



**AFRICAN DEVELOPMENT
BANK GROUP**

PROJECT: MENENGAI GEOTHERMAL DEVELOPMENT PROJECT
COUNTRY: KENYA

PROJECT APPRAISAL REPORT – TECHNICAL ANNEXES

November, 2011

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

DEVELOPMENT AGENDA

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

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

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

ENERGY SECTOR BRIEF

A1.4 Kenya's National Energy Policy¹ defines the policy framework for providing cost-effective, affordable and adequate quality energy services on a sustainable basis over the period 2004-2023. The policy also points out the importance of regional power interconnections for supply security, particularly during periods of severe droughts, and for investment decisions on least cost generation capacity additions. The long term strategy for the expansion of the interconnected power system is summarized in regularly updated least cost power development plans (LCPDP) showing both demand forecasts and supply targets.

¹ Sessional Paper No. 4, Ministry of Energy 2004

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

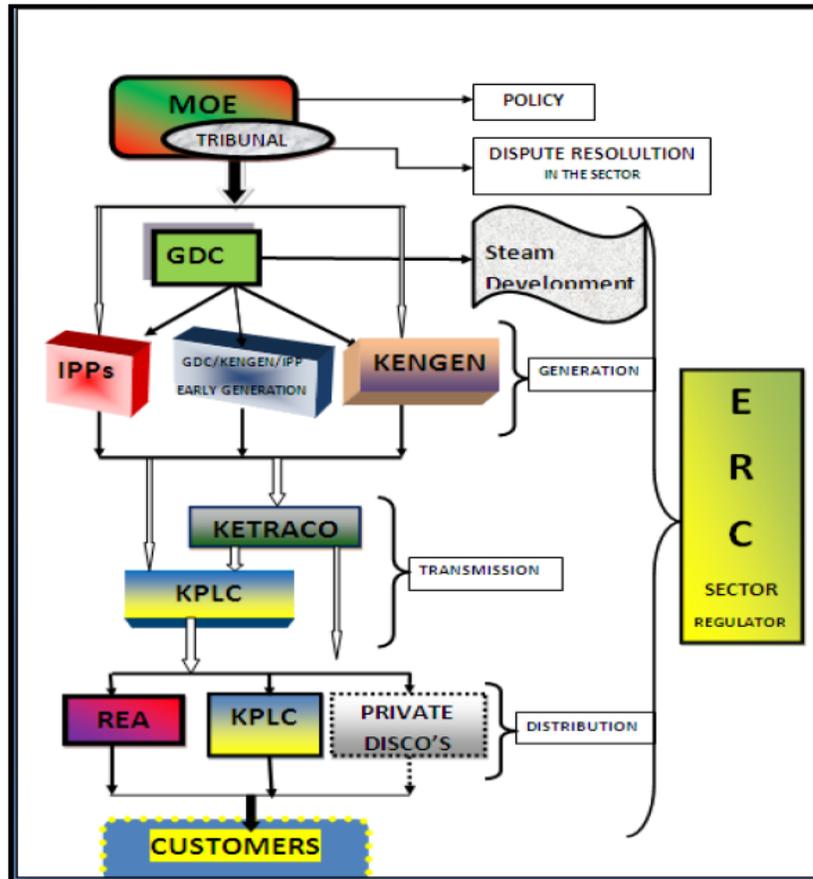
| Year | Hydro | Nuclear | MSD | Import | Cogen | GT-KERO | GT-NG | Geothermal | Coal | Wind | Total | Peak Load | Reserve Margin | % LOLP |
|--------------|-----------|------------|-----------|-----------|-----------|-----------|------------|------------|------------|-----------|--------|-----------|----------------|--------|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

