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Financing of Geothermal Power Projects in Kenya: A Developing Country Model

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ABSTRACT

World over, financing of geothermal power projects takes the nature of project finance (as opposed to alternative conventional financing), a long-term financing based on the projected cash flows of the project rather than the balance sheets of the project sponsors. The financing structure involves equity investors, a syndicate of debt-holders providing non-recourse loans to the operations and secured by the project assets, including the revenue-producing contracts and paid entirely from project cash flows, rather than from the general assets or creditworthiness of the project sponsors; a decision supported by financial modeling. Generally, a special purpose entity which has no assets other than the project is created for each project. Project financing has been commonly used in geothermal projects applying project financing principles under public-private partnerships (PPP) and Private Finance Initiative (PFI) transactions. Kenya is the leading geothermal power producer in Africa and ranks ninth in the world. Financing of Geothermal projects in Kenya takes similar approach in cognizance to the worldwide geothermal project financing practices. Projects technical, environmental, economic and country/political risks identification and allocation is critical for Kenya. The government's strategic development interests, in tandem with the socio-economic and political development agenda, coupled with the obvious universal upfront risks associated with geothermal development makes the financing mix and/or models depart considerably from pure project financing approach. Geothermal Development Company Limited (GDC) business model and design describes the rationale of how Kenya captures, creates, and delivers socio-economic and technological value from geothermal energy, development approach as part of the business strategic process to the projects, and business relationships with investors. GDC's major capital budgeting and investments decisions are guided and geared towards making the projects attractive

for funding purposes. These long-term choices comprise of which projects receive investment (investment decision), whether and to what extent to finance that investment (project) with equity or debt (financing decision). Project's evaluation is done for financial decisions by the standard financial tools and techniques to include Weighted Average Cost of Capital (WACC), Net Present Value (NPV), Internal Rate of Return (IRR) and Payback Period. Projects proactive packaging/structuring at all stages is critical for financing purposes.

1. Introduction

World over, financing of geothermal power projects takes the nature of project finance (as opposed to alternative conventional financing), a long-term financing based on the projected cash flows of the project rather than the balance sheets of the project sponsors. The financing structure involves equity investors, a syndicate of debt-holders providing non-recourse loans to the operations and secured by the project assets, including the revenue-producing contracts and paid entirely from project cash flows, rather than from the general assets or creditworthiness of the project sponsors; a decision supported by financial modeling. Generally, a special purpose entity which has no assets other than the project is created for each project.

Project financing has been commonly used in geothermal projects applying project financing principles under public-private partnerships (PPP) and Private Finance Initiative (PFI) transactions. The financing is typically secured by all of the project assets, including the revenue-producing contracts. Generally, a special purpose entity is created for each project, thereby shielding other assets owned by a project sponsor from the detrimental effects of a project failure. As a special purpose entity, the project company has no assets other than the project.

Kenya is the leading geothermal power producer in Africa and ranks ninth in the world with a current capacity of 209MW. Financing of geothermal projects in Kenya takes similar approach in cognizance to the worldwide geothermal project financing practices. Through a special purpose company, Geothermal Development Company Limited (GDC), the Kenyan financing

