kenyan Government, through the Kenya Forest Service who are the custodians of Menengai forest.

B8.6.3 Most importantly, the project will result in positive social impacts, many of which will contribute towards the reduction of poverty in the project zone. Direct and indirect employment opportunities will be generated by the project. The project will create approximately 912 skilled jobs and 300 unskilled jobs. Unskilled employment positions will be given to the locals hence uplifting the livelihood of the local community both temporarily and for longer term and at the same time reducing the risk of HIV/AIDS. Land use around the project area is farming. The land obtained from the 22 individuals adjacent to the road reserves were mostly quarry and with the widening of the road, GDC dug some of the quarry for use in the caldera and rehabilitated all areas to an extent that all those areas are now used for farming. This project has therefore increased the yield of maize harvesting. Furthermore, houses in the area were mostly mud houses and the compensation payments have allowed most of them to build brick houses. The upgrading of the access roads will improve access to Menengai caldera for security operation and tourism purposes. Menengai caldera is a tourist attraction noted particularly for its scenic beauty; moreover, geothermal development in itself

is a tourist attraction feature and this will create opportunity to enhance the touristic nature of the area.

B8.6.4 In addition, GDC intends to utilize geothermal resources to promote initiatives which would be of immense socio-economic importance to surrounding communities. Through the provision of steam and water generated during its main activities, GDC will seek to promote, among others, aloe vera farming, watermelon farming, pyrethrum and fish farming, improved pasture land, milk processing, afforestation, and grain storage. By tapping into Kenya's immense geothermal development potential, opportunities will be created to the building of national expertise, sharing of expertise regionally, and facilitating the transfer of knowledge nationally and regionally. Through its holistic Corporate Social Responsibility (CSR) approach, GDC will greatly emphasize community investments. As such, GDC intends to assist local communities through the development of Community Action Plans and financing various projects, such as the formation of cooperatives.

B8.7 Monitoring of Social Impacts

B8.7.1 The monitoring of the project's social impacts will be carried out primarily through the EMMP. The cost of implementing both social and environmental impacts is estimated at 99,000,000.00 KSH. An Environment, Health, and Safety Officer will be on site to ensure compliance to relevant regulations by the Contractor. GDC has established mechanisms for promoting stakeholder engagement in local communities, which will contribute towards ensuring the social sustainability and acceptability of the project.

B8.7.2 To mitigate against negative social impacts, the EMMP has been tailored to factor in the following during its implementation: monitoring and scheduling of community issues such as supply of water and electricity to the local community; freedom of passage for grazing purposes; employment for local community members. Other social concerns expressed by the surrounding communities will be addressed through the provisioning of CSR scholarships and other complimentary initiatives.

B9. Project Preparation and Supervision

B9.1 Following an official request from the Government of Kenya on 23 March 2011 to the Bank to consider financing this project, the Bank fielded a preparation mission in April 2011. Pursuant to the preparation mission, and after having discussed the project's concept note, the Bank dispatched an appraisal mission in August 2011 whose outcome is the subject of this report. The negotiation of the loan agreement is planned for end October / beginning November for a board approval on 30 November 2011. The loan is expected to be effective by June 2012. A mid-review of the project will take place in 2014. The project is expected to be completed by December 2016.

B9.2 During the preparation and appraisal missions, the mission members discussed with the relevant government institutions and associated agencies the project details and interacted with key donors active in the energy sector in the country. The environmental issues including mitigation measures and environmental management and resettlement plans were all discussed. It was established that GDC had done the necessary consultations with stakeholders in the country.

B9.3 The Project will be launched in the second quarter of 2012 and will be field supervised at least twice a year during implementation, with active participation of the Bank's Country Office in Kenya (KEFO).