A1.5. As indicated in the 2011-31 LCPDP (see table A1.1), electricity demand in Kenya is expected to grow by between 9% and 14% annually, reflecting about 200 000 new customers every year. Most of these will be urban residential and rural customers with an estimated consumption of 120 kWh per month per new customer. To meet the new demand, plans are in place to increase electricity supply. The interconnected system of Kenya currently has an installed capacity of 1,363 MW, and system peak demand of 1,227 MW which leaves a very low margin to guarantee reliability. The forecast demand is 1,302 MW in 2011 rising to 16,905 MW in 2031. The optimal development program under the LCPDP indicates that geothermal capacity should be increased from the current 198MW to 5,530 MW in the planning period, equivalent to 26% of the system peak demand by 2031. The study indicates that imports will be required to supply substantial capacity ranging between 200 MW in 2014 and 2,000 MW in 2031, capped at a maximum of 15% of forecast annual peak demand. The system expansion plan over the 20 year plan period indicates that 26% of the total installed capacity will be obtained from geothermal, 19% from nuclear plants and 13% from coal plants while imports will provide up to 9% of capacity. Hydro plants, Medium Speed Diesel (MSD) plants, Gas Turbines (GTs) and wind plants will provide 5%, 9%, 11% and 9% of the total capacity, respectively. The present value of the system expansion cost over the 20 year planning period amounts to USD 41.4 billion (committed projects excluded).

SECTOR INSTITUTIONAL FRAMEWORK

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

Figure A1.1 : Power Sector Institutional Structure



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

A1.8 Transmission is the responsibility of KPLC, currently the only licensed electricity provider. KPLC is a listed company in the Nairobi Stock Exchange., KPLC purchases power from KenGen and from IPPs under power purchase agreements, and is entitled to import around 20 MW of non-firm power from Uganda under an agreement with Uganda Electricity

Transmission Company Ltd. (UETCL). KPLC also has some cross-border trade on a limited scale with TANESCO of Tanzania, and plans are under way to establish an interconnection with Ethiopia. To work around liquidity constraints facing KPLC, GOK recently created a Government-owned company, the Kenya Electricity Transmission Company (KETRACO), to serve as custodian of all new transmission lines. KETRACO will maintain power purchase contracts with KenGen and the IPPs, and a management contract will be established with KPLC, who will perform transmission operations and maintenance on KETRACO's behalf. Under this system, transmission remains predominantly a Government function.

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

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

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

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

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

TARIFFS

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

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

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

Table A1.2: Structure of Retail Tariffs in Kenya

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

DONOR SUPPORT

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

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

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

B. Back up of Key Arguments of the Report

B.1 Lessons learnt

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

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

B3. Implementation Arrangements

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

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

B3.3 This project will be implemented by GDC through a dedicated Project Implementation Team (PIT). The PIT will be assisted by a consultant with experience in undertaking similar projects. The PIT will report to the GDC Board Committee which will oversee project implementation and provide the necessary oversight including the review of the annual work plans and budgets. The consultant will be responsible for the management and supervision of the project implementation and will provide periodic reporting to the financiers.

B3.4 The PIT will be headed by a project manager and comprised of one drilling / mechanical engineer, one accountant, one procurement expert, one socio-economist, one environmentalist and one M&E specialist who will be assigned to the project subject to Bank approval. The establishment of the Project Implementation Team at with qualifications and experience acceptable to the Bank is one of the conditions for first disbursement of the ADF loan. Implementation of the ESMP will be the responsibility of the main contractor under the supervision of the consulting engineer. The contractor shall employ an officer responsible for implementation of social/environmental

B3.5 GDC will also constitute the operational link between the Bank and the Government of Kenya on matters related to the implementation of the project. The PIT will be assisted by a consultant with experience in undertaking similar projects. The PIT will report to the GDC Board

Committee which will oversee project implementation and provide the necessary oversight including the review of the annual work plans and budgets. The consultant will be responsible for the management and supervision of the project implementation and will provide periodic reporting to the financiers.

B4. Financial Management and Disbursement Arrangements

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

COUNTRY ISSUES

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

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

B4.4 An area of concern is the continuous observations from the Controller and Auditor General in his Annual reports regarding the quality of financial records, bank reconciliations and fund accounts which to a large extent, relate to older problems and previous years some of which may have already been attended to.

