



**AFRICAN DEVELOPMENT
BANK GROUP**

PROJECT: MENENGAI GEOTHERMAL DEVELOPMENT PROJECT
COUNTRY: KENYA

PROJECT APPRAISAL REPORT

November, 2011

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CURRENCY EQUIVALENTS

September 2011

UA 1	USD 1.5
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FISCAL YEAR

1 January - 31 December

WEIGHTS AND MEASURES

• m	Metre	• KOE	kilogram of oil equivalent
• cm	centimetre = 0.01 metre	• kV	kilovolt = 1 000 volts
• mm	millimetre = 0.001 metre	• KVa	kilovolt ampere (1 000 Va)
• km	kilometre = 1 000 metres	• KW	kilowatt = 1 000 Watts
• m ²	square meter	• GW	gigawatt (1000 000 kW or 1000 MW)
• cm ²	square centimetre	• MW	megawatt (1 000 000 W or 1 000 kW)
• km ²	square kilometre = 1 000 000 m ²	• KWh	kilowatt hour (1 000 Wh)
• ha	hectare = 10 000 m ²	• MWh	megawatt hour (1 000 KWh)
• t (t)	metric tonne (1 000 kg)	• 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
•	PFM	:	Public Financial Management
•	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 (USD million)	Instrument
African Development Bank	120	Loan
SREP Loan through African Development Bank	7.5	Loan
SREP Grant through African Development Bank	17.5	Grant
World Bank	100	Loan
SREP through World Bank	15	Loan and Grant
Agence Française de Développement (AFD)	166	Loan
European Investment Bank	36	Loan
Geothermal Development Company/ Government of Kenya	284	Equity
Total Project Cost	746	

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 undisbursed portion of the loan starting 120 days after the signing of the Loan Agreements.	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	16 December 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, consistent with Kenya's green growth vision. More specifically, the project aims to develop the Menengai geothermal steam field to produce enough steam for 400 MW power that will be generated by the private sector as Independent Power Producers (IPP). The project will be completed by December 2016 and will cost USD 746 million.

In a country where the electrification rate is only 15%, this project will enable substantial increase in the provision of additional reliable, clean and affordable power generation capacity to Kenyan households, businesses and industries, with an increase equivalent to 26% of the current total installed generation capacity in the country. The steam field development will enable electricity generation equivalent to the consumption needs of up to around 500,000 households of which 70,000 in rural areas, 300,000 small businesses, as well as 1,000 GWh of energy to businesses and industries. The project will also help avoid close to 2 million tons of CO₂ per annum. Access to modern energy will help improve health and education opportunities, particularly for women and girls. The project will also 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 who normally collect water for domestic purposes.

Needs Assessment: In order to meet the demand despite the unreliability of the hydropower generation capacity (due to extreme drought during the last 3 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, and highly carbon intensive. This strong reliance on emergency power has pushed up operating costs sharply increasing small industry and households electricity tariffs to US Cents 18 per kWh and US Cents 16 per kWh respectively in 2010. As a result, load shedding occurs frequently in Kenya, particularly during the dry season. This situation has underscored the 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, clean, and relatively reliable and affordable 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 investments, and need to create the right enabling environment for private sector participation, among others.

Knowledge Management: The project will have a catalytic replication potential 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 Djibouti, Ethiopia, Rwanda, Tanzania, and Uganda.

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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

