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Report No: PAD1282

INTERNATIONAL DEVELOPMENT ASSOCIATION

PROJECT PAPER

ON A

PROPOSED ADDITIONAL CREDIT

IN THE AMOUNT OF SDR 48 MILLION
(US$68 MILLION EQUIVALENT)

AND AN ADDITIONAL GRANT
FROM THE GLOBAL PARTNERSHIP ON OUTPUT-BASED AID

IN THE AMOUNT OF US$3 MILLION

TO THE

REPUBLIC OF KENYA

FOR THE

ELECTRICITY EXPANSION PROJECT

May 19, 2016

Energy and Extractives Global Practice
Africa Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective April 30, 2016)

Currency Unit	=	Kenyan Shilling
100 Ksh	=	US$1
US$0.71	=	SDR 1

FISCAL YEAR
January 1 – December 31

ABBREVIATIONS AND ACRONYMS

AF	Additional Financing
AFD	French Development Agency (*Agence Française de Développement)*
BOQ	Bill of Quantity
CAGR	Compounded Annual Growth Rate
DSCR	Debt Service Coverage Ratio
EBITDA	Earnings Before Interest Taxes Depreciations and Amortizations
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EIRR	Economic Internal Rate of Return
ERB	Electricity Regulatory Board
ERC	Energy Regulatory Commission
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
FIRR	Financial Internal Rate of Return
GDC	Geothermal Development Corporation
GHG	Greenhouse Gas Emissions
GoK	Government of Kenya
GNI	Gross National Income
GPOBA	Global Partnership for Output Based Aid
IBRD	International Bank for Reconstruction and Development
IDA	International Development Association
IVA	Independent Verification Agent
IPP	Independent Power Producer
KISIP	Kenya Informal Settlements Improvement Project
KEEP	Kenya Electricity Expansion Project
KEMP	Kenya Electricity Modernization Project
KenGen	Kenya Electricity Generating Company Limited
KETRACO	Kenya Electricity Transmission Company Limited
KPLC	Kenya Power and Lighting Company Limited
Ksh	Kenya Shillings
KV	Kilovolt
LV	Low Voltage

MoEP	Ministry of Energy and Petroleum
MW	Megawatt
NEMA	National Environmental Management Authority
NPV	Net Present Value
OP	Operational Policy
PDO	Project Development Objective
RAP	Resettlement Action Plan
REA	Rural Electrification Agency
SEA	Strategic Environmental Assessment
SSA	Sub-Saharan Africa
WB	World Bank
WTP	Willingness to Pay

Regional Vice President:	Makhtar Diop
Country Director:	Diarietou Gaye
Acting Senior Global Practice Director:	Anna Bjerde
Practice Manager/Manager:	Lucio Monari
Task Team Leaders:	Sudeshna Ghosh Banerjee and Laurencia Karimi Njagi

REPUBLIC OF KENYA

ADDITIONAL FINANCING: KENYA ELECTRICITY EXPANSION PROJECT

(P153179)

CONTENTS

ADDITIONAL FINANCING DATA SHEET

Kenya

Additional Financing: Kenya Electricity Expansion Project (P153179)

AFRICA

GEE01

Basic Information – Parent			
Parent Project ID:	P103037	Original EA Category:	A - Full Assessment
Current Closing Date:	31-Dec-2017		

Basic Information – Additional Financing (AF)			
Project ID:	P153179	Additional Financing Type (from AUS):	Cost overruns / Scale up
Regional Vice President:	Makhtar Diop	Proposed EA Category:	A - Full Assessment
Country Director:	Diarietou Gaye	Expected Effectiveness Date:	15-Jul-2016
Acting Senior Global Practice Director:	Anna Bjerde	Expected Closing Date:	31-Dec-2017
Practice Manager/Manager:	Lucio Monari	Report No:	PAD1282
Team Leader(s):	Sudeshna Ghosh Banerjee, Laurencia Karimi Njagi		

Borrower

Organization Name	Contact	Title	Telephone	Email
The National Treasury	Dr. Kamau Thugge	Principal Secretary	254-20-2252299	ps@treasury.go.ke

Project Financing Data - Parent (Electricity Expansion-P103037) (in US$ Million)