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

the long delay with which Parliament attends to the audit report and the Government responses both in time and relevance, thereby undermining the value of the process.

B4.6 In conclusion, there is evidence that the PFM institutional framework in Kenya is under transition, and that a number of important improvements are being implemented as reflected in the improved rating of several of the sub-dimensions to the performance indicators. The changes have the potential to improve system performance much further. Overall performance has definitely improved between 2006 and 2008 but with still several areas to be improved on. These have been identified and the necessary corrective measures are either being implemented or in the process of being implemented with the objective of adopting international good practices. The Country Financial Management Systems shall to a great extent be used in compliance with the 2005 Paris Declaration and the 2008 Accra Agenda for Action. The project shall however not apply the systems in situations where accountability may be compromised.

On governance, it should also be noted that the Government of Kenya has in the recent past given anti-corruption some prominence. 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 before.

RISK ASSESSMENT AND MITIGATION

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

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

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

Table B.4.1 : Key Risks

| Risk | Risk Rating | Risk Mitigation measures incorporated into project design | Risk after Mitigation |
|--|--------------------|---|------------------------------|
| Inherent Risk | | | |
| Country-The 2008 PEFA report identified weaknesses in government PFM systems. Challenges in budget processes, roll-out of IFMIS | S | Necessary corrective measures are being undertaken with the objective of adopting good international practices. This will further strengthen the PFM reforms. Capacity building is ongoing at KENAO to increase its scope to cover more public funds in their audits. A performance | M |

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

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

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

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

STRENGTHS AND WEAKNESSES OF THE MANAGEMENT UNIT

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

- The accounting personnel within the company are adequately qualified and experienced.
- The accounting system is computerized under SAP system.
- The project being under GDC will use the GDC's Finance Manual as its accounting policies and procedures.

- Budgeting arrangements are adequate;
- External auditing arrangements have been discussed and are adequate;
- Funds flow arrangements are adequate.

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

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

BUDGETING ARRANGEMENTS

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

ACCOUNTING ARRANGEMENTS

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

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

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

INTERNAL CONTROLS & INTERNAL AUDITING

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

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

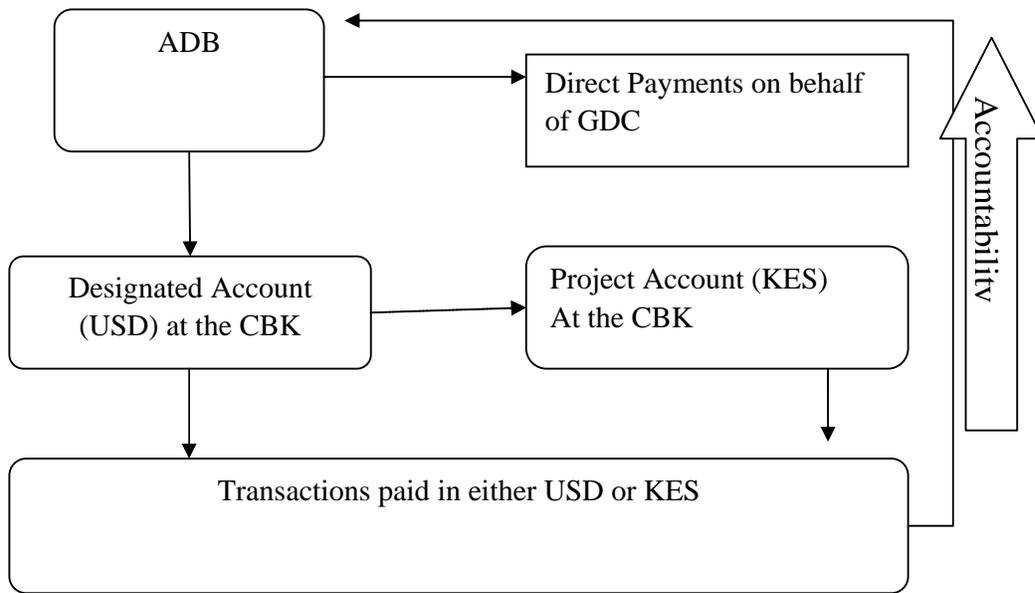
BANKING & FUNDS FLOW ARRANGEMENTS

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

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

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

THE PROJECT’S FUNDS FLOW CHART



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

FINANCIAL REPORTING ARRANGEMENTS

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

B4.21 These Financial Statements will comprise of:

1. A Statement of Sources and Uses of Funds/Cash Receipts and Payments which recognizes all cash receipts, cash payments and cash balances controlled by the entity; and separately identify payments by third parties on behalf of the entity.

