Language: English
Original: English

AFRICAN DEVELOPMENT BANK GROUP

PROJECT: MENENGAI GEOTHERMAL DEVELOPMENT PROJECT

COUNTRY: KENYA

PROJECT APPRAISAL REPORT – SREP SUPPLEMENTARY DOCUMENT

November, 2011

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

Peer Reviewers	N. KULEMEKA, Chief Socio-Economist	ONEC.3	2336
	M. CISSE, Chief Investment Officer	OPSM.3	1906
	R. CLAUDET, Chief Investment Officer	OPSM.3	2666
	G. MAKAJUMA , Infrastructure Specialist	KEFO	6073
	Martin Njoroge Mwangi, External Peer Reviewer	n/a	n/a

1. Introduction

Kenyan Energy Sector Overview

1. Following the structural adjustments program in the 1990s, the Government of Kenya officially liberalized power generation as part of the power sector reforms in 1996. Among the first reforms to take place was the unbundling of the state utility in 1997. Kenya Generating Company Limited (KenGen) which remained entirely state owned became responsible for the generation assets while Kenya Power and Lighting Company (KPLC) assumed responsibility for all distribution and transmission. The Electricity Regulatory Board was also established under the 1997 electric power Act as the sub sector regulator.

2. Reforms in the power sector have continued to take place especially with energy policy development of 2004 and the subsequent enactment of the energy Act of 2006 which established the Energy Regulatory Commission and the Rural Electrification Authority. The sessional paper No 4 of 2004 on energy also provides for the creating of the Geothermal Development Company (GDC) and Kenya Electricity Transmission Company (KETRACO). Geothermal Development Company is a fully owned Government Special Purpose Vehicle (SPV) intended to undertake surface exploration of geothermal fields, undertake exploratory, appraisal and production drilling develop and manage proven steam fields and enter into steam sales agreements with investors in the power. Those reforms laid the ground for the introduction of Independent Power Producers (IPPs) in Kenya

3. The installed capacity, effective capacity and annual production in Kenya in 2009/10 by source of energy is shown in Table 1 below.

Table 1 - Installed Capacity, Effective Capacity and Annual Production in Kenya

Sources	**Installed Capacity**	***Share***	**Effective Capacity**	***Share***	**Annual Production**	***Share***
	MW	***%***	**MW**	***%***	**GWh**	***%***
Hydro	**761**	***50%***	**745**	***49%***	**2170.00**	***32.52%***
Thermal	**525**	***34%***	**525**	***35%***	**3.029.00**	***45.4%***
Geothermal	**198**	***13%***	**198**	***13%***	**1339.00**	***20.07%***
Cogeneration	**26**	***2%***	**26**	***2%***	**99**	***1.48%***
Wind	**5.45**	***0%***	**5.45**	***0%***	**16.3**	***0.24%***
Isolated Grid	**18**	***1%***	**15.6**	***1%***	**19**	***0.28%***
Total	**1533**	***100%***	**1515**	***100%***	**6,672**	***100%***

Source: KPLC Annual accounts and Statistics 2010

4. The interconnected system has a total installed capacity of 1,533 MW made up of 761.0 MW of hydropower (50%), 525 MW of thermal (34%), 198 MW of geothermal (13%) and other sources. The share of annual production from hydropower is however much lower (32%) due

to the relatively low plant factor and it is expected to decrease even further with the impacts of climate change. On the other hand, the share of annual production from geothermal is rising quickly and accounts to 20% of total annual production in 2009/10 (from 16% in 2008/09). Geothermal is the source of energy with the most potential but, although operating costs are low, capital costs are relatively high, which has deterred significant private-sector involvement to date.

5. Despite the strong presence of IPPs in Kenya, the country remains prone to electricity shortages as demonstrated by the frequent periodic power cuts in the country. This situation is partly due to the dependence of KenGen on rain-fed hydropower which is prone to climate change impacts. More severe power cuts have been avoided thanks to increased reliance on emergency, diesel-based, power generation. But this strong reliance on emergency power has pushed up operating costs sharply (the cost of fuel for the month of august 2009 alone, when the peak demand was the highest, amounted to more than USD 41 million), increasing domestic and industry electricity tariffs to US Cents 18 per kWh and US Cents 16 per kWh respectively in 2010. This compares with roughly US Cents 7 per kWh and US Cents 8 per kWh in South Africa and Tanzania respectively.