B9.5 GDC, in liaison with the supervision consultant, will prepare and submit to the Bank quarterly progress reports. These will show (among other things) financial receipts by specific sources and expenditures by main expenditure classifications, together with Physical Progress Reports linking financial information with physical progress and highlighting issues that require attention. In addition an audit report will be prepared and submitted to the Bank within six months of the end of every financial year. During implementation, monitoring of the ESMP will be done by GDC and key stakeholders and affected communities. Quarterly Environmental Reports will be prepared by the consultant. Environmental monitoring will be carried out to ensure that all construction activities comply and adhere to environmental provisions and standard specifications, so that all mitigation measures are implemented. An environmental audit will be conducted according to NEMA regulations at least one year after project completion. The contractor and GDC have responsibility to ensure that the proposed mitigation measures are properly implemented during the construction phase.

C. Additional Technical Annexes

C.1 Technical Due Diligence

CONFIRMATION OF THE GEOTHERMAL RESOURCE

C.1.1 Exploration has provided evidence that a high temperature geothermal reservoir is present within the project area. This evidence is mainly from fumarole distribution and fluid geothermometry. The presence of a resource has now been confirmed by deep drilling. GDC has estimated that the geothermal reservoir may have an extent of 84 km² (March 2010 estimate) to 107 km² (December 2010 estimate). Most recently, an area of 110 km² has been used by GDC. These estimates are based mainly on identified resistivity anomalies. While the anomaly pattern is not distinct enough to confidently infer the reservoir's boundaries, the extent of thermal activity (as indicated by the distribution of fumaroles and ground temperature anomalies) is of the same order of magnitude as the potential reservoir area inferred by GDC from resistivity survey data, adding confidence to the estimate of resource size.

ASSESSMENT OF THE EXPLORATORY DRILLING

C.1.2 Two wells (MW1 and 2) have been completed to date, and two others (MW3 and 4) are being drilled. MW1, located along the northern edge of the area of active surface thermal manifestations, is a successful producer capable of supplying about 7 MW. MW2, located about 3 km NNW of MW1, is permeable but cool, possibly due to down-flow of cool fluids in the well. This down-flow may be present in the formation (meaning it is a true characteristic of this area of the Menengai crater) or it may be a feature present only in the wellbore, which as a long open-hole section. The down-flow originates below the casing shoe (at about 850 m) to a depth of about 2,300 m. This is a common problem in geothermal wells with long open-hole intervals open to multiple permeable zones. It will be important for GDC to ascertain if this is a wellbore feature only, or represents subsurface conditions in this part of the reservoir, which is more distant from active surface thermal manifestations. Well MW3 is located about 2 km E of MW1, also along the northern edge of the main fumaroles area. Currently, the drill pipe is stuck, and fishing operations are ongoing. The well is producing hot fluids, which indicates that it has some permeability. Considering its location and drilling results to date, we can infer that the area tapped by MW3 is productive. MW4 is currently drilling in the production interval at a depth of about 1,200 m +/- . This well is located between and slightly north of wells MW1 and MW3, meaning it is slightly further away from the main fumaroles area than the other two wells.

C.1.3 Using a combination of exploration data sets (primarily resistivity and passive seismic survey data), GDC has estimated the reservoir area at 110 km². Using a reasonable average productivity value per square kilometer of 15 MW/km², and assuming that all ground is productive, GDC has estimated that about 1,500 MW can be produced at Menengai. This is considered to be an optimistic estimate, as it is unlikely that the entire area will be capable of supporting commercially productive wells, as has already been demonstrated by well MW2.