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

FINANCIAL MANAGEMENT ACTION PLAN

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

Table B.4.2 : Actions to Strengthen Financial Management

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

EFFECTIVENESS CONDITIONS AND FINANCIAL COVENANTS

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

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

SUPERVISION PLAN

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

CONCLUSION OF THE ASSESSMENT

B4.26 A description of the company's financial management arrangements above have been found to be adequate to provide, with reasonable assurance, accurate and timely

accounts/information on the status of the Project as required by the Bank. Some follow up is required as detailed in the Financial Management Action Plan above.

B5. Procurement Arrangements

NATIONAL PROCEDURES AND REGULATIONS

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

PROCUREMENT ARRANGEMENTS

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

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

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

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

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

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

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

GOODS

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

Table B.5.2 : Procurement Packages for Goods

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

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

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

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

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

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

CONSULTING SERVICES

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

Table B.5.3 : Procurement Packages for Consulting Services

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

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

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

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

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

ASSESSMENT OF THE EXECUTING AGENCY

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

GENERAL PROCUREMENT NOTICE

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

PROCUREMENT PLAN

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

PRIOR REVIEW

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

FREQUENCY OF PROCUREMENT POST REVIEW MISSION

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

B6. Audit Arrangements

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

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

B7. Economic and Financial Analysis

GDC PAST PERFORMANCE

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

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

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

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

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

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

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

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

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

GDC CASHFLOW PROJECTIONS

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

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

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

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

PROJECT PERFORMANCE

Financial Analysis

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

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

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

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

Table B.7.1 : Cash Flow Profile and Project Returns

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

Economic Analysis

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