SREP Background

6. As one of the six pilot countries selected to benefit from the Scaling Up Renewable Energy Program (SREP), Kenya will receive loan and grant financing from SREP as the country works toward harnessing its abundant renewable energy resources to set the country on a development path that produces low levels of greenhouse gas (GHG) emissions.

7. The Kenyan Investment Plan (IP) for SREP was presented to the SREP Subcommittee on September 8, 2011, via video conference. The following projects were identified in the Kenyan IP:
   a) Hybrid mini-grid systems: the project aims at scaling-up the ongoing program for expansion of pilot hybrid mini-grids in rural areas to increase electricity access among households and institutions in isolated areas as well as to reduce local pollution and GHG emissions.
   b) Solar water heating: the project aims at developing market incentives to scale up SWH systems for commercial, industrial and residential buildings and to increase uptake of SWH and reduce peak demand.
   c) Development of the Menengai geothermal field for 200 MW power generation: the project aims at accelerating the shift to geothermal based power as the main source of base load generation capacity in Kenya.

8. The SREP Subcommittee endorsed the Kenyan IP as a basis for further development of the projects identified in the IP and asked the Government of Kenya (GoK) and the MDBs to prepare a supplementary document addressing the SREP Subcommittee members' comments and questions. The IP supplementary document was submitted to the Subcommittee on October 12, 2011, along with the Project Appraisal Report (PAR) for the third project

identified in the IP, namely the development of the Menengai geothermal field for 200 MW power generation.

9. The Menengai Geothermal Development Project Appraisal Report (PAR) was discussed on November 1, 2011, at the SREP Subcommittee meeting held at the World Bank in Washington, D.C. The SREP Subcommittee approved the PAR, subject to MDBs' submission of a supplementary document addressing the comments and questions raised by the SREP Subcommittee members.

10. This document is the GoK and the AfDB's response to SREP Subcommittee members' comments and questions about the Menengai Geothermal Development PAR.

2. Brief Description of the Project

11. The Menengai Geothermal Development Project involves the development by the Geothermal Development Company (GDC) of the Menengai geothermal field to produce steam able to generate 400 MW of power. The power will be generated by private investors as Independent Power Producers (IPPs).

12. The project aims to meet Kenya's rapidly increasing demand for power while diversifying the country's energy mix by developing its huge geothermal potential. The total cost of the project is estimated at USD 746 million, and it is expected to be completed by the end of December 2016.

13. The Bank along with the other potential financiers initially considered scaling down the project to 200 MW so as to reduce the funding needs. However, as the Bank and the World Bank worked on finalizing the SREP Investment Plan (IP) for Kenya, a number of other financiers have expressed their interest in co-financing the Menengai project. Moreover, the potential financiers gained increased confidence on the availability of the geothermal resources based on the findings of the independent geothermal consultant contracted by the Bank. Therefore, the AfDB, in accordance with the other potential financiers and the GoK, has appraised the project on the basis of a 400 MW instead of 200 MW as initially envisaged in the IP.

3. Project Development Impacts (Section 2.6 of the revised PAR)

14. By providing additional installed generation capacity and injecting it into the national grid, the project will ultimately result in affordable and reliable electricity supply to more households, businesses and industries. The 400 MW installed capacity will result in 3,154 GWh of additional energy assuming a plant factor of 90% (typical for geothermal power plants). This additional energy will enable electricity supply to up to 523,150 households, 333,737 small businesses, as well as 1,279 GWh of energy to businesses and industries, assuming the same distribution of consumption per categories of consumers as the one indicated in the 2011 Least Cost Power Development Plan LCPDP). Out of the 523,150

households being connected as a result of the project, 73,341 households (14%) will be located in rural areas.

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

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

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

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

4. SREP Transformational Impact (Section 4.6 of the revised PAR)

19. SREP is expected to spur a transformational change that will lead Kenya towards a low GHG emissions development pathway by harnessing the country's abundant renewable resources. Kenya has a huge geothermal potential, estimated at not less than 7,000 MW of generation capacity. Currently, the country's installed generation capacity is dominated by hydropower, which constitutes 48% of installed capacity and accounted for 33% of total sales in 2009–10.

Lately, however, as Kenya deals with the effects of climate change, severe droughts have revealed hydropower generation to be unreliable. The situation is similar in the neighboring countries of Kenya such as Tanzania, Uganda, Rwanda and Uganda.