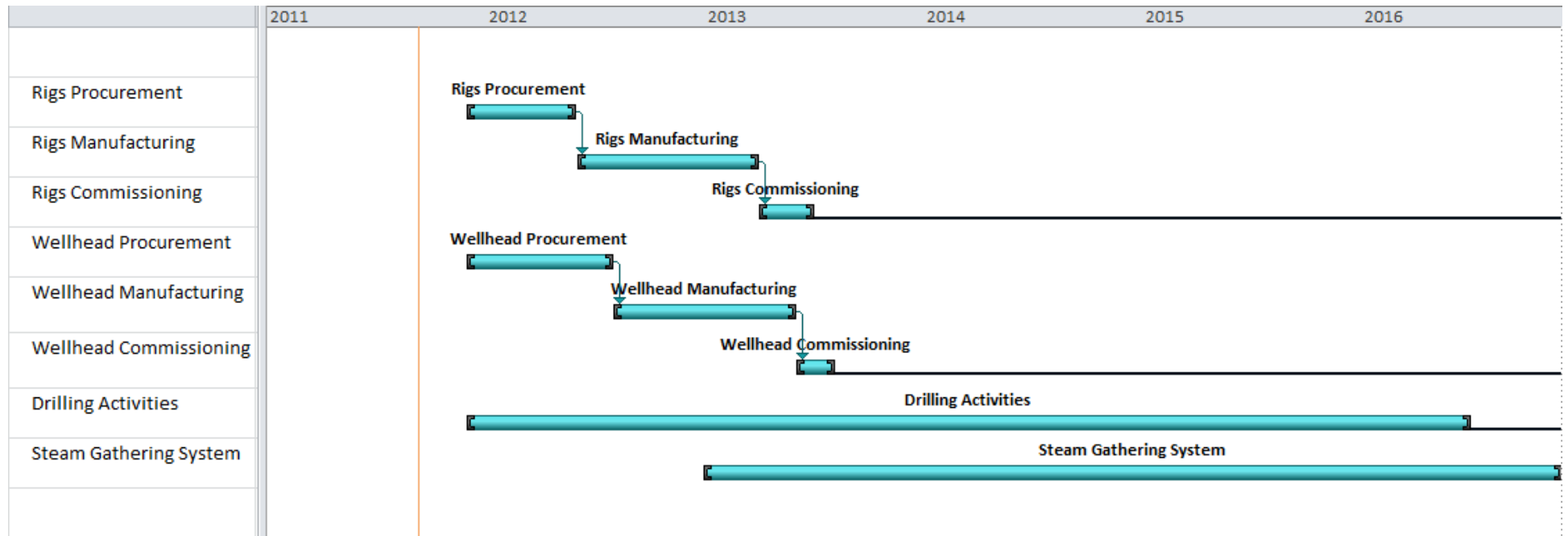
	RESULTS CHAIN	PERFORMANCE INDICATORS			MEANS OF VERIFICATION	RISKS/MITIGATION MEASURES
		Indicator (including Core Sector Indicator)	Baseline	Target		
IMPACT	Sustainable economic growth and improved living conditions and wellbeing of the population	Gross Domestic Product (GDP) growth	5.6% in 2010	At least 7% by 2020	<ul style="list-style-type: none"> - Human Development Report - National economic statistics 	<ul style="list-style-type: none"> - The political risk is mitigated by the adoption of the new constitution leading to presidential elections in 2012.
OUTCOMES	New electricity connections	Number of households and small businesses	n/a	About 500,000 households and 300,000 small businesses	<ul style="list-style-type: none"> - National statistics - Project post-evaluation report - Public utility companies records 	<ul style="list-style-type: none"> - A variety of factors could lead to delays in the contracting, construction and start-up of power plants by private investors. The large number of private investors that responded to the Request for Interest and the involvement of a transaction advisor in the project will mitigate that risk. - There is a risk that the transmission line will not be constructed on time to evacuate the power from the power plant. This is considered a low risk, and GDC and KETRACO will jointly undertake detailed feasibility study for the transmission line financed under component E.
	Additional power to businesses and industries	Consumption in GWh	n/a	About 1,000 GWh		
	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 ² starting 2018 (when the power plant is completed)		
	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)		

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

² See calculation details in Annex C.2

OUTPUTS	Geothermal field development	<ul style="list-style-type: none"> - Number of wells drilled - Quantity of steam produced (tonnes) 	n/a	By end 2016: <ul style="list-style-type: none"> - 120 wells drilled - 27.8 million of tonnes of steam produced annually 	<ul style="list-style-type: none"> - Progress reports from the implementing agency - Supervision mission reports from AfDB 	<ul style="list-style-type: none"> - 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 be provided to GDC under the project.
	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	By end 2016: <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 	<ul style="list-style-type: none"> - Disbursement and financial reports from the implementing agency - Project completion report 	<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 6 months before affecting the financial and economic viability of the project.
	Environmental and social management	Execution of the environmental and social management plan	n/a	By end 2016: Environmental and social management plan executed		<ul style="list-style-type: none"> - 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 at this early stage of drilling, it is already proven that there is a 90% probability that the resource will be sufficient for 200 MW and this will improve as drilling goes on.
KEY ACTIVITIES	COMPONENTS				INPUTS	
	A. Site civil works B. Equipment C. Well drilling D. Steam gathering system E. Consultancy services F. Environmental and social management				Total Cost : USD 746	

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 (equivalent to USD 120 million), and Scale-up Renewable Energy Program (SREP) (through ADF) loan of US\$ 7.5 million and grant of US\$ 17.5 million to Kenya for the Menengai Geothermal Development Project.

1 STRATEGIC THRUST AND RATIONALE

1.1 Project Linkages with Country Strategy and Objectives

1.1.1 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. Kenya has significant aspirations for a Green Growth, thanks to its abundant renewables resources, and geothermal energy is a cornerstone of Kenya's green growth. 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.