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

Table B.7.2 : Summary of Economic Conversion Factors

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

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

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

Table B.7.3 : Economic Resource Flow and Economic Returns

| ECONOMIC RESOURCE FLOW STATEMENT (ANNUAL) (REAL, USD million) | | | | | | | | | | | | | | | | | | | | | | | |
|---|--------------------|--------------|--------------|------------|---------------|---------------|---------------|---------------|---------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Fin. Year | PV@EOCK | Economic | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
| REVENUE | | | | | | | | | | | | | | | | | | | | | | | |
| Steam Project | | | | | | | | | | | | | | | | | | | | | | | |
| Steam revenue | USD million | 0.0 | No CF | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Carbon revenue | USD million | 0.0 | 0.0000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| IPP Project | | | | | | | | | | | | | | | | | | | | | | | |
| Energy sales | USD million | 1,379.0 | No CF | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 175.5 | 352.0 | 352.0 | 352.0 | 353.0 | 352.0 | 352.0 | 353.0 | 352.0 | 352.0 | 352.0 | 353.0 | 352.0 | 352.0 |
| Carbon revenue | USD million | 0.0 | 0.0000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| COSTS | | | | | | | | | | | | | | | | | | | | | | | |
| Steam Project | | | | | | | | | | | | | | | | | | | | | | | |
| Staff | USD million | -0.4 | 0.600 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 |
| Transport | USD million | -0.9 | 0.931 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.1 | -0.2 | -0.2 | -0.2 | -0.2 | -0.2 | -0.2 | -0.2 | -0.2 | -0.2 | -0.2 | -0.2 | -0.2 | -0.2 | -0.2 |
| Administration | USD million | -0.3 | 0.700 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 |
| Repairs & Maintenance | USD million | -1.8 | 1.087 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.2 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 |
| Electricity | USD million | -0.6 | 1.150 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.1 | -0.2 | -0.2 | -0.2 | -0.2 | -0.2 | -0.2 | -0.2 | -0.2 | -0.2 | -0.2 | -0.2 | -0.2 | -0.2 | -0.2 |
| Land (lease, rates) | USD million | -2.8 | 1.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.3 | -0.7 | -0.7 | -0.7 | -0.7 | -0.7 | -0.7 | -0.7 | -0.7 | -0.7 | -0.7 | -0.7 | -0.7 | -0.7 | -0.7 |
| Insurance | USD million | -3.3 | 0.931 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.4 | -0.8 | -0.8 | -0.8 | -0.8 | -0.8 | -0.8 | -0.8 | -0.8 | -0.8 | -0.8 | -0.8 | -0.8 | -0.9 | -0.9 |
| Make-up wells drilling cost | USD million | -15.2 | 1.087 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -5.0 | -5.0 | -5.0 | -5.1 | -5.1 | -5.1 | -5.1 | -5.2 | -5.2 | -5.2 | -5.2 | -5.3 |
| Make-up wells connection cost | USD million | -8.7 | 1.087 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -2.9 | -2.9 | -2.9 | -2.9 | -2.9 | -2.9 | -2.9 | -3.0 | -3.0 | -3.0 | -3.0 | -3.0 |
| Make-up wells testing cost | USD million | -0.8 | 1.087 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.2 | -0.3 | -0.3 | -0.3 | -0.3 | -0.3 | -0.3 | -0.3 | -0.3 | -0.3 | -0.3 | -0.3 |
| Net Change in WC | USD million | -7.2 | 1.087 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -13.2 | -0.3 | -0.3 | -0.3 | -0.4 | -0.3 | -0.3 | -0.3 | -0.4 | -0.3 | -0.3 | -0.3 | -0.4 | -0.3 | -0.3 |
| Tax paid | USD million | 0.0 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| IPP Project | | | | | | | | | | | | | | | | | | | | | | | |
| Steam cost | USD million | 0.0 | No CF | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Variable Costs | USD million | -38.3 | 1.087 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -4.9 | -9.8 | -9.8 | -9.8 | -9.8 | -9.8 | -9.8 | -9.8 | -9.8 | -9.8 | -9.8 | -9.8 | -9.8 | -9.8 | -9.8 |