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

21. Geothermal power has numerous advantages over other sources of power: it is not affected by drought and climatic variability; it has the highest availability factor at about 95 percent; it is green energy with no adverse effects on the environment; it is indigenous and readily available in Kenya unlike fossil thermal energy that relies on fuel imports. This makes geothermal the most suitable source for base load electricity generation in the country. Despite these advantages, the development of geothermal has been slow as highlighted below:

    a. 45 MW Olkaria I Power Plant: Drilling started in 1955 and the last unit of the plant was commissioned in 1985. This was about 30 years after the initial drilling.
    b. 105 MW Olkaria II Power Plant: Drilling using a rig owned by KenGen, started in 1986 and the plant was commissioned in 2003 (Unit 1 & 2) and 2010 (Unit 3). This was about 17 and 24 years after the initial drilling respectively.
    c. 280 MW Olkaria IV and I (Unit 4&5): Exploration drilling by KenGen using own rig was done in 1998 to 1999. Appraisal and production drilling mainly through hired rigs started in 2006 and the plant is scheduled for commissioning by December 2013. This will be 15 years after the initial drilling.
    d. 100 MW Olkaria III: Concessioned in 1998. By 2009 (11 years later), the IPP had developed only 48 MW and the additional 52 MW plant is scheduled for commissioning by 2013 which will be 13 years after the concession.
    e. Other concessions for the undeveloped prospects in Suswa (2007) and Longonot (2009) have not registered any progress.

22. The main challenges have been the high resource risk associated with the initial project preparation activities (resource assessments, feasibility studies) and infrastructure development, purchase of drilling rigs and materials, surface exploration and appraisal drilling. The challenges have been addressed through the creation of GDC to lead the development of the geothermal resources.

23. The Levelised Cost of Energy (LCoE) for the different types of candidate power plants in the country is shown in the Table below (Source: LCPDP). The LCoE for hydropower generation is estimated at USD cents 6.8 per KWh.

TYPE OF FUEL	CANDIDATE POWER PLANT	LOAD FACTOR	LCoE - USc/Kwh 12% Disc. Rate
Clean Energy	Geothermal	93%	9,2
	Low Grand Falls	60%	14.1
	Wind	40%	12.2
Non Clean Energy	Nuclear	85%	14.5
	Gaz Turbine – Natural Gas	55%	12.0
	Coal	55%	14.9

24. The Menengai project is the first field being developed by GDC after Olkaria. The development of this field will contribute to meeting the country's ambitious target of substantially increasing its geothermal based power generation capacity between now and 2031, becoming a world-class geothermal developer and a strong regional player in the sector. Providing "first-mover" investment for this project is hence critical. By doing so, SREP will help accelerate the implementation of the GoK's power generation expansion plan and will facilitate private sector participation at the same time. In fact, a technically and financially credible GDC will be attractive to private developers seeking to be the partner in building the power plant.

25. If successful, GDC's business model could be replicated in Kenya's neighboring countries interested in developing their geothermal potential. SREP funding to provide capacity building to GDC is hence critical.

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

27. Although the SREP financing share is a relatively low proportion of the total investment required for the geothermal development, SREP will cover the exploration drilling phase, which is the riskiest and most critical as it aims to prove the availability of steam resources. SREP will therefore support a project at a stage involving significant risks, but considerable potential benefit as well, which is in line with the program's spirit. Moreover, the SREP financing is crucial for mobilizing MDBs' co-financing to the project. It is therefore paramount that this phase is handled carefully to attract subsequent investments that would enable realization of the green energy resource.