1.1.2 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 structured as a Public Private Partnership (PPP), will facilitate, attract and 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 are 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 (last update in March 2011). 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 carbon intensive (diesel and heavy fuel), and very expensive (average cost of about USD 23 cents per kWh compared to an average retail tariff of USD 16 cents per kWh for domestic (household) customers, USD 18 cents for small industrial customers and USD 12 cents for commercial and industrial customers.³). Increase of deploying fossil fuel electricity solutions especially for industrial sector has also led to increase of the total national import bill. Even then, load shedding occurs frequently 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, clean, and relatively reliable and affordable 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 in March 2011, the Government of Kenya (GoK) 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 Bank along with the other potential financiers initially considered scaling down to 200 MW so as to reduce the funding needs and meanwhile investigate the steam potential of the site. However, as the Bank and the World Bank contributed to finalizing the SREP Investment Plan (IP) for Kenya, a number of other financiers have expressed their interest in co-financing the Menengai project. Moreover, the potential financiers gained confidence in the availability of the geothermal resources based on the findings of the independent geothermal consultant contracted by the Bank. Therefore, the AfDB, in accordance with the other potential financiers and the GoK, has appraised the project on the basis of a 400 MW instead of 200 MW as initially envisaged in the IP.

1.2.5 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 one of the Climate Investment Funds (CIF). The Bank's financing being concessional, it is expected to overcome various barriers to create enabling environment for the private sector participation and develop Kenya's full geothermal potential. Those barriers are typically drilling and financing risks. Moreover, the relatively affordable geothermal energy will likely help lower the currently high costs of electricity to consumers, which is likely to make Kenya a preferred destination for investors

³ LCPDP, March 2011

bringing with it the attendant benefits such as job creation, increased taxation revenue and improved economy development to the country and to the region. Geothermal being a clean energy source, it is expected that the project will help avoid close to 2 million tons of CO₂ per annum once power is generated from steam.

1.2.6 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 In order to mobilize and coordinate the enormous resources required for the energy sector, the Ministry of Energy has established a sector working group among development partners. 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, consistent with its green growth ambition. More specifically, the project aims to develop the Menengai geothermal steam field to produce sufficient steam for 400 MW power. Upon availability of the needed steam quantity, the private sector as Independent Power Producers (IPP) will then take the lead and responsibility for generation and supply of electricity to the national grid. Therefore 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. The project is a clean investment, as upon its operation it will contribute to emission reduction of about 2 million tons of CO₂ per annum.

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 USD million)			
N°	Component Name	Estimated Cost	Component Description
A)	Site civil works	8	Construction of access roads Construction of a water reticulation system
B)	Equipment	149	Procurement and commissioning of drilling rigs Procurement and commissioning of wellhead generation units
C)	Well drilling	296	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 Labour and administrative costs
D)	Steam gathering system	158	Engineering, procurement and construction of a steam gathering system (EPC)
E)	Consultancy services	66	Drilling expertise Slotting services Feasibility study Steam gathering supervision consultant Transaction advisor Trainings and workshops Project management and supervision consultant Audit services
F)	E&S management	1	Implementation of environmental & social (E&S) management plan
	Price escalation and contingencies (10%)	68	
	Total Project Cost	746	

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.

		<ul style="list-style-type: none"> • 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 sufficient base load capacity
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 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.
Geothermal steam field development by the 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. •
	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 which is currently being developed by KenGen and Orpower4 to its maximum limit.

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 USD 746 million, of which USD 515 million in foreign currency and USD 231 million in local currency. Table 2.3 presents the foreign and local currency project cost by component.

Table 2.3 Estimated Cost by Component (Amounts in USD million)				
Components	Foreign Currency	Local Currency	Total	% Foreign
A. Site preparation	0	8	8	0%
B. Equipment	149	0	149	100%
C. Well drilling	103	194	296	35%
D. Steam gathering system	158	0	158	100%
E. Consultancy services	59	8	66	88%
F. Environmental and social management	0	1	1	0%
Total base cost	468	210	678	69%
Price escalation and contingencies (10%)	47	21	68	69%
Total project cost	515	231	746	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). The SREP resources will be channeled through the Bank and the World Bank. 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 in September 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.

2.4.3 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 sources of financing of the project are illustrated in Table 2.4.

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 UA 189 million.

2.4.5 The project cost by category of expenditure is provided in Table 2.5 and the expenditure schedule by component is illustrated in Table 2.6. The detailed use of the different sources of financing is provided in Table 2.7.