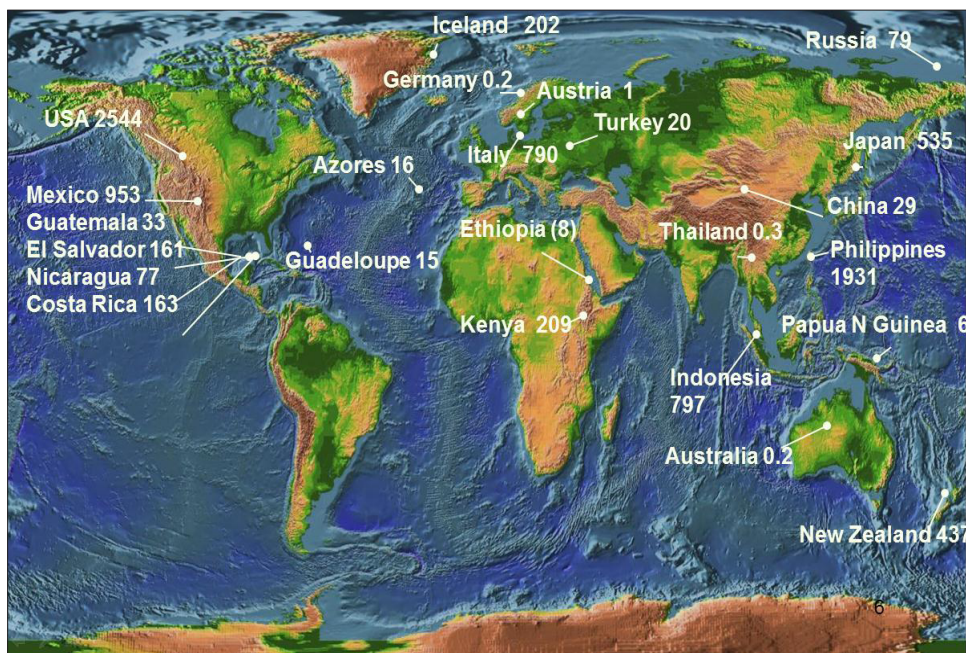


Figure 1. Worldwide Geothermal Power Development (Source GDC 2011).

Ranking	Nation	Average capacity - 2007 (MW)	Average capacity - 2009 (MW)
1	United States	2,687	3,086
2	Philippines	1,970	1,904
3	Mexico	992	1,197
4	Indonesia	953	958
5	Italy	811	843
6	New Zealand	472	628
7	Iceland	421	575
8	Japan	535	536
9	Kenya	132	209
10	El Salvador	204	204
11	Costa Rica	163	166
12	Nicaragua	87	88
13	Russia	79	82
14	Turkey	38	82
15	Papua New Guinea	56	56
16	Guatemala	53	52
17	Portugal	23	29
18	China	28	24
19	France	15	16
20	Ethiopia	7.3	7.3
21	Germany	8.4	6.6
22	Austria	1.1	1.4
23	Australia	0.2	1.1
24	Thailand	0.3	0.3
	Total (MW)	9,723.3	10,751.7

Figure 2. Worldwide Geothermal Power Ranking (Source GDC 2011).

focus is on initial development stages of; exploration appraisal to production drilling, to competitively avail steam to both public and private investors to put up power plants.

Through the government’s Vision 2030 initiatives, Kenya’s Gross Domestic Product (GDP), is expected to grow by at least 10% from 2012. Consequently the electricity

demand is envisioned to grow at the same rate to reach 10,000MWe by 2030.

Out of this demand, 50%, that is 5,000MW is expected to come from geothermal energy. Therefore the accelerated financing of geothermal power projects, to exploit the indigenous high potential source of electricity in the country through GDC. The structuring and financing model for GDC projects is a blueprint for any developing nation which must realize her socio-economic potential.

Figure 1 and Figure 2 summarize the worldwide geothermal power development and national ranking, while Figure 3 highlights the Kenyan geothermal potential.

2. GDC Business Model

GDC’s business model and design describes the rationale of how Kenya captures, creates, and delivers socio-economic and technological value from geothermal energy, development approach as part of the business strategic process to the projects, and business relationships with investors. Figure 4 summarizes GDC’s business development model.

3. Financing Plan

The government’s strategic development interests, in tandem with the socio-economic and political development agenda, coupled with the obvious universal upfront risks associated with geothermal development makes the financing mix and/or models depart considerably from pure project financing approach.

These long-term choices comprise of which projects receive investment (investment decision), whether and to what extent to finance that investment (project) with equity or debt (financing decision).

When making this investment or capital allocation decision, the value of each opportunity or project, which is a function of the size, associated risks, timing and predictability of future cash flows, is carefully considered. Table 1 shows the projected financing mix/requirements in the next 10

years GDC business Plan, while Table 2, overleaf, summarizes the financing sources/alternatives for GDC.