| Fixed Costs | USD million | -33.0 | 0.703 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -4.2 | -8.4 | -8.4 | -8.4 | -8.4 | -8.4 | -8.4 | -8.4 | -8.4 | -8.4 | -8.4 | -8.4 | -8.4 | -8.4 | -8.4 |
| Insurance | USD million | -10.7 | 0.931 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -1.7 | -3.3 | -3.2 | -3.1 | -3.0 | -2.9 | -2.8 | -2.8 | -2.7 | -2.6 | -2.5 | -2.4 | -2.4 | -2.3 | -2.2 |
| Misc. | USD million | -4.5 | 1.087 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.6 | -1.1 | -1.1 | -1.1 | -1.1 | -1.1 | -1.1 | -1.1 | -1.1 | -1.1 | -1.1 | -1.1 | -1.1 | -1.1 | -1.1 |
| Net Change in WC | USD million | -12.9 | 1.087 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -23.8 | -0.5 | -0.6 | -0.6 | -0.7 | -0.5 | -0.6 | -0.6 | -0.7 | -0.5 | -0.6 | -0.6 | -0.7 | -0.5 | -0.6 |
| Tax paid | USD million | 0.0 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Operational CF | | | | | | | | | | | | | | | | | | | | | | | |
| Steam project capex | USD million | -470.9 | 1.087 | 0.0 | -107.6 | -129.7 | -296.3 | -128.2 | -119.5 | 86.9 | -25.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| IPP project capex | USD million | -356.2 | 1.087 | 0.0 | 0.0 | 0.0 | 0.0 | -185.6 | -342.4 | -171.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| CF before financing | USD million | 410.5 | 0.000 | 0.0 | -107.6 | -129.7 | -296.3 | -313.8 | -462.0 | 41.6 | 300.3 | 326.1 | 318.0 | 318.8 | 318.2 | 318.1 | 318.1 | 318.9 | 318.4 | 318.2 | 318.2 | 319.0 | 318.5 |
| Steam Project | | | | | | | | | | | | | | | | | | | | | | | |
| Equity | USD million | 0.0 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Debt | USD million | 0.0 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| IPP Project | | | | | | | | | | | | | | | | | | | | | | | |
| Equity | USD million | 116.0 | 1.087 | 0.0 | 0.0 | 0.0 | 49.5 | 89.3 | 94.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Debt | USD million | 0.0 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| CF available for debt service | USD million | 526.4 | 0.000 | 0.0 | -107.6 | -129.7 | -296.3 | -264.2 | -372.7 | 135.8 | 300.3 | 326.1 | 318.0 | 318.8 | 318.2 | 318.1 | 318.1 | 318.9 | 318.4 | 318.2 | 318.2 | 319.0 | 318.5 |
| Steam Project | | | | | | | | | | | | | | | | | | | | | | | |
| Interest and fees | USD million | 0.0 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Principal repayments | USD million | 0.0 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| IPP Project | | | | | | | | | | | | | | | | | | | | | | | |
| Interest and fees | USD million | 0.0 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Principal repayments | USD million | 0.0 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| CF available for DSRA | USD million | 526.4 | 0.000 | 0.0 | -107.6 | -129.7 | -296.3 | -264.2 | -372.7 | 135.8 | 300.3 | 326.1 | 318.0 | 318.8 | 318.2 | 318.1 | 318.1 | 318.9 | 318.4 | 318.2 | 318.2 | 319.0 | 318.5 |
| Change DSRA | USD million | 0.0 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| CF available for MMRA | USD million | 526.4 | 0.000 | 0.0 | -107.6 | -129.7 | -296.3 | -264.2 | -372.7 | 135.8 | 300.3 | 326.1 | 318.0 | 318.8 | 318.2 | 318.1 | 318.1 | 318.9 | 318.4 | 318.2 | 318.2 | 319.0 | 318.5 |
| Change MMRA | USD million | 0.0 | 1.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| CF available for distribution | USD million | 526.4 | 0.000 | 0.0 | -107.6 | -129.7 | -296.3 | -264.2 | -372.7 | 135.8 | 300.3 | 326.1 | 318.0 | 318.8 | 318.2 | 318.1 | 318.1 | 318.9 | 318.4 | 318.2 | 318.2 | 319.0 | 318.5 |
| IPP Dividend | USD million | -201.8 | 1.087 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -28.6 | -32.9 | -34.1 | -34.3 | -34.6 | -34.5 | -41.3 | -26.0 | -58.7 | -90.4 | -90.5 | -90.7 | -90.7 | -90.7 |
| IPP Withholding tax | USD million | 0.0 | 0.000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Net Resource Flow | USD million | 324.6 | 0.000 | 0.0 | -107.6 | -129.7 | -296.3 | -264.2 | -372.7 | 135.8 | 271.6 | 293.1 | 283.9 | 284.5 | 283.7 | 283.6 | 276.9 | 292.8 | 259.6 | 227.8 | 227.7 | 228.3 | 227.7 |