Table 2.4 Sources of Financing (Amounts in USD million)				
Sources of Financing	Foreign Exchange	Local Currency	Total	% Total
African Development Bank (AfDB)	120	0	120	16%
SREP – AfDB	25	0	25	3%
World Bank	100	0	100	13%
SREP – World Bank	15	0	15	2%
Agence Française de Développement (AFD)	166	0	166	23%
European Investment Bank (EIB)	0	36	36	5%
Government of Kenya / GDC	89	195	284	38%
Total Project Cost	515	231	746	100%
Percentage (%)	69%	31%	100%	n/a

Table 2.5 Project Cost by Category of Expenditure (Amounts in USD million)				
Category of expenditure	Foreign Exchange	Local Currency	Total	% Foreign Currency
Goods (supplies and equipment)	250	72	322	78%
Works	158	8	166	95%
Consultancy services (studies, control and auditing)	51	0	51	100%
Non-consultancy services	9	130	139	6%
Total base cost	468	210	678	69%
Price escalation and contingencies (10%)	47	21	68	69%
Total project cost	515	231	746	69%

Table 2.6 Expenditure Schedule by Component (in USD million)						
Components	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017
A. Site preparation	2	3	1	1	0	0
B. Equipment	69	77	2	0	0	0
C. Well drilling	33	120	54	42	38	9
D. Steam gathering system	0	40	40	53	13	13
E. Consultancy services	5	19	17	12	12	1
F. Environmental and social management	0	0	0	0	0	0
Total base cost	110	258	115	108	63	24
Price escalation and contingencies (10%)	11	26	11	11	6	2
Total project cost	121	284	126	119	70	27

Table 2.7 Detailed Use of Sources of Financing (Amounts in USD million)								
N°	Component Name	Estimated Cost	Component Description	AfDB / SREP	WB / SREP	AFD	EIB	GoK / GDC
A)	Site civil works	4	Construction of access roads	0	0	0	0	4
		4	Construction of a water reticulation system	0	0	0	0	4
B)	Equipment	139	Procurement and commissioning of drilling rigs	50	0	69	0	20
		10	Procurement and commissioning of wellhead generation units	10	0	0	0	0
C)	Well drilling	73	Acquisition of offshore drilling materials	73	0	0	0	0
		5	Acquisition of local drilling materials	0	0	0	0	5
		67	Fuel and lubricants	0	0	0	36	31
		4	Water pumping costs	0	0	0	0	4
		9	Transport (materials and personnel)	0	0	0	0	9
		29	Spare parts	0	0	29	0	0
		15	Well testing	0	0	0	0	15
		1	Drill pipe inspection	0	0	0	0	1
D)	Steam gathering system	94	Labour and administrative costs	0	0	0	0	94
		158	Engineering, procurement and construction of a steam gathering system (EPC)	0	112	23	0	23
E)	Consultancy services	41	Drilling expertise	0	0	41	0	0
		2	Slotting services	0	0	0	0	2
		2	Feasibility study	0	2	0	0	0
		6	Steam gathering supervision consultant	0	0	6	0	0
		2	Transaction advisor	2	0	0	0	0
		8	Trainings and workshops	3	0	0	0	4
		6	Project management and supervision consultant	6	0	0	0	0
		0	Audit services	0	0	0	0	0
F)	Environmental and social management	1	Implementation of environmental management plan	0	0	0	0	1
	Price escalation and contingencies (10%)	68		0	0	0	0	68
	Total	746		145	115	166	36	284

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 Project's Development Impacts

By providing additional installed generation capacity and injecting it into the national grid, the project will ultimately result in affordable and reliable electricity supply to more households, businesses and industries. The 400 MW installed capacity will result in 3,154 GWh of additional energy assuming a plant factor of 90% (typical for geothermal power plants). This additional energy will enable the supply for around 500,000 households of which 70,000 in rural areas, 300,000 small businesses, as well as 1,000 GWh of energy to businesses and industries, assuming the same distribution of consumption per categories of consumers as the one indicated in the 2011 Least Cost Power Development Plan LCPDP).

2.6.1 Lack of access to productive electricity is increasingly acknowledged as a key obstacle to social and economic development. Kenya has currently a very low overall electricity access rate of 15%. The project will add an additional installed generation capacity equivalent to 26% of the the current total installed generation capacity in the country. Kenyan consumers will benefit most directly from the increase in installed generation capacity and related electricity supply, as it will promote greater economic growth and equity. The project will provide opportunities for the development of small businesses; expand Kenyans' access to modern energy, Information and Communications Technology (ICT) such as radio, and the Internet; and increase employment opportunities and incomes, thereby helping to improve overall quality of life. Women and girls tend to have increased opportunities for good health and education when the community has access to modern forms of energy, which allows for more efficient health centres and lighting. Kenya as a country will also reap the benefits of a diversified energy mix and enhanced energy security, since geothermal is an indigenous resource.

2.6.2 The local communities surrounding the Menengai field will benefit from local job creation (GDC will employ and train local workers for construction, operation, security and other positions) as well as business and other tertiary opportunities; in fact, the project is expected to create 912 skilled and about 300 unskilled jobs in the area. Women will particularly benefit from the project, as the employment ratio of women will be at least 30% (above the current national women employment ratio in the country). Considering the fact that the potable water facilities to be developed by the project for the drilling activities will be transferred to the community/municipality at the end of the project implementation, this will have a direct effect on the empowerment of women and girls who normally collect water for domestic purposes.