4. Financial & Economical Analysis

Projects evaluation is done for financial decisions by the standard financial tools and techniques to include Weighted

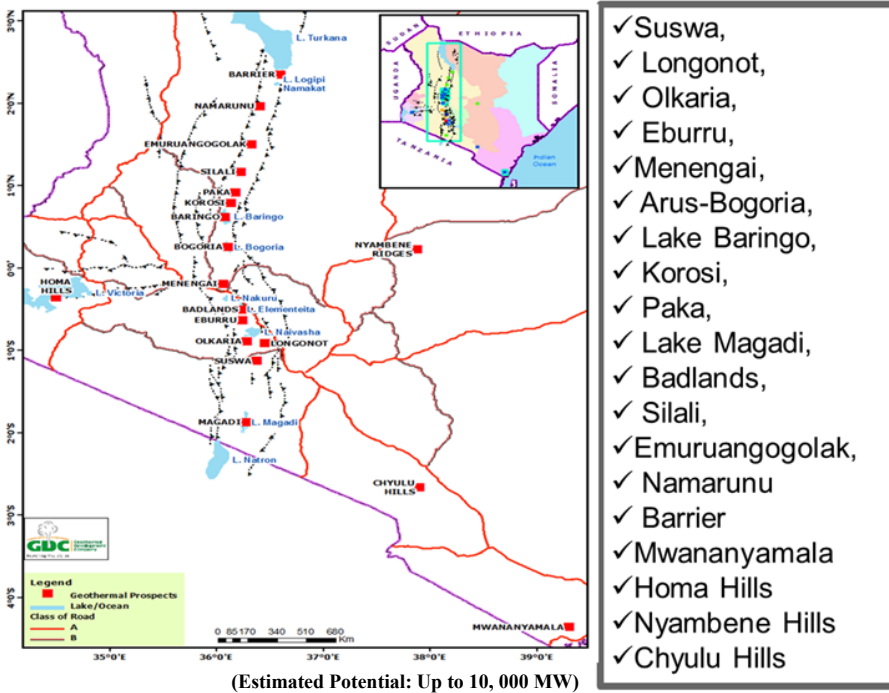


Figure 3. Geothermal Potential in Kenya (Source GDC 2011).

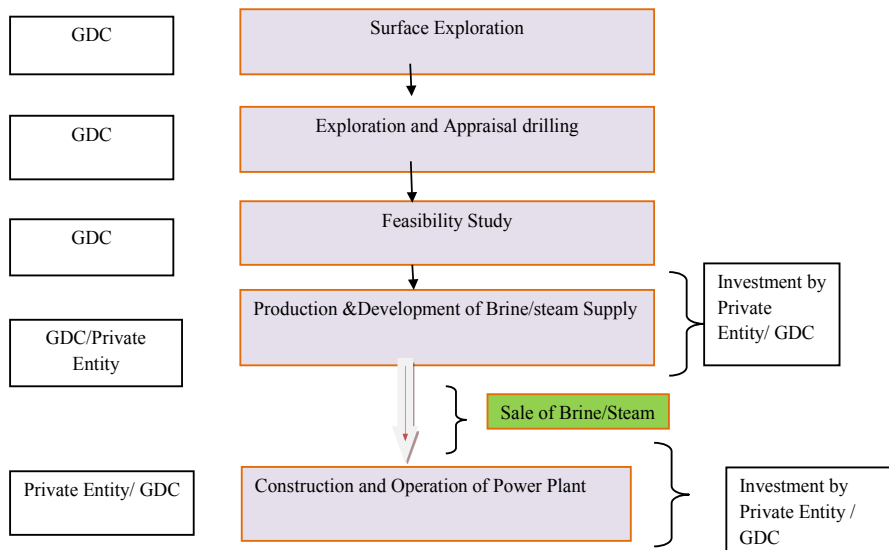


Figure 4. GDC Business Model (Source 2011).

Table 1. Ten Year Financing Plan (Budget Requirements) (Source GDC 2011).

Description	Financing (MUSD)			Total
	GoK	GDC (Net Revenue)	Develop. Partners	
Rigs & Equipment	130	177	205	512
Drilling Works	264.3	1,184	394	1,842
Scientific Services	25.3	58		83
Staff & Admin Costs	28.4	102		130
Total (MUSD)	448	1,520	599	2,567
% of Total	17%	59%	23%	100%

Key to Table 1: GoK - Government of Kenya
MUSD - Million US Dollars

Average Cost of Capital (WACC), Net Present Value (NPV), Internal Rate of Return (IRR) and Payback Period.