Sensitivity Analysis

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

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

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

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

Table B.7.4 : Summary of Sensitivity Tests

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

B8. Environmental and Social Analysis

B8.1 Environmental Review and Key Findings

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

B.8.1.2 The negative environmental impacts associated with the project include clearing and leveling of sites using heavy machinery which may interfere with ecological niches for the few resident species in the area leading to habitat loss. Disturbance of the plant community may induce changes in species composition due to increased chance of alien vegetation species. Clearance of vegetation will expose the soil to wind and water erosion. Drilling fluids may result in the contamination of water and soil. Drilling and well testing also result in the generation of H₂S and other non-condensable gases (NCG) and this will be in addition to exhaust gases (CO₂, CO, NO_x, SO_x, Particulate Matter) and dust from machineries during mobilization and by traffic movement during drilling. The negative environmental impacts will be mitigated through measures embedded in the Environmental Management and Monitoring Plan (EMMP) for environmental and social impacts.

B.8.1.3 The positive environmental impacts of the project emanate from the fact that it is a clean energy project with no significant and direct impact on climate change. It will assist Kenya in expanding the use of renewable energy and will displace expensive and environmentally hostile thermal generation. It will provide reliable power supply as opposed to the existing hydropower which has been negatively affected by droughts in the recent past. The project will contribute an additional 140 MWe to the national grid, thus leading to reduction in the use of fossil fuels. Mindful of the potential impacts of climate change on the project, the infrastructure is designed to withstand likely natural disasters and accidents. As a result of the project, the nursery has been providing trees for free for replanting in the neighbouring communities; these include species planted for firewood hence protecting the caldera while at the same time balancing green-house gas emissions.

B8.2 Policy, Regulatory, and Institutional Framework

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

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

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

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

B8.3 Monitoring of Environmental Impacts

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

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

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

B8.4 Stakeholder Consultation and Public Disclosure Process

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

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

B8.5 Gender Analysis

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

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

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

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

B.8.6.1 The project's negative social impacts include temporary change in population due to influx of people in search of employment. During drilling and well testing, there could be increased dust, noise and air pollution levels for surrounding communities. There will be some increase in vehicular movement to the project area through the access roads and this could result in elevated dust level as the road are not tarred and some increased noise levels. Drilling operations always present an element of danger. Occupational health and safety of the workforce will have to be monitored by the respective Contractors' supervisors and Foremen. The negative social impacts will be mitigated through measures embedded in the EMMP.

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

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

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

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

B8.7 Monitoring of Social Impacts

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

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

B9. Project Preparation and Supervision

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

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

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

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

C. Additional Technical Annexes

C.1 Technical Due Diligence

CONFIRMATION OF THE GEOTHERMAL RESOURCE

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

ASSESSMENT OF THE EXPLORATORY DRILLING

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

C.1.3 Using a combination of exploration data sets (primarily resistivity and passive seismic survey data), GDC has estimated the reservoir area at 110 km². Using a reasonable average productivity value per square kilometer of 15 MW/km², and assuming that all ground is productive, GDC has estimated that about 1,650 MW can be produced at Menengai. This is considered to be an optimistic estimate, as it is unlikely that the entire area will be capable of supporting commercially productive wells, as has already been demonstrated by well MW2.

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

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

ASSESSMENT OF GDC'S DEVELOPMENT STRATEGY

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

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

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

PROJECT RISKS

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

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

PRELIMINARY CONCLUSIONS AND NEXT STEPS

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

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

C.2 CO2 Emissions Calculation

The method uses Olkaria II unit 3 emission reduction based on the fact that Olkaria II steam has 0.3% w/w of non- condensable gases (NCG). CO₂ is 88.45% in NCG at Olkaria. The steam consumption rate for Olkaria II unit 3 is 2.087kg/s/MWe. Therefore CO₂ in emitted is $2.087 \times .3\% \times 88.45\% \times 60 \times 60 = 19.9362762$ kg/MWhr. Assuming that the power station will operate at 90% load factor, total CO₂ emitted in 1 yr for the 400MW power plant(s) will be $(8760 \times 90\% \times 19.9362762 \times 400)/1000 = 62,871.04062$ tCO₂/yr. Then determine the CO₂ emitted by the Kenyan grid for the equivalent 400MW. Energy generated by 400MW geothermal plant in one year is $8760 \times 90\% \times 400 = 3,153,600$ MWhr. The base emission is $3,153,600 \times .6396$ (Kenya grid factor) = 2,017,042.56 tCO₂e/yr. Therefore the emission reduction due to generating 400MW of geothermal at 90% load capacity = $2,017,042.56 - 62,871.04062 = 1,954,171.52$ tCO₂e/yr.