2.6.3 Furthermore, GDC intends to utilize geothermal resources to promote socioeconomic initiatives in surrounding communities, such as fish farming, improvements to 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.

2.6.4 Last but not least, when electricity is generated from the steam field, it is estimated to result in the reduction in GHG emissions of close to 2 million tons per year.

2.7 Participatory Approach

2.7.1 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.

2.7.2 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.

2.7.3 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.

2.8 Experience and Lessons Reflected in Project Design

A. Lessons Learned from AfDB Operations

2.8.1 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.

2.8.2 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.

B. Lessons Learned from Developing the Geothermal Resource in Kenya

2.8.3 The first geothermal power plant in Kenya was commissioned in Olkaria in 1982. Olkaria I ultimately had a total installed power generation capacity of 45 MW. Olkaria II was then commissioned from 2003 to 2009 with a total installed capacity of 115 MW.

2.8.4 The first geothermal IPP, Olkaria III, was concessioned to a private investor in 1998. As per the concession, the private investor was supposed to develop required number of wells to generate 100 MW. As of today, 13 years later, the private investor has developed a limited number wells to produce only 48 MW, despite inheriting 6 productive wells from the GoK.

2.8.5 Finally, drilling activities are ongoing in Olkaria IV for 140 MW power generation and Olkaria I extension for another 140 MW power generation. The projects are being financed by the Government of Kenya along with other development partners. The status of the geothermal power generation in Kenya is provided in Table 2.8.

Table 2.8 – Status of Geothermal Power Generation in Kenya

Field Name	Station Name	Unit Capacity (MWe)	Date Commissioned	Status	Developer
East	Olkaria I	45	1982 -1985	Additional 140 MWe proposed	KenGen
North	Olkaria II	115	2003, 2009		KenGen
West	Olkaria III	48	1998 & 2008	48 MWe Existing	Orpower4 (IPP)
Domes	Olkaria IV			140 MWe - proposed	KenGen

2.8.6 Other greenfield geothermal sites, Suswa (800 MW potential) and Longonot (1,000 MW), were concessioned to private investors in 2007 and 2009 respectively. However, to date, there has been very little activities on the ground.

2.8.7 The main lesson learned so far is that the private sector’s has limited appetite for relatively risky drilling activities, especially on greenfields. In fact, on the greenfield concessions of Suswa and Longonot, it has proven to be very difficult to mobilize the

required financing from traditional sources to undertake the initial development activities (drilling and infrastructure). Therefore the developers have to mobilize significant equity financing to undertake those initial activities and they expect extremely high returns as well, which may limit the economic and financial viability of the project.

2.8.8 Learning lessons from the above, the GoK has decided to create a dedicated geothermal development company (GDC) in 2008. To date, GDC has already drilled wells to generate 350 MW (initial target of 280 MW) of power for the ongoing projects at Olkaria I and IV. GDC has also undertaken the required project preparation activities for drilling wells to generate 400 MW in Menengai and has already drilled 4 wells so far.

2.8.9 GDC has therefore accumulated a significant amount of experience with these on-going projects. The main lessons learnt from these projects are: (i) the steam produced by a well should be exploited as it becomes available by installing wellhead generation units; and (ii) it is useful to manage many rigs operating simultaneously (5 rigs in the case of Olkaria). 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. Also, since GDC is involved in the drilling management at Olkaria, this experience will be very useful in Menengai as well.

2.9 Key Performance Indicators

2.9.1 The key outcome indicators will be the geothermal power generation capacity installed in the country in MW and the tons 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.

2.9.2 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 a model developed by Geothermal Development Company (GDC) assisted by the Bank's modeling team. The results from the 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.

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 positive with an estimated NPV of USD 324.6 million and EIRR of 16.7% real.

3.1.4 It is important to note that while GDC, as a state owned enterprise, as well as its development partners are satisfied with a FIRR of 8.3%, this return would not be acceptable for a private investor in the drilling stage of geothermal development. Drilling, being an exploration type of activity would have to be essentially funded by equity if undertaken by a private investor. As such, it is typically seen that private investors would expect returns ranging between 25 and 35 percent return on equity for sub-Saharan African exploration risk. This is why private sector participation is only considered for the second phase of the project, namely the steam-to-power generation investment.

3.1.5 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 2011⁴. 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 and as such will help with mitigation efforts of climate change. The project will result in significant displacement of CO₂ emissions (1.95 million tonnes per year⁵ 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 (floods, drought, small tremors, etc.). 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.