5. RESPONSES TO COMMENTS / QUESTIONS

Ref. No.	Comments	Response
Written comments submitted by Switzerland on 04 November 2011		
1.	*We found the project document inconsistent with the endorsed SREP IP in as far as it foresees the development of 400 MW of steam destinated to geothermal power generation (vs. 200 MW in the IP). We understand from the comments made by the AfDB during the meeting that SREP support generated unexpectedly strong interest for the project from other sources of financing, which enabled the scaling up of the project. We of course welcome this development, which is a strong sign of the SREP leverage power.* *However, we would like to have the project document amended to reflect the change from 200 MW to 400 MW, notably in relation with phase II of the project (construction of the power plant and related transmission equipment) as well as in the results framework.*	*The Bank along with the other potential financiers initially considered scaling down the project to 200 MW so as to reduce the funding needs. However, as the Bank and the World Bank contributed to finalizing the SREP Investment Plan (IP) for Kenya, a number of other financiers have expressed their interest in co-financing the Menengai project. Moreover, the potential financiers gained increased confidence on the availability of the geothermal resources based on the findings of the independent geothermal consultant contracted by the Bank. Therefore, the AfDB, in accordance with the other potential financiers and the GoK, has appraised the project on the basis of a 400 MW instead of 200 MW as initially envisaged in the IP. This is reflected in section 1.2.4.* *Phase II in the IP relates to the development of the power plant (electricity generation and supply to the grid) and related transmission line as opposed to the exploration (drilling) phase. Phase II under the IP is a separate project to be developed by private investors, with the support of MDBs and SREP (depending on the amount allocated to Kenya under the SREP reserve). The power plant and related transmission line will therefore be designed for 400 MW, not 200 MW, once the private investors have been selected.*
2.	*It was emphasized by Kenya and the MDBs that the project would have a significant impact also on access to electricity for the poor and thus poverty reduction and social inclusion, which are important objectives of the SREP. We would welcome an explicit listing and justification of these trickle-down effects and the mechanisms and activities foreseen to forester them.*	*The development impacts of the project, with a particular focus on its impact on access to electricity and reduction of poverty, has been reflected in the document, mainly in section 2.6.* *Furthermore, it should be noted that the Government of Kenya (GoK) has a rural electrification strategic plan for the period 2008-2011 being implemented by the Rural Electrification Authority (REA). The objective of the*

		master plan is to improve the access to electricity in the underdeveloped rural areas and encourage productive use of electricity. In addition, KPLC is undertaking a scaling up of customer connections under World Bank financed projects with a target of 200,000 new connections per year. It should also be noted that reducing the retail price of electricity and increasing generation capacity are key to ensure the success of the ongoing rural electrification programs. The Menengai project will result in increased generation capacity from Kenya's least cost source of generation and will therefore result in reduced retail price of electricity. This has been reflected in section 4.4.9.
3.	*Finally, we join other countries in their concerns regarding the fiduciary risks particularly related to the size of the project. We would therefore appreciate a clear outline of all mechanisms, included the explicit mentioning of the application of MDB rules and procedures, foreseen to mitigate all sorts of fiduciary risks. The risk mitigation mechanism should be detailed and the respective responsibilities outlined.*	*The GoK has recently requested technical assistance from Public Private Infrastructure Advisory Facility (PPIAF) to assist GDC in undertaking financial management and procurement assessment in order to enhance GDC's access to finance and PPIAF has accepted the GoK's request. The terms of reference for this assessment have already been prepared and the procurement of a consultant to undertake the assessment is underway.* *The AfDB, as part of its appraisal, has thoroughly looked at the fiduciary issues such as possible inability to use funds efficiently and economically for intended purposes, break-down of the system, weak vetting controls over payments to contractors, etc. The Bank rules and procedures will be followed for procurement1 and financial management2, and the borrower will seek the Bank's non-objection for each step of the process. The project document already included detailed information regarding fiduciary risks in Annex B.4. The fiduciary risks analysis has been strengthened in section 4.1 and 4.2.*

[1] *http://www.afdb.org/en/projects-and-operations/procurement/resources-for-borrowers/*

[2] *http://www.afdb.org/en/projects-and-operations/financial-management/*

Written comments submitted by Netherlands on 07 November 2011		
4.	*The SREP investment plan for Kenya places the challenge of geothermal energy against the background of slow development and long delays in the past decades. From our partners at FMO we have learned that the more private-sector driven development of the Olkaria geothermal field has been very satisfactory. In this case, the private sector took care of field development as well as power generation as Independent Power Producer. The project was also successful in terms of financing by attracting private sector finance to geothermal development in Kenya.* *Against this setting, we would expect the Menengai field geothermal project to strike a balance between public sector supported field exploration and appraisal, and private sector based field development and power generation.* *We would like to note that in the Netherlands the exploration and appraisal of geothermal wells is implemented by the private sector, supported by the public sector with through a risk guarantee arrangement.* *In the current proposal, GDC would be responsible not only for exploration and appraisal, but also development and operational management of the field. GDC would sell the steam to Kengen and possibly Independent Power Producers. This would be a maximum role for GDC as state owned organisation. We think that in the context of SREP's transformational objectives, it is important to pay more attention to how private sector capacity can best be mobilised and catalyzed for these tasks.*	*The lessons learnt from developing the geothermal resource in Kenya has been reflected in section 2.8 B. It was concluded that the main lesson learnt from this past experience is that private sector's appetite for relatively risky drilling activities is limited, especially on greenfields, as it is the case for Menengai.* *It should also be noted that Menengai being a single reservoir to be share by all the prospective IPPs, it is advisable that the reservoir is managed by one single entity to avoid operation and management failures. GDC is the entity established by the Government of Kenya to play that role.*
5.	*We understand that work is on-going to better understand the technically optimal development approach for the Menengai field. Because this is highly relevant for the SREP supported project, we regret that the results could not*	*The studies / reports reviewed by the project team, which included the feasibility for the geothermal resource, included: GDC's Ten Year Business Plan dated April 2010, A report by GDC's Geothermal Advisory Board dated*