The following key and critical assumptions have been considered by GDC in its Business, Financial and Economic models Analysis.

- Each well output 5MW
- Excess steam requirements is 20%
- Average well success rate is 85%
- 1 reinjection well for every 5 production wells
- Well cost USD 3.5 million per well, including rig amortization
- Number of wells per rig per year is 5
- Cost per MW of construction of power plant is USD 1.43 million
- Next Project commissioning date is December 2015
- Cost of steam gathering system is USD 0.4 million per MW
- Rig amortization period is 15 years
- Well productive life is 15 years.

The WACC is taken as the required rate of Return (RoR) by the Government of Kenya (GoK). Projects with higher NPVs and IRR as well as shorter payback period are favored for financing. GDC projects have Cash flows, Revenues and Expenditures as captured in Figure 5, overleaf.

Financial Analysis entails looking at projects with Positive free cash flow, $IRR > WACC$, Early Break even and Short Payback periods whereas Economic Analysis at the opportunity costs of the financed Projects with $IRR > Alternative Project$ (investment) IRR. To guide management of GDC in capital budgeting decisions, Figure 6 is an analysis of the steam price at various cost of debt.

5. Risks Analysis

Projects technical, environmental, economic and country/political risks identification and allocation is a critical component for geothermal projects financing, even for developing countries and emerging markets as in the case of Kenya.

GDC considers and strives to identify external circumstances or events that have a high chance of occurrence and are detrimental for the project to be successful.

Identifying something as a risk/challenge by project team increases its visibility, and allows a proactive risk management plan (mitigation) to be put into place to enhance and guarantee significant projects success. A summary of possible risks of concern GDC projects is in Table 3, overleaf.

To guide Economical Investment decisions, a scenario sensitivity Analysis of the various costs of steam at varying well outputs

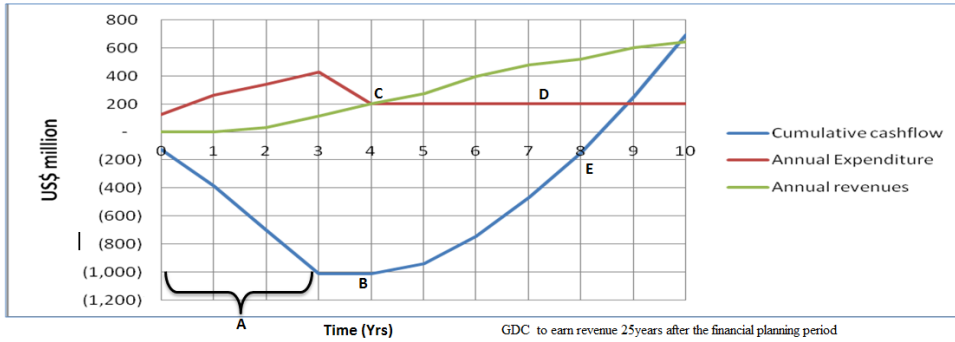


Figure 5. GDC Expenditure Versus Revenue Analysis over time (Source GDC 2011).

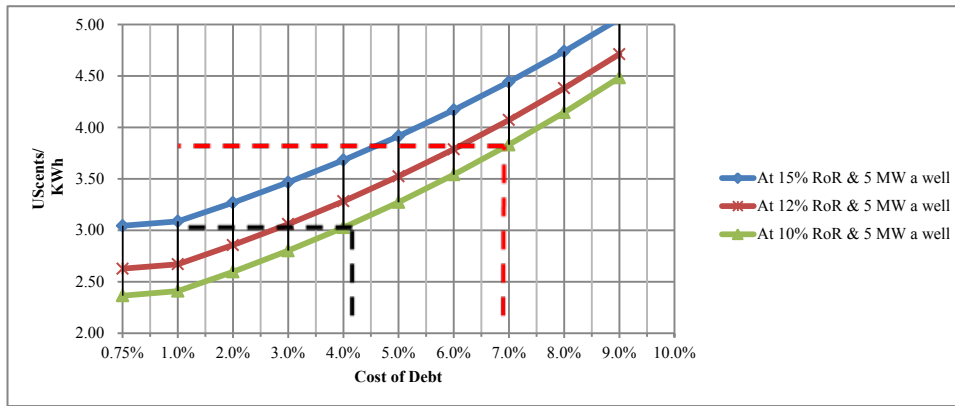


Figure 6. Change of steam price with cost of Debt (Sources Author 2011).