⁴ <http://www.afdb.org/fileadmin/uploads/afdb/Documents/Environmental-and-Social-Assessments/Kenya-Menengai%20Geothermal%20Power%20Project-ESIA%20Summary.pdf>

⁵ The CO₂ emission saving is calculated assuming grid emission factor of approximately 0.6 tons of CO₂e/MWh

3.2.6 Gender: Women and girls tend to have increased opportunities for good health and education when the community has access to modern forms of energy. When it comes to the direct employment by the project, males dominate the commercial, industrial, building stone quarrying, ballast crushing and sand harvesting sectors. However, this project will ensure an employment ratio of minimum 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 that will be employed by and/or create by them. 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 ultimately provide a significant amount of additional reliable, clean and affordable power generation capacity to connect households and businesses 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 30 km of 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 acquired 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 from the 22 private owners.

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 and is aggressively training staff in all the activities of geothermal development.

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 at the moment but this is expected to change when it starts receiving revenues from sale of steam and early generation from wellheads. 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 months procurement plan has been prepared by GDC. 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.

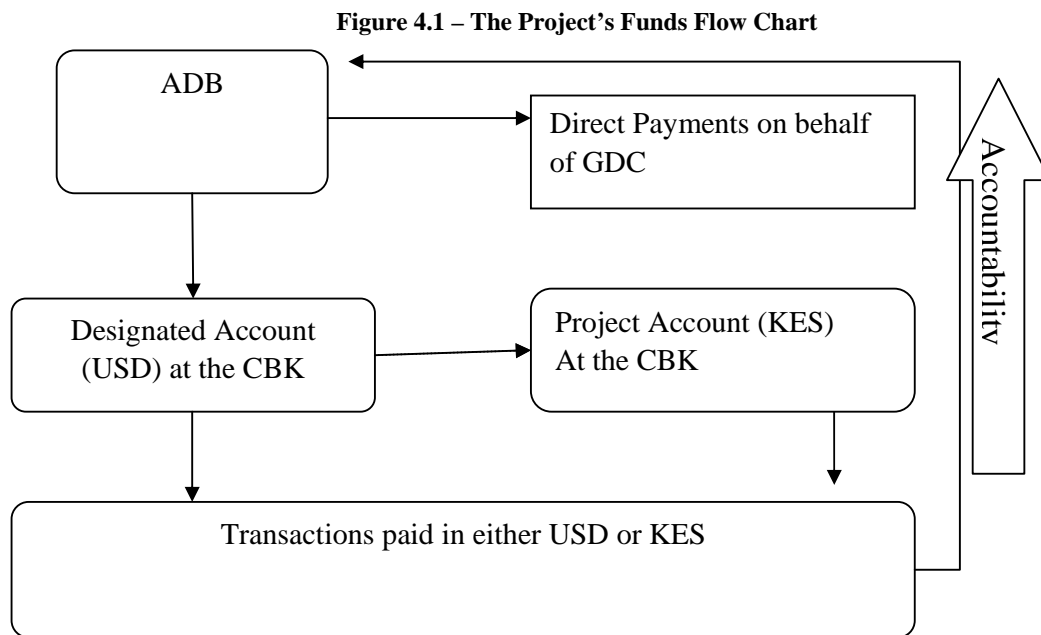
4.1.7 **Financial Management:** The financial management disbursement arrangements ensure that project funds are used for intended purposes in an efficient and economical way; project financial reports are prepared in an accurate, reliable and timely manner; and project's assets are safeguarded against associated risks.

4.1.8 The Public Financial Management (PFM) institutional framework in Kenya has been assessed to be "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. It should however be noted that in situations where accountability may be compromised due to weak country systems, the Bank's financial management systems will be used.

4.1.9 The overall residual risk is assessed as moderate upon mitigation of identified risks. The strengths of the project in terms of financial management are: (i) the accounting personnel within the company are adequately qualified and experienced; (ii) the accounting system is computerized under SAP system; (iii) the project being under GDC will use the GDC's Finance Manual as its accounting policies and procedures; (iv) budgeting arrangements are adequate; (v) external auditing arrangements have been discussed and are

adequate; (vi) funds flow arrangements are adequate. The weaknesses are: (i) limited experience with AfDB financial practices. GDC needs to ensure that training is provided in order to enable the staff to comply with Bank requirements; (ii) lack of a comprehensive financial policies and procedures manual that encompasses all aspects of financial management.

4.1.10 GDC's budgeting, accounting, staffing, internal controls as well as internal auditing arrangements have been found to be adequate. The same systems will be used in the project's implementation. Special bank accounts denominated in US Dollars for Bank disbursements shall be opened at the Central Bank of Kenya together with Project Accounts in local currency to receive Government counterpart funds in compliance with Bank rules and regulations. The project's funds flow chart is presented in Figure 4.1.



4.1.11 The annual financial statements shall be prepared in accordance with International Financial Reporting Standards for external audit. Audited financial statements to the Bank shall be submitted within six months after the financial year end in the prescribed formats by the Bank. 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 in a prescribed format.

4.1.12 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.

4.1.13 **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.