	have been integrated in the project proposal. Our suggestion would be to take the potential for private sector roles and involvement into account when assessing the results of this feasibility study.	*17 February 2011, which included a review of the Menengai project (where drilling was just beginning), GDC's Menengai development plan ("30 year Menengai I-IV-AfDB-Submission.xlsb"), the Environmental Impact Assessment report for Menengai, GDC's Menengai Resource Report ("Menengai Geothermal Prospect – A Geothermal Resource Assessment Project Report Update," dated March 2010).* *Those studies were sufficient to provide comfort to the Bank and its technical advisor (GeothermEx) on the technically optimal development approach for the Menengai field.* *Another feasibility study for Phase II (steam to power) will be undertaken once enough wells (about 9) have been drilled. The purpose of this feasibility study is to provide data and information about the haracteristics of the fluids and to prove the reservoir capacity so as to confirm the results of the early exploration studies. This study will be the basis for the design of the steam gathering system and the power plants (to be developed by the private sector).*
6.	*The success of geothermal development in Kenya depends not only on the needed support by the public sector, but also on the capacity of the public sector organizations to deliver. In this project, the role of GDC is essential.* *Against the background of past slow development of geothermal energy in the country, and understanding that GDC has been set up as special purpose vehicle with key staffing coming from the previous geothermal team in Kengen, we believe that the institutional risks related to the role of GDC need to be monitored and managed better. We fear that reconsidering tasks and roles of GDC may be a better risk management approach than more training and hiring more staff (as the proposal now mentions).*	*The risk linked to the capacity of GDC has been investigated by the Banks experts and by the geothermal expert hired by the Bank. The findings of the geothermal expert are summarized below (reflected in section 4.5.2):* ▪ *The quality and organization of the work performed by GDC (as reflected in execution of civil works, organization of facilities, maintenance of equipment, and execution drilling operations; water supply to the rigs, etc…) appears to meet an adequate standard, based on observations and data reviewed to date. As more rigs are added, and operations become more complex (including the possible installation and operation of wellhead units (WHUs), and the construction of steam field piping systems) it will become more challenging to maintain this standard. But*

	This would be clarified from the proposed business model and related risk assessment. We understand technical assistance is currently given to GDC to detail its business model and regret that the results have not been included in detail in the project proposal.	*GDC is assisted by experts from rigs suppliers to assist during the drilling phases. Furthermore GDC is apparently undertaking a considerable amount of training of new personnel, by mixing new employees in on the drilling operations as work proceeds (such that the present drilling operations are reportedly somewhat over-staffed, due to the inclusion of the trainees). In addition GDC is well aware of the to the need to: (i) coordinate personnel and equipment, (ii) plan drilling operations quickly and efficiently, in order to avoid well failures caused by poor siting or design of wells as multiple rigs are put into operation. This would be a challenge for any operator, but it is not necessarily unattainable.* ▪ *The development program that has been outlined by GDC in the documentation provided is ambitious but not unattainable. It calls for significant 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.* ▪ *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. 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.*
7.	*In the same context of institutional risks, we would like to point to the management of corruption risks. In the October 2011 issue of The Nairobi Law*	*Same response as for question 3.*