Key Dates

Project	Ln/Cr/TF	Status	Approval Date	Signing Date	Effectiveness Date	Original Closing Date	Revised Closing Date
P103037	IDA-47430	Effective	27-May-2010	05-Jul-2010	01-Oct-2010	30-Sep-2016	31-Dec-2017
P125388	TF-10097	Effective	20-Feb-2012	20-Feb-2012	21-May-2012	30-Jun-2014	30-Jun-2017

Disbursements

Project	Ln/Cr/TF	Status	Currency	Original	Revised	Cancelled	Disbursed	Undisb-ursed	% Disbursed
P103037	IDA-47430	Effective	USD	330.00	330.00	0.00	291.69	30.46	88.39
P125388	TF-10097	Effectiv	USD	5.15	5.15	0.00	4.95	0.20	96.20

		e							

Project Financing Data - Additional Financing: Kenya Electricity Expansion Project (P153179) (in US$ Million)					
[ ]	Loan	[X]	Grant	[ ]	IDA Grant
[X]	Credit	[ ]	Guarantee	[ ]	Other

Total Project Cost:	71.00	Total Bank Financing:	71.00
Financing Gap:	0.00		

Financing Source – Additional Financing (AF)	Amount
BORROWER/RECIPIENT	0.00
International Development Association (IDA)	68.00
Global Partnership on Output-Based Aid (GPOBA)	3.00
Total	71.00

Policy Waivers

Does the project depart from the CAS in content or in other significant respects?	No
Explanation	
Does the project require any policy waiver(s)?	No
Explanation	

Team Composition

Bank Staff

Name	Role	Title	Specialization	Unit
Sudeshna Ghosh Banerjee	Team Leader (ADM Responsible)	Senior Energy Specialist	Team Leader	GEE01
Laurencia Karimi Njagi	Team Leader	Senior Energy Specialist	Team Leader	GEE01
Dahir Elmi Warsame	Procurement Specialist (ADM Responsible)	Consultant	Procurement	GGODR
Josphine Kabura Kamau	Financial Management Specialist	Sr Financial Management Specialist	Financial Management	GGO31
Almudena Mateos Merino	Team Member	Energy Specialist	Technical	GEEES
Gibwa A. Kajubi	Safeguards Specialist	Senior Social Development Specialist	Social development	GSU07

Juliet Pumpuni	Team Member	Senior Infrastructure Specialist	Technical	GSUOA
Lara Born	Team Member	Jr Professional Officer	Technical	GEE01
Lien Thi Bich Nguyen	Team Member	Program Assistant	Administrative	GEE07
Lucy Kang'arua	Team Member	Program Assistant	Administrative	AFCE2
Mariano Salto	Team Member	Energy Economist	Economics	GEE01
Mitsunori Motohashi	Team Member	Senior Energy Specialist	Technical	GEE01
Noreen Beg	Environmental Specialist	Senior Environmental Specialist	Environment	GEN04
Panos Vlahakis	Team Member	Senior Operations Officer	Technical	CASEE
Thrainn Fridriksson	Team Member	Energy Specialist	Technical	GEEES
Ubaldo Daniel Coila Quispe	Team Member	Operations Analyst	Technical	GSUOA
Yasmin Tayyab	Safeguards Specialist	Senior Social Development Specialist	Social development	GSU07

Extended Team

Name	Title	Location

Locations

Country	First Administrative Division	Location	Planned	Actual	Comments
Kenya	Nakuru	Olkaria, Naivasha		X	
Kenya	Uasin Gishu	Uasin Gishu	X		
Kenya	Nairobi Area	Nairobi Province	X		
Kenya	Mombasa	Mombasa District	X		
Kenya	Mandera	Mandera District	X		
Kenya	Laikipia	Laikipia District	X		
Kenya	Kwale	Kwale District	X		
Kenya	Kitui	Kitui District	X		
Kenya	Kisii	Kisii District	X		
Kenya	Kilifi	Kilifi District	X		

Kenya	Kiambu	Kiambu District	X		
Kenya	Kericho	Kericho District	X		
Kenya	Garissa	Garissa District	X		
Kenya	Busia	Busia District	X		
Kenya	Baringo	Baringo District	X		
Kenya	Nyandarua	Nyandarua District	X		
Kenya	Machakos	Machakos District	X		
Kenya	Taita Taveta	Taita Taveta District	X		
Kenya	Homa Bay	Homa Bay District	X		
Kenya	Bomet	Bomet District	X		
Kenya	Migori	Migori District	X		
Kenya	Nakuru	Nakuru District	X		
Kenya	Narok	Narok District	X		
Kenya	Tana River	Garsen District	X		
Kenya	Nyamira	Nyamira District	X		