Table 2. Financing Sources/Options for GDC (Source Author 2011).

		Governments						Private Investment	Special Purpose		
		Grants AID - Technical Assistance			Concessional Loans				Green Funds	CDM	Insurance
		Advisory Services	Project Preparation/ Feasibility	Capacity Building (Training)	Technical Assistance	Credit (Very long- below market interest)	Loans (Long- market rate interest)				
Multilateral Development Banks	AfDB		◆	◆		◆	◆		◆		◆
	IDA	◆	◆	◆	◆	◆		◆	◆		
	IBRD						◆				
	EIB		◆	◆			◆		◆		
	IFC							◆			
	MIGA										◆
Bilateral Financing Institutions	France	AFD	◆	◆	◆	◆					
		Prorpac						◆			
	Germany	KfW								◆	
		DEG						◆			
	Japan	JICA	◆	◆	◆	◆	◆				
		JBIC					◆	◆	◆		◆
	China Exim Bank					◆					
	USA	Exim Bank						◆			
USTDA		◆	◆	◆							
USAID		◆	◆								
OPIC										◆	

Key to Table 2: AfDB- African Development Bank, IDA-International Development Association, IBRD- International Bank for Reconstruction and Development, EIB- European Investment Bank, IFC- International Finance Corporation, MIGA- Multilateral Investment Guarantee Agency, AFD- Agence Française de Développement, KfW- Kreditanstalt für Wiederaufbau, DEG- Deutsche Investitions- und Entwicklungsgesellschaft, JICA- Japan International Cooperation Agency, JBIC- Japan Bank for International Cooperation, Exim Bank- [Export-Import Bank](#), USTDA- The U.S. Trade and Development Agency, USAID- The United States Agency for International Development, OPIC- Overseas Private Investment Corporation. Alternative financing sources available to GDC are from:

- Governments’ - Taxes, royalties, fees & levies, Government Instruments (Treasury bills and Infrastructure bonds), other bilateral arrangements and Commercial loans and
- Private sectors -Retained earnings, Equity, Corporate bonds and Commercial loans.

Summary Key to Figure 5:
A-Build up period
B-Capital Outlay (US\$ 1 Billion)
C-Break-Even Point (4th Year)
D-Operating Profits
E-Payback Period (8th Year)

is given in the Figure 7. GDC wells have given an output of 5MW to 12.5 MW.

6. Packaging Geothermal Projects for Financing in Kenya

In view of the available financing opportunities/sources and the universal but unique upfront risks for geothermal projects, structuring/packaging of GDC projects at all stages takes a proactive unique approach which has enhanced great success of its geothermal energy projects. GDC projects don’t take a pure corporate finance approach though it borrows heavily the corporate finance tools and analysis to make financial decisions. GDC’s major capital budgeting and investments decisions are guided and geared towards making the projects attractive for funding purposes as opposed to just increase wealth of the shareholder, the GoK.

Table 3. Risks Register Summary for GDC Projects (Author 2011).