C.1.4 A preliminary volumetric estimate of the heat resource at Menengai has been undertaken. After reduction to account for uneven fluid recovery (i.e., the presence of unproductive areas), the heat resource has been converted to equivalent MW using typical geothermal power plant energy conversion and operating parameters. A probabilistic (Monte Carlo simulation) approach has been applied to account for uncertainties in the three most

important resource parameters (the area, thickness and average temperature of the reservoir). Drilling data and the distribution of thermal features have been used as a guide for estimating the minimum, maximum and most likely reservoir areas (10, 110 and 40 km², respectively). The results of well MW1 have guided the selection of reservoir thickness (minimum 500m, maximum 1,500m, and most likely 1,000m) and average reservoir temperature (minimum 225°C, maximum 275°C, most likely 250°C). Porosity is assumed to range from 3 to 7% with equal probability; recovery factor is assumed to range from 5 to 20% with equal probability. Using these and other fixed parameters (including a 30 year project life), there is a 90% probability that at least 165 MW can be developed at Menengai, and there is considerable upside. For example, the minimum reservoir area (one of the most significant input parameters) considered herein is only 10 km². This very conservative assumption only considers an area about twice the size of that around wells MW1, 3 and 4. The most-likely area (40 km²) is based on the size of the area of active thermal manifestations plus a small margin; however, it is likely that the reservoir is present over a larger area. Therefore we consider the 90% cumulative probability value of 200 MW to be a reasonable lower bound for Menengai that will increase as drilling proceeds.

ASSESSMENT OF GDC'S DEVELOPMENT STRATEGY

C.1.5 The development program that has been outlined by GDC in the documentation provided is ambitious but not unattainable. It calls for what amounts to fast-track development of a relatively large geothermal project in a period of several years, coordinating the activities of planning and execution of civil works; drilling and well testing; project feasibility studies; installation, connection and operation of WHUs (likely by third-party IPP providers); construction of steamfield piping systems; construction and start-up of conventional power plants by IPPs; and connection of generation capacity to the power grid.

C.1.6 GDC has assembled and organized the resources (financial and physical) to undertake the initial part of this program, including the completion of a major part of the required civil works, and the deployment of two drilling rigs with full crews and support facilities for the drilling of the initial 4 wells in the field. The organizational capacity to undertake a portion of the program has therefore been demonstrated; however, the program will become significantly more complex as additional rigs are added, and new dimensions are added (including steamfield gathering system construction and the installation and operation of WHUs and eventually conventional power plants. Much of the major work aside for drilling is expected to be conducted by third-party contractors through tenders, but this nevertheless implies the need to set up, manage and coordinate major construction contracts.

C.1.7 The available documentation and discussions with GDC indicate that the schedule and budget for project development have changed over time, and therefore it would not be unreasonable to anticipate further changes, particularly since certain key components (such as procurement of new drilling rigs, and construction of the gathering system) have yet to be tendered.

PROJECT RISKS

C.1.8 The main risk at Menengai is the adequacy of the resource to produce 400 MW. Although a preliminary heat resource estimate suggests that developing the resource to this level it should be possible, this estimate yields a "minimum" MW value (that with 90% cumulative probability) of about 200 MW. This risk can be mitigated through additional drilling, which is expected to provide support for GDC's planned project size.

This risk followed closely by that associated with the ability of GDC to deliver steam at the wellhead according to its schedule and budget. The addition of more rigs will increase the pace of resource confirmation and development, but adds complexity to the operations. Training of personnel, good maintenance procedures and skillful management of drilling equipment, personnel and operations will help GDC attain its ambitious goals.

PRELIMINARY CONCLUSIONS AND NEXT STEPS

C.1.9 The Menengai geothermal project is based on an attractive geothermal resource which has now been shown to be commercially exploitable at some level. In addition, GDC is at this point a well-funded company which is performing according to appropriate standards. However, both the exploration/development of the Menengai field and the expansion of GDC are in their early stages, which leads to the following sources of project risk:

- Resource risk, principally the risk that the resource may not be capable of sustaining generation at the 400 MW level currently envisaged. Initial heat resource estimation is consistent with a 200 MW development, at a minimum. It is expected that this estimate will increase as more wells are drilled.
- Operational risks, including risks of schedule and cost overruns that could come from a variety of sources, including internal difficulties, factors related to IPPs, and factors related to the utilization of WHUs for early generation.