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

4.1.15 **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. The external auditor to be sub-contracted should be acceptable to the Bank and the audit costs thereon will be borne by the project funds. The audits will be performed in accordance with International Standards on Auditing. The final audit report will still be issued by the Government's Auditor General, based on the tests carried out by the external auditor. 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 Governance

4.2.1 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 complementary skills and relevant experience to carry out its duties. Functions of the BoD are governed by set Policies and Procedures.

4.2.2 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.

4.2.3 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.

4.2.4 A new body, the Ethics and Anti-Corruption Commission formed through an Act of Parliament with effect from November this year as provided for in the new 2010 constitution has been instituted. It is mandated with fighting corruption among other responsibilities but is yet to be fully operational as its officers are yet to be recruited. Its precursor is the Kenya Anti-Corruption Commission which was disbanded a few months ago.

4.2.5 Finally, it is important to note that GDC governance, procurement and fiduciary standards have passed the acceptance of some DFIs such as AFD who has financed GDC in the past.

4.3 Project Monitoring and Evaluation

4.3.1 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.

4.3.2 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), with support of the Regional Resource Centre to be created in Nairobi in 2012, will also carry out field supervisions once a year or on a need basis.

4.3.3 The Implementing Agency (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 Implementing 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 Implementing Agency will prepare and submit a Project Completion Report (PCR).

4.3.4 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.

4.4 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 IPPs to be competitively involved in 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 is highly committed 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.

4.4.4 To ensure the affordability of electricity to end users, the domestic tariff category is divided into three consumption blocks (domestic, small commercial and commercial and industrial customers). For domestic (household) customers, there is a fixed charge of 120 KSh per month which is set to recover the customer related costs of metering, meter reading, inspection, maintenance billing and customer accounting. There is also a demand charge which is meant to recover the costs associated with the transmission and distribution network. The demand charge varies depending on the level of consumption: (i) 2.00 KSh per KWh for consumption below 50 kWh per month; (ii) 8.10 KSh per KWh for consumption below 50 kWh per month; and (iii) 18.57 KSh per KWh for consumption over 1,500 kWh per month. The tariff structure ensures access to the poor consumers in rural areas where the consumption is relatively low and whose purchasing power might make it difficult to pay for electricity otherwise. As of the end of 2010, the average retail tariff was USD 16.36 cents per KWh for domestic (household) customers, 17.95 for small industrial customers and 11.61 for commercial and industrial customers⁶.

4.4.5 **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. Currently there are five Independent Power Producers (IPP), 4 thermal and 1 geothermal. The IPPs contribute 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.

4.4.6 The existing geothermal IPP, Olkaria III (48 MW), is owned and operated by Orpower4 Inc, which is owned by Ormat International. 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.

4.4.7 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.

⁶ LCPDP, March 2011

4.4.8 In this regard, GDC has already issued an expression of interest and more than 20 potential investors have expressed interest to invest in power generation at Menengai, 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 are typically either unwilling to take, or only willing to take at an unsustainably high return. 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 should also be noted that GDC assured that in the unlikely case that there is no private investor willing to develop the power plant, the Kenya Electricity Generating Company Limited (KenGen), the country's leading power generation company and majority government owned, would step in. It is expected that the construction of the power plant by the private sector will be completed by 2018 and will cost around USD 800 million.

4.4.9 **Electricity access / Rural electrification:** The Government of Kenya (GoK) has a rural electrification strategic plan for the period 2008-2012 being implemented by the Rural Electrification Authority (REA). The objective of the master plan is to improve the access to electricity in the underdeveloped rural areas and encourage productive use of electricity. In addition, KPLC is undertaking a scaling up of customer connections under World Bank financed projects with a target of 200,000 new connections per year. It should also be noted that reducing the retail price of electricity and increasing generation capacity are key to ensure the success of the ongoing rural electrification programs. The Menengai project will result in increased generation capacity from Kenya's least cost source of generation and might therefore result in reduced retail price of electricity hence accelerating the electrification momentum in the country.

4.4.10 **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.

4.4.11 **Power evacuation:** The power plant will be connected to the grid through a planned and funded transmission line going from Olkaria (located in the vicinity of the Menengai site) to Lessos designed at 220 KV double circuit. The line would have a transit capacity of 500 MW. The line is being financed by JICA and is currently at design stage (feasibility and ESIA studies completed and way leaves acquisition on-going) and should be commissioned in 2014.

4.4.12 The project will require a 20 km transmission line from Menengai to Rongai to intersect the Olkaria-Lessos line. Detailed study for that line will be undertaken jointly by Kenya Electricity Transmission Company Ltd (KETRACO) and GDC and will be included in the scope of the feasibility study being financed under the project (component E). The

implementation of the transmission line could be included in the scope of the power generation component to be developed by the private sector.