	Monthly, geothermal energy is presented as "the next frontier for kickbacks for Kenya's corrupt elite". In view of this worrying report, and the capital intensiveness of the sector, we believe that sector specific measures are needed to contain the corruption risk. We fear that a business model for IPPs to buy steam from GDC and sell power to KPLC may constitute a double risk.	*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. This has been reflected on section 4.3 of the PAR.* *The establishment by the Bank of a Regional Resource Center in Nairobi will also help in a closer follow-up of the project, in particular with regards to fiduciary risks.*
Comments during the SREP Sub-Committee meeting on 01 November 2011		
USA		
8.	*Is the external peer reviewer the one referred to in the document as the technical consultant,* ***GeothermEx****.*	***GeothermEx*** *is a leading consulting firm in geothermal hired by the AfDB to assist the Bank in the technical due diligence of the project. On the other hand, the external peer reviewer is an independent peer reviewer selected by the Bank to undertake an independent review of the project appraisal report, as per the SREP guidelines. A summary of the consultant's terms of reference is presented in Annex 1.*
9.	*What is the justification for the wellhead generators and why did GDC choose to use wellhead generators instead of building a conventional power plant.*	*Only one wellhead generator is being financed by the project. This well head will supply electricity to the rigs (during the drilling phase) instead of using the thermal generators. The benefits are (i) cost and (ii) emission savings.*
10.	*What will be the business model for engaging the private sector? How will GDC interact with the private producer (IPPs), KPLC, etc.*	*This is described in Annex A.1. In particular, Figure A1.1 shows the Power Sector Institutional Structure and shows how GDC will interact with the IPPs and how the IPPs will interact with KPLC as the off-taker.*

11.	*Elaborate more on the regional integration aspect of the project.*	*With the addition of power generation capacity to the national grid, this project will help Kenya eventually export power in its neighboring countries. The ongoing NELSAP will connect Kenya-Uganda, Uganda-Rwanda, Rwanda-Burundi and Rwanda-DRC. The Kenya-Ethiopia interconnection is currently being appraised by potential financiers and the studies for the Kenya-Tanzania are currently being finalized.*
Australia		
12.	*Even though the social safeguards and particularly the gender dimension have been properly reflected in the document, it lacks proper demonstration of the project's development impacts.*	*A section (2.6) has been added to the PAR on the project's development impacts.*
13.	*What is the status of the implementation of the transmission line to the project site?*	*The power plant will be connected to the grid through a planned and funded transmission line going from Olkaria (located in the vicinity of the Menengai site) to Lessos designed at 220 KV double circuit. The line would have a transit capacity of 500 MW. The line is being financed by JICA and is currently at design stage (feasibility and ESIA studies completed and way leaves acquisition on-going) and should be commissioned in 2014.* *The project will require a 20 km transmission line from Menengai to Rongai to intersect the Olkaria-Lessos line. Detailed study for that line will be undertaken jointly by Kenya Electricity Transmission Company Ltd (KETRACO) and GDC and will be included in the scope of the feasibility study being financed under the project (component E). The implementation of the transmission line could be included in the scope of the power generation component to be developed by the private sector.*
Japan		
14.	*How does USD 40 million from SREP make this project viable?*	*While GDC, as a State Owned Enterprise, as well as its development partners are satisfied with a FIRR of 8.3%, this return would not be acceptable for a private investor in the drilling stage of geothermal development. Drilling,*

		being an exploration type of activity would have to be essentially funded by equity if undertaken by a private investor. As such, it is typically seen that private investors would expect returns ranging between 25 and 35 percent return on equity for sub-Saharan African exploration risk. *Hence the need for as much as concessional and grant financing as possible to undertake this project and attract private sector participation in the second phase of the project, namely the steam-to-power generation investment.*
Norway		
15.	*SREP will help accelerate the implementation of this project and will facilitate private sector participation.*	Reflected in the PAR in section 4.6.
16.	*The geothermal investment carries with it both considerable risk and considerable potential benefit for Kenya and possibly the region, which is exactly the kind of projects SREP is designed to support.*	Reflected in the PAR in section 4.6.
17.	*Not only could this specific project provide up to 400MW of power to Kenya (with a potential to connect 500,000 households), but it could also contribute as an important demonstration project that would encourage even private sector investments in a stable, secure and scalable energy source for the entire region.*	Reflected in the PAR in section 4.6.
18.	*Providing "first-mover" capital for this investment appears to be a highly productive use of SREP funds.*	Reflected in the PAR in section 4.6.
Switzerland		
19.	*Why is it necessary to allocate 80% of the SREP resources (USD 40 million) to the geothermal project alone? How will SREP make a difference, given the fact that the project is already financially and economically viable?*	During the preparation of the Investment Plan the GoK investigated the grant /concessional resources available for the various energy technologies.. The most significant gap is in geothermal where the greatest potential for scaling up renewable energy exists. The provision of additional grant and highly concessional resources to the project will help GDC generate revenues early enough and be self-sufficient quickly so that the Government of Kenya does not need to allocate public funding to GDC.