Institutional Data

Parent (Electricity Expansion-P103037)

Practice Area (Lead)

Energy & Extractives

Contributing Practice Areas

Cross Cutting Topics

[ ] Climate Change

[ ] Fragile, Conflict & Violence

[ ] Gender

[ ] Jobs

[ ] Public Private Partnership

Sectors / Climate Change

Sector (Maximum 5 and total % must equal 100)

Major Sector	Sector	%	Adaptation Co-benefits %	Mitigation Co-benefits %
Energy and mining	Transmission and Distribution of Electricity	53		

Energy and mining	Other Renewable Energy	40		
Public Administration, Law, and Justice	Public administration-Energy and mining	7		
Total		100		

Themes

Theme (Maximum 5 and total % must equal 100)

Major theme	Theme	%
Financial and private sector development	Infrastructure services for private sector development	58
Rural development	Rural services and infrastructure	33
Urban development	Urban services and housing for the poor	3
Human development	Education for all	3
Human development	Health system performance	3
Total		100

Additional Financing Additional Financing: Kenya Electricity Expansion Project (P153179)

Practice Area (Lead)

Energy & Extractives

Contributing Practice Areas

Cross Cutting Topics

[X] Climate Change

[ ] Fragile, Conflict & Violence

[ ] Gender

[ ] Jobs

[ ] Public Private Partnership

Sectors / Climate Change

Sector (Maximum 5 and total % must equal 100)

Major Sector	Sector	%	Adaptation Co-benefits %	Mitigation Co-benefits %
Energy and mining	Transmission and Distribution of Electricity	10		
Energy and mining	Other Renewable Energy	90		90

☐ I certify that there is no Adaptation and Mitigation Climate Change Co-benefits information applicable to this project.

Greenhouse Gas Accounting			
Net Emissions	20,072,020 tCO2	Gross Emissions	20,904,000 tCO2

Themes

Theme (Maximum 5 and total % must equal 100)

Major theme	Theme	%
Rural development	Other rural development	90
Urban development	Other urban development	10
Total		100

Consultants (Will be disclosed in the Monthly Operational Summary)

Consultants Required? Consultant services will be required

I. INTRODUCTION

1. This Project Paper seeks the approval of the Executive Directors to provide an additional International Development Association (IDA) credit in an amount of SDR 48 million (US$68 million equivalent) to the Republic of Kenya for the Electricity Expansion Project (KEEP, P103037). The proposed Additional Financing (AF) would enhance and maximize the development impact of KEEP by supporting: (1) cost overruns related to the expansion of low-cost base load geothermal resources in Kenya's energy mix; (2) scale-up of slum electrification across the country; and (3) scale-up of technical assistance and capacity building for sector entities. The majority of the proposed AF will cover cost increases incurred by the steamfield gathering system investments contract for the 280 MW Olkaria geothermal fields financed by the Bank under KEEP.

2. Associated with the proposed AF is a grant from the Global Partnership on Output-Based Aid (GPOBA). An original grant in the amount of US$5.15 million complemented IDA financing under KEEP for slum electrification. Additional GPOBA funds for Kenya in the amount of US$3 million have been granted to support the scale-up of slum electrification activities.

3. The Project Development Objectives (PDO) for the KEEP, and retained under this AF, are to: (a) increase the capacity, efficiency, and quality of electricity supply; and (b) expand access to electricity in urban, peri-urban, and rural areas. Progress towards the achievement of the development objective and implementation progress are currently rated moderately satisfactory and have been so for the past twelve months.

4. To allow sufficient time to ensure the completion of the slum electrification and technical assistance activities included in this AF, the closing date of the KEEP has been extended from September 30, 2016 to December 31, 2017. As part of the AF, the results framework is revised to introduce two new indicators: one related to the number of new consumers in slums connected to the grid and one related to citizen engagement to capture feedback from newly electrified slum consumers. Disbursement estimates, components and costs, and the project implementation schedule are also revised to reflect the AF.