4.4.13 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 assessment estimates that at this early stage of drilling, it is already proven that there is a 90% probability that the resource will be sufficient for 200 MW and these numbers will increase as drilling goes on.
- 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. Furthermore, the training to be provided to GDC under this project will also greatly assist in addressing this risk.
- 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 includes events such as chemical scaling from geothermal fluids, delays in drilling and connecting make-up wells or failure in reinjection system. 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. The establishment of a competent PIT supported by a supervision and management consultant will also greatly mitigate the risk of delays and cost overrun. Furthermore, the drilling cost estimates are 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. Careful selection of the IPP with extensive previous experience will also 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.
- Reputation risk: There is a risk that the failure of the project might affect the reputation of the Bank and other stakeholders involved. This risk is mitigated by the fact that GDC has already drilled four exploration wells as of October 2011, and the results have shown the existence of the resource in Menengai, making important steps towards overcoming the initial resource risk barrier.

4.6 SREP Transformational Impact

4.6.1 SREP is expected to spur a transformational change that will lead Kenya towards a low-GHG-emissions development pathway by harnessing the country's abundant renewable resources. Kenya has a huge geothermal potential, estimated at not less than 7,000 MW of generation capacity. Currently, the country's installed generation capacity is dominated by hydropower, which constitutes 50% of installed capacity and accounted for 33% of total sales in 2009–10. Lately, however, as Kenya deals with the effects of climate change, severe droughts have revealed hydropower generation to be unreliable. The situation is similar in the neighboring countries of Tanzania, Uganda, Rwanda and Uganda.

4.6.2 The country's optimal development program under the least cost power development plan (LCPDP) indicates that geothermal capacity should be increased from the current 198 MW to 5,530 MW in the planning period, equivalent to 26% of the system peak demand by 2031. In the past however, geothermal development in Kenya has been characterized by long gestation periods due to various constraints including financing and geothermal resource risks.

4.6.3 The Levelised Cost of Energy (LCoE) for the different types of candidate power plants in the country is shown in the Table 4.1 below (Source: LCPDP). The LCoE for hydropower generation is estimated at USD cents 9.2 per KWh.

Table 4.1 – Levelised Cost of Energy for Candidate Power Plants in Kenya

TYPE OF FUEL	CANDIDATE POWER PLANT	LOAD FACTOR	LCoE - US\$/Kwh 12% Disc. Rate
Clean Energy	Geothermal	93%	9.2
	Low Grand Falls	60%	14.1
	Wind	40%	12.2
Non Clean Energy	Nuclear	85%	14.5
	Gaz Turbine – Natural Gas	55%	12.0
	Coal	55%	14.9

4.6.4 The Menengai project is the first field being developed by GDC after Olkaria. The development of this field will contribute to meeting the country's ambitious targets for increasing its capacity between now and 2031, becoming a world-class geothermal developer and a strong regional player. Providing "first-mover" investment for this project is hence critical. By doing so, SREP will help accelerate the implementation of the GoK's power generation expansion plan and will facilitate private sector participation as well.

4.6.5 A technically and financially credible GDC will be attractive to private developers seeking to be the partner in building the power plant. If successful, GDC's business model could be replicated in Kenya's neighboring countries interested in developing their geothermal potential. SREP funding to provide capacity building to GDC is hence critical.

4.6.6 Geothermal will secure part of the needed base load and displace thermal and other expensive sources of energy that are normally called upon to provide base load power in Kenya (after hydropower, which is limited and unreliable). This will lower tariffs and make power more affordable for consumers. SREP funding to prioritize geothermal development in the country will also be a crucial step toward scaling up the deployment of other renewable energy sources — for example, exploiting Kenya's wind power potential, which is among the highest in the world.

4.6.7 Although the SREP financing share is a relatively low proportion of the total investment required for the geothermal development, SREP will cover the exploration drilling phase, the riskiest and most critical stage as it aims to prove the availability of steam resources. SREP will therefore support a project at a stage involving considerable risks, but considerable potential benefit as well, which is in line with the program's spirit. Moreover, the SREP financing is crucial for mobilizing MDBs' co-financing to the project. It is

therefore paramount that this phase is handled carefully to attract subsequent investments that would enable realization of the green energy resource.

4.7 Knowledge Building

4.7.1 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 and SREP 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 AfDB) loan to the Republic of Kenya; and
- SREP (through the AfDB) 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 grant 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 Fund of the firm commitment of the co-financiers or evidence satisfactory to the Fund 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 Fund;
 - iii) Evidence of the opening of a special account for the project; and
 - iv) Evidence satisfactory to the Fund 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 Livelihoods Sup. Pr	ADF	17-Dec-03	3-Jun-04	22-Sep-04	18,41	89,8	30-Dec-12	7,9
		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-Oluoch Smallholder Irrigation Deve	ADF	31-May-06	14-Jul-06	21-Sep-06	22,98	55,2	30-Sep-13	5,4
		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
		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
		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
		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
		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 (ARGE0)	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