		Furthermore, the leveraging effect of SREP is the program's greatest impact in the case of this project. Without SREP, GDC and the Government of Kenya would not be able to mobilize the required financing to implement the project. This would delay the implementation of the future geothermal projects and prevent Kenya from meeting its demand as forecasted in the power sector LCPDP. Despite the fact that the financial and economic analysis of the project has demonstrated the viability of the project, it is based on the assumption that SREP will remove the initial development risk so that feasibility study can be undertaken. Therefore, SREP funding at this stage of the project is critical for its viability and for firming up the financial commitment of the other potential financiers.
20.	*There are inconsistencies in the PAR on the figures.*	*This is due to the fact that some amounts are in UA (the denomination of the AfDB loan) and some amounts are in USD. The document has been harmonized and the figures are all in USD.*
21.	*The fiduciary risk is a source of concern and should be properly mitigated.* *1. In particular, in Table B.4.1, the risk related to the 'Inability to use funds efficiently and economically for intended purposes' is rated as strong and the residual risk after mitigation remains strong. It is not enough to 'Provide checks and balances' and this risk should be properly mitigated to reduce the risk to moderate or lower.* *2. It is mentioned in the document that: 'The Bank is in compliance with the 2005 Paris Declaration and the 2008 Accra Agenda for Action in so far as the use of Country Financial Management Systems is concerned as they shall be used to a great extent in the implementation.' The Bank's financial management procedures should also be used instead of relying on the*	*1. The risk was rated to be substantial mainly as a result of teething problems associated with new entities, GDC being one. As activities progress particularly with this project, the risk is expected to reduce to moderate or even low.* *2. Yes, the Bank is in compliance with the 2005 Paris Declaration and the 2008 Accra Agenda for Action on use of country systems but in situations where accountability may be compromised due to weak country systems the Bank's financial management systems will be used.* *Please also see response to comment 7.*

	country's financial management systems.	
22.	*There is a reputational risk for SREP which should be properly mitigated.*	*It should be noted that GDC has already drilled four exploration wells as of October 2011, and the results have shown the existence of steam resources in the Menengai field, an important step towards overcoming the initial resource risk barrier. This has been added in paragraph 4.5.2 of the PAR.* *In addition, the SREP Programming Guidelines state that "the aim of SREP is to pilot and demonstrate, as a response to the challenges of climate change, the economic, social and environmental viability of low carbon development pathways in the energy sector by creating new economic opportunities and increasing energy access through the use of renewable energy" and "Encourage private sector investment to significantly increase renewable energy capacity in a country's energy supply". That is exactly what this project intends to do.*
23.	*Clarify the rational for financing the development of the steam field (Phase I) without financing the development of the power plant (Phase II).*	*The development of the steam field will remove the barriers to participation of the private sector in the second phase (power plant development). In geothermal, the main barrier to private sector participation is to prove the steam resource. A section of the report is devoted to the participation of the private sector (section 4.4.4).*
Environmental and Social Assessment Comments		
24.	*Link where the summary can be viewed and reference to the Board document.*	*http://www.afdb.org/fileadmin/uploads/afdb/Documents/Environmental-and-Social-Assessments/Kenya-Menengai%20Geothermal%20Power%20Project-ESIA%20Summary.pdf*
25.	*Source and amount of drilling water needed.*	*A water supply system has been installed to serve the drilling operations. This consist of 5 water wells (with more wells planned in order to increase the water –supply Capacity if needed), a main pumping station with storage , a secondary station with storage tanks that allow for gravity-feeding of water*

		to the initial drilling sites, and a high pressure (8-inch) pipelines connecting to the pumping stations and the drilling sites.
26.	*Details of calculations of CO2 emissions.*	*Detailed in Annex C.2*

Annex 1 – ToRs of GeothermEx

PHASE 1 – INFORMATION REVIEW AND EVALUATION

To be undertaken in the home office after receiving data[3] from GDC and AfDB.