Risks Categories		Issues of Concern	
COUNTRY	Political Stability	<ul style="list-style-type: none"> Change of Govt. Consistence of policies War & Civil disturbances Expropriation Currency inconvertibility 	
	Legal & Regulation	<ul style="list-style-type: none"> Process to pursue claims Foreign Law recognition Arbitration Enforcement of awards Licensing & permitting 	
INSTITUTIONAL	Off-taker	<ul style="list-style-type: none"> Breach of Contract 	
	Transmission Company	<ul style="list-style-type: none"> Completion Operations & Maintenance 	
	Power Producer (s)	<ul style="list-style-type: none"> Completion Operations & Maintenance 	
	Manufacturer(s)/ Contractor(s)	<ul style="list-style-type: none"> Proven Technologies Guarantees & Warrantees Long-term supply & Service contracts 	
	Steam Supplier	<ul style="list-style-type: none"> Completion Guarantee of supply 	
	Market	<ul style="list-style-type: none"> Price Access 	
	Environmental	<ul style="list-style-type: none"> Environmental Impact Social Impact 	
	Technology	<ul style="list-style-type: none"> Proven Operations & Maintenance 	
	PROJECT	Policies	<ul style="list-style-type: none"> Repatriation of dividends, profits Taxations Foreign exchange restrictions
		Resource	<ul style="list-style-type: none"> Existence Size Well Character (Temp., Press. Flow, Chemistry) Performance with time (Cooling, decline) Reinjection
Financial/economic		<ul style="list-style-type: none"> Accelerated geothermal development entails large/High upfront financial input/investments Long debt repayment/Service periods 	

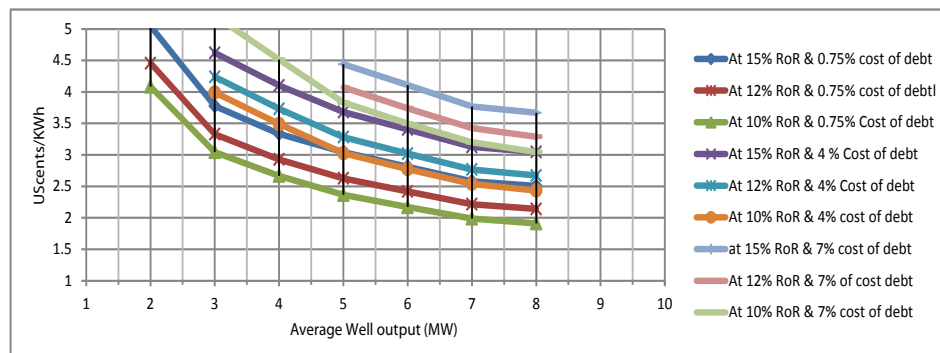


Figure 7. Cost of Steam at various well outputs (Source Author 2011).

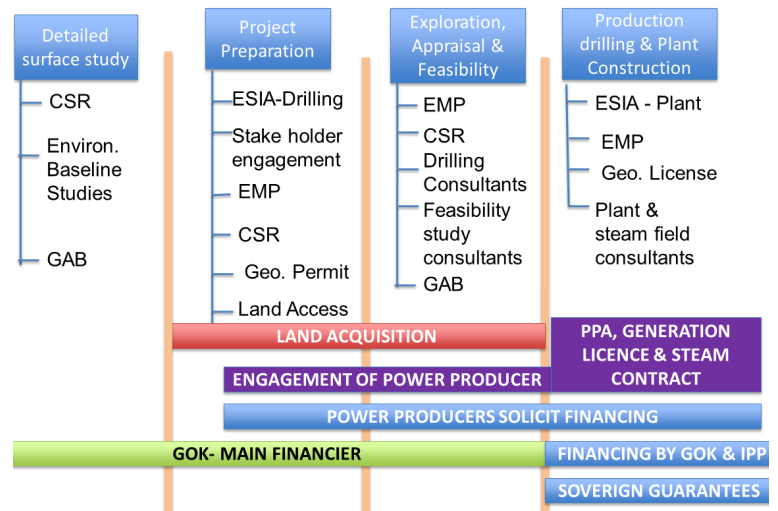


Figure 8. Summary of Project Packaging for Financing Purposes (Source Author 2011).

Key to Figure. 8:
 CSR - Corporate Social Responsibility;
 EMP - Environmental Management Program; G
 GAB - Geothermal Advisory Board,
 ESIA - Environmental and Social Impact Assessment;
 PPA - Power Purchase Agreement;
 IPP - Independent Power Producer(s),
 GoK - Government of Kenya.

GDC Projects planning for financing purposes at all the development stages to include and addresses the aspects of land rights, engagement of investors and/or power producers, GoK and other financiers, steam contracts and generation licensing. Figure 8 is a summary of GDC projects planning and financing packaging.

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