II. BACKGROUND AND RATIONALE FOR ADDITIONAL FINANCING IN THE AMOUNT OF US$71 MILLION EQUIVALENT

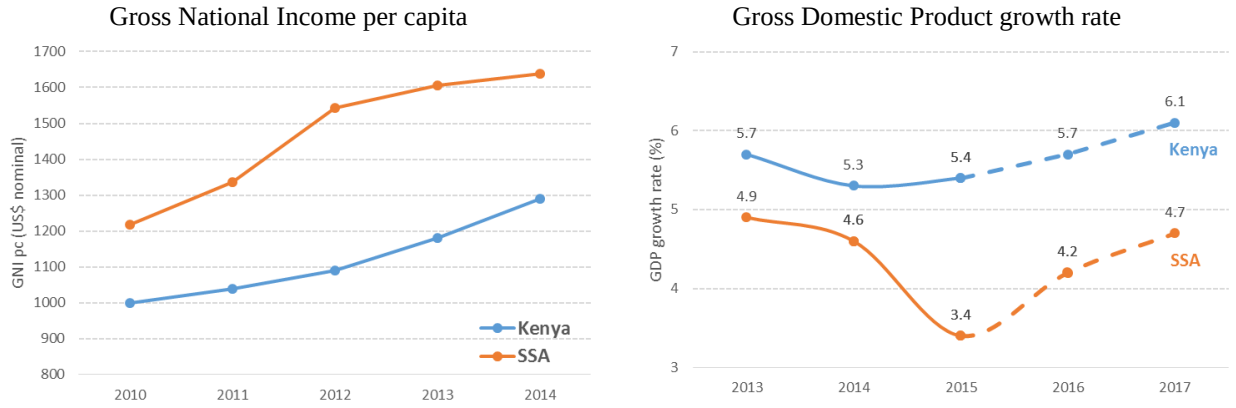
A. COUNTRY AND SECTOR BACKGROUND

5. In 2012, Kenya achieved middle income country status. With an economy growing at an average 5.2 percent over the last decade, Kenya is one of the fastest-growing economies in Sub Saharan Africa (SSA), and continues to exceed the average growth rate for both Africa and the lower-middle income countries (Figure 1). After a small dip in 2013, investment spending took off again in 2014. Real investment spending rebounded, driven by higher development spending on major infrastructural activities, such as the standard gauge railway, roads, and power generation projects. Kenya also improved its business environment as the country jumped from

129 in 2015 to 108 in 2016 in the Doing Business Index.[1] The effects of the sustained macroeconomic growth are translating into improved quality of life. The national poverty rate fell from 47 percent in 2005 to 39 percent (based on best estimates) in 2012.

6. However, the Gross National Income (GNI) per capita at US$1,280 (2015) is still converging towards the regional average of US$1,638 (Figure 1). Inequality remains high with a Gini coefficient of 47.4. There are significant differences in opportunities and outcomes between women and men and for those living in the remote and most underdeveloped regions, and ethnicity remains an important factor in societal development. To that end, the promulgation of a new Constitution in 2010 signaled far-reaching political and economic maturity. Kenya's highly ambitious devolution of political and economic power to 47 new county governments seeks to narrow long-term, deeply entrenched regional disparities; increase the responsiveness and accountability of government to citizens; and grant greater autonomy to regions and groups.[2]

Figure 1 – Evolution of Key Macroeconomic Indicators



Source: World Bank, 2016

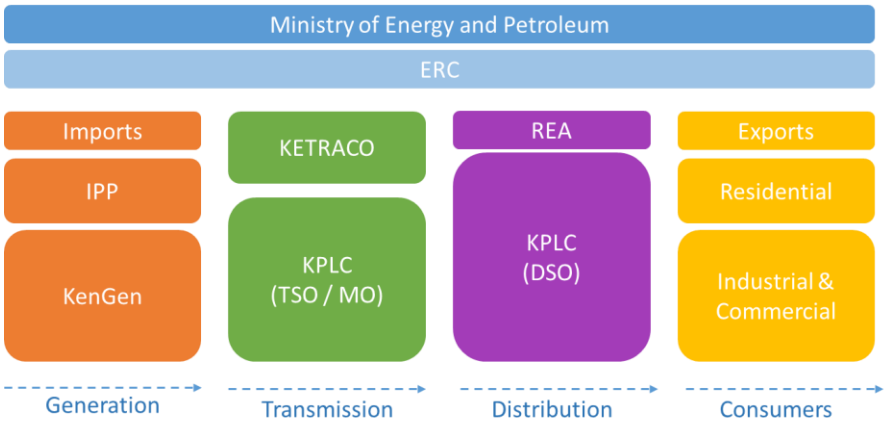
7. Recognizing the essential role that the power sector plays in economic growth and poverty reduction, the successive governments in Kenya have undertaken key sector reforms since 1993 when the country's first Energy Sector Policy Framework was developed. The key thrust of this framework was to separate the policy function from commercial functions, adopt cost reflective retail tariffs, and liberalize generation by introducing private sector participation in generation investment. This led to the procurement of the first four independent power producers (IPPs) in 1995 and 1996. In 1997, the Electric Power Act was enacted to establish an enabling framework that included creation of a sector regulator, the Electricity Regulatory Board (ERB). Further, the generation function was unbundled from transmission and distribution functions. The generation assets owned by several public bodies, including the Kenya Power and Lighting Company Limited (KPLC) were transferred to the Kenya Electricity Generating Company Limited (KenGen), while the transmission assets owned by the Government and KenGen were transferred to KPLC, whose mandate was now limited to transmission, distribution, and retail functions. KenGen and KPLC entered into standard power purchase agreements to govern their commercial relationship and operated on commercial principles.

[1] Doing Business 2016: Measuring Regulatory Quality and Efficiency, World Bank Group.
[2] Source: World Bank (2015). Kenya Economic Update.

8. Following the enactment of the Energy Act 2006, ERB was transformed into a single sector regulator, the Energy Regulatory Commission (ERC), with a mandate for technical and economic regulation of petroleum, electricity, and renewable energy. The Geothermal Development Company (GDC) was established in 2008 as a wholly state owned company to focus on development of geothermal resources, including resource assessment and steam development. The Kenya Electricity Transmission Company Limited (KETRACO), another wholly state owned company, was set up to facilitate transmission network expansion involving new lines above 132 KV. The Rural Electrification Authority (REA) was tasked with accelerating rural electrification. Finally, an Energy Tribunal was organized to adjudicate sector disputes, especially those arising from dissatisfaction with decisions taken by ERC.

9. A transformative policy and legislation – the Energy Policy and Energy Bill – is currently awaiting parliamentary approval. It is expected to align the policy and regulatory framework of the sector with the 2010 Constitution's requirements for devolution of electricity services and greater accountability in the sector. Key changes will include: (i) an obligation for the national and county governments to provide affordable energy services to all citizens; (ii) sharing of roles of electricity planning, development, services, and regulation between the two levels of governments (i.e., national and county); (iii) transparent and competitive process for licensing of renewable energy natural resources; and (iv) open access over transmission and distribution networks and periodic review of electricity market design with a view to enhancing competition. The bill is expected to be passed during the second half of 2016.

Figure 2 – Power Sector Structure in Kenya



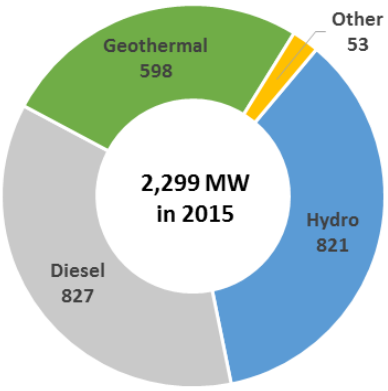
Source: World Bank, 2016. Note: DSO: distribution system operator; MO: market operator; TSO: transmission system operator.

10. There has been much progress to date in strengthening the energy sector. Generation capacity stands at 2,300 MW, dominated by geothermal and hydro resources at 64 percent. The electrification rate, estimated to be as low as 23 percent in 2009, now stands at close to 50 percent with KPLC counting 4.2 million households as its consumers. The sector operates on commercial principles supported by transparent financial relationships between the sector utilities and cost reflective retail electricity tariffs. KenGen and KPLC are listed on the Nairobi Stock Exchange with an important share of private ownership (30 and 49.9 percent, respectively), which has ensured availability of continuous audited financial statements.

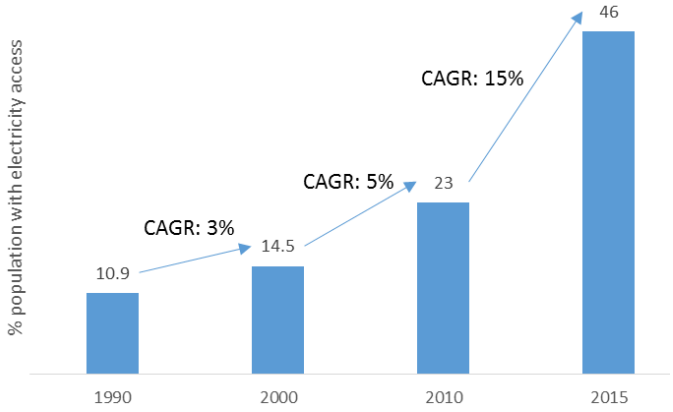
Furthermore, since 1997, the country attracted significant private participation in generation: currently there are ten IPPs that account for approximately 30 percent of installed generation capacity (over 658 MW) with US$2.4 billion in private equity and commercial loans mobilized to finance privately owned power plants. Their sustainability – the first two privately owned generation operations were commissioned in 1997 – has been underpinned by stable sector investment conditions.

Figure 3: Achievements in the power sector

(a) Generation Capacity (MW)



(b) Electrification Rate



Source: World Bank analysis using ERC and KPLC data. (2016)
CAGR = Compounded Annual Growth

11. The Government of Kenya (GoK) has set ambitious targets to scale-up investments across the sector value chain. The 2013 strategic plan of the Ministry of Energy and Petroleum (MoEP) targets an increase in generation capacity by over 5,000 MW and 4,600 kilometers (km) of new high voltage transmission lines by 2017. However, most projects are delayed and only about 800 MW will be delivered within the timeline. In parallel, the GoK aims to increase electricity access to 70 percent by 2017 and 100 percent by 2020.

12. The GoK recognizes that a number of issues need to be addressed to realize such a scale-up. First, expanding the generation and transmission assets will require at least US$9 billion by 2019[3]. Second, doubling the electrification rate over the next four years will require a careful planning process to optimize the use of available resources, a high degree of coordination at the institutional level, a clear and transparent mechanism to involve the private sector in the process, and the availability of resources to make investments happen. Beyond the optimization of the planning process, financial resources will need to be available to implement the universal access programs – either through grid extension or a set of off-grid alternatives. A share of these resources can come from existing users via levies on electricity consumption or similar measures, but a significant share most probably will have to be financed by a combination of national treasury resources and the international community. Finally, if private participation and market competition is to be bolstered, new primary and secondary legislation will likely be required, as well as capacity building for ERC and the MoEP to ensure that the design of the

[3] Kenya. Ministry of Energy and Petroleum (2015). Development of a Power Generation and Transmission Master Plan, Kenya; Medium Term Plan (2014-2019).

market mechanisms promotes rational, fair, and transparent competition among the market players.

13. The GoK is proactively taking steps to plan this scale-up and funding options accordingly. To this end, four important consultancies are underway. First, Lahmeyer, funded by the Agence Française de Développement (AFD), is supporting ERC to review and prepare a Least Cost Power Development Plan underpinned by realistic assumptions, particularly regarding demand growth. Second, Power Africa has been working on an overarching financing framework to help Kenya achieve its power sector targets. Third, the World Bank (through ongoing Kenya Electricity Modernization Project - KEMP, P120014) is supporting preparation of a National Electrification Strategy that will outline the technical, financial, and institutional contours of achieving universal access by 2020, including a prioritized electrification plan. Fourth, the World Bank (through an Energy Sector Management Assistance Program grant, P158407) is supporting ERC in analyzing a set of potential alternatives to promote competition based on the provisions of the new Energy Bill.

B. DESCRIPTION OF THE ORIGINAL PROJECT AND PERFORMANCE

14. The KEEP (P103037), financed through an IDA credit in the amount of SDR 217.40 million (US$330 million equivalent), was approved by the Bank's Board on May 27, 2010 and became effective October 1, 2010.[4] The KEEP's PDOs are (a) increase the capacity, efficiency, and quality of electricity supply; and (b) expand access to electricity in urban, peri-urban, and rural areas. By adding new geothermal generation capacity to the grid, the project is enhancing the energy available for all consumers, reducing the cost of supply, and contributing to a greener energy mix. By connecting new typically poor consumers living in informal settlements, the project is providing grid access to energy and creating conditions for productive activities[5]. The KEEP has the following four components:

- **Component A -- Geothermal Generation (US$1,035 million, of which IDA US$117.82 million equivalent)**. This component supports the construction of 280 MW of geothermal generation capacity in Naivasha (140 MW expansion at the existing Olkaria I power station and 140 MW at Olkaria IV). IDA financing supports construction of (i) steam gathering and distribution system works for the two power plants; (ii) an access road interconnecting Olkaria I and Olkaria IV plants; and (iii) a geothermal workshop and laboratories. The funding also pays for technical assistance provided by a geothermal board of consultants that provides independent advice to KenGen on geo-scientific issues, steam gathering systems and power plants design, as well as environmental management.

- **Component B – Transmission (US$72.5 million, of which IDA US$59 million equivalent).** This component supports the extension of Kenya's electricity transmission network and construction of new 132/33 kV substations.

[4] KEEP is co-financed by the GoK, the European Investment Bank, AFD, the Japan International Cooperation Agency, and the German Development Bank KfW.

[5] An ESMAP financed knowledge product and beneficiary assessment is underway to draw the lessons learned from slum electrification experience and understand welfare implications for consumers.

- **Component C – Distribution (US$272 million, of which IDA US$147 million equivalent, and GPOBA grant US$5.15 million for slum electrification)**. This component supports: (i) strengthening and extending electricity distribution networks in urban, peri-urban, and rural areas; (ii) electrifying priority loads (public facilities) in rural areas; (iii) electrifying urban slums; and (iv) supporting a revolving fund for deferred payment of electricity connection fees.

- **Component D -- Sector Institutional Development and Operational Support (US$11.5 million, of which IDA US$6.18 million)**. This component supports: (i) institutional development and studies; (ii) training; and (iii) project implementation support and monitoring and evaluation.

15. The implementing entities for KEEP are KenGen for component A, KPLC for components B and C, REA for component C, and MoEP for Component D.

16. Implementation status: As of May 16, 2016, about 90 percent of IDA funds under KEEP had been disbursed. The mid-term review of the project was carried out in June 2015. In the last 12 months, progress towards the achievement of the development objectives and implementation progress have been rated moderately satisfactory in the project Implementation Status and Results Reports.

- **Component A:** The 280 MW of new geothermal capacity at Olkaria has been commissioned into commercial operation (140 MW of Olkaria IV commissioned September 2014 and 140 MW of Olkaria I commissioned January 2015), and the IDA financed local infrastructure has been completed. With the commissioning of 280 MW, there has been a 12 percent increase in the total installed electricity generation capacity in Kenya and a 60 percent increase in geothermal capacity which now constitutes 26 percent of Kenya's total installed generation capacity, expanding renewable energy penetration to 64 percent of installed capacity.

- **Components B and C:** Implementation of the transmission and distribution works, although delayed by about 13 months compared to the original schedule (due to right-of-way, compensation, and contractor issues which caused the Component to be classified as Moderately Unsatisfactory on the Implementation Status and Results Report of June 2015) is nearing completion. The distribution substations and lines are complete, while the transmission works are expected to be completed by the second quarter 2016. One of the activities in the distribution works (Component C) involves slum electrification (co-financed by GPOBA) for which available IDA and GPOBA funds were exhausted ahead of schedule. The total number of electricity connections in the target slums was 40,323 households by June 2015, exceeding the target of 40,000 households.

- **Component D:** The sector institutional development and operational support comprised sector studies, capacity building and training activities that are aimed at sustaining the policy, institutional and regulatory reforms. Seven studies have been carried out to-date, out of which four have been completed while three others are ongoing. The studies include options for development of a power market in Kenya; cost of service for electricity; technical, regulatory, financial and economic aspects for the development of small scale grid connected

renewable energy; and feasibilities studies for the 400MW Menengai Phase 1 Geothermal Project; and private sector renewable mini grids. In addition, selected group of staff of MoEP, KenGen, KPLC, KETRACO and ERC have received training on pertinent sector issues such as policy management, planning, regulation, procurement, and environmental and social safeguards provided by several local and global institutions.

17. Results Framework: Under KEEP, the indicators on reduction of system losses and supply interruptions have not yet been met. First, reduction of losses has been challenging (17.5 percent in FY15 compared to a target of 14.7 percent). The higher losses are due to the extension of distribution lines in the low voltage network associated with expansion in household access and overload of major transmission lines following commissioning of new generation plants. KPLC is implementing a number of loss reduction initiatives that include a revenue protection program (financed under the Kenya Electricity Modernization