1) Detailed review of exploration work and conceptual resource model. Review the available data from the Menengai field for quality of work and completeness. Review the conceptual model of the resource developed by GDC or a third party for validity and consistency with available data and basic principles of geothermal resources in similar geologic and heat flow environments. Identify and characterize the most significant uncertainties regarding the characteristics of the geothermal resource. Develop an independent estimate of the heat resource.
2) Review the proposed development strategy being pursued by GDC, in particular at the Menengai field. Review the technical aspects of GDC's Business Plan. Provide a brief assessment of the overall approach and specific techniques that GDC is using for exploring and utilizing high-temperature resources like Menengai and others found in the rift valleys of Africa.
3) Detailed analysis of the status and progress of drilling. Review the status and results of the drilling program, through inspection of basic drilling records (daily drilling reports, well summary reports, cost data, etc.) to evaluate the progress and efficiency of drilling as compared to both the planned schedules and costs, and to similar projects elsewhere in the world.

[3] *Among the studies reviewed by the consultant: GDC's certificate of incorporation, GDC's Annual Report for the year ending 30-June 2010, GDC's Ten Year Business Plan dated April 2010, A report by GDC's Geothermal Advisory Board dated 17 February 2011, which included a review of the Menengai project (where drilling was just beginning), GDC's Menengai development plan ("30 year Menengai I-IV-AfDB-Submission.xlsb"), GDC's funding request to AfDB for the development of 400 MW of geothermal fluid supply at Menengai (undated), A short document describing GDC's capacity building to date and its personnel requirements going forward, The Environmental Impact Assessment report for Menengai, A certificate of Transfer of Environmental Impact Assessment License (from KenGen to GDC) from the National Environment Management Authority (NEMA) dated 22 February 2010, GDC's Menengai Resource Report ("Menengai Geothermal Prospect – A Geothermal Resource Assessment Project Report Update," dated March 2010).*

4) Progress Report. Prepare a memo-style report summarizing the results of the first 4 tasks and laying out the objectives for the site visit.

PHASE II: SITE VISIT AND ANALYSIS

Completion of the work described above was to set the stage for the second phase of work.

1) Site visit. A senior GeothermEx specialist in geothermal resource development and financial analysis (Roger Henneberger) visited the field during the week of 29 August 2011. Time was spent with GDC personnel in Nairobi and at Menengai. Significant additional data were obtained from GDC during the site visit.
2) Analyze resource development cost estimates for the project, particularly for drilling rigs.
3) Evaluate drilling equipment delivery schedule and resource development timetable.
4) Summarize the resource development risks of the Menengai project.

Annex 2 – Cost of Fuel for August 2009

Thermal Power Plant	Fuel Price	Fuel Consumption in Aug '09	Cost of Fuel Aug '09	Cost of Fuel Aug '09
	KShs/kg	Kg	KShs	USD
1. Kipevu I Diesel Plant	38,15	8 466 038	322 979 350	4 210 943
2. Kipevu II Diesel Plant (Tsavo)	37,64	10 115 566	380 749 912	4 964 145
3. Kipevu Gas Turbine I & II	58,20	11 721 193	682 173 433	8 894 047
4. Iberafrica Diesel Plant (1.8%S HFO):	39,20	6 883 228	269 822 519	3 517 895
5. Iberafrica Additional Plant	39,11	3 911 414	152 975 405	1 994 464
6. Embakasi I&II (EPP)	54,32	17 531 150	952 292 052	12 415 802
7. Agrekko 3 (EPP)	51,07	120 260	6 141 654	80 074
8. Eldoret (EPP)	56,64	5 637 863	319 328 539	4 163 345
9. Garissa Diesel Plant (Off-grid)	66,37	278 559	18 487 928	241 042
10a. Lamu Diesel Plant (Existing - Off-grid):	74,08	168 142	12 455 944	162 398
10b. Lamu Diesel Plant (New - Off-grid):	74,08	153 855	11 397 596	148 600
11. Lodwar (Off-grid)	87,02	80 428	6 998 846	91 250
12. Mandera (Off-grid)	95,38	94 354	8 999 467	117 333
13. Marsabit (Off-grid)	64,10	60 100	3 852 384	50 227
14. Wajir (Off-grid)	70,37	110 074	7 745 917	100 990
15. Moyale (Off-grid)	91,51	42 366	3 876 869	50 546
16. Mpeketoni (Off-grid)	80,91	20 027	1 620 393	21 126
17. Hola (Off-grid)	101,99	22 135	2 257 502	29 433
18. Merti (Off-grid)	76,80	3 379	259 469	3 383
19. Habaswein (Off-grid)	87,19	9 903	863 461	11 258
20. Elwak (Off-grid)	120,48	6 788	817 822	10 663
Total & Average	**73,231**	**65 436 819**	**3 166 096 461**	**41 278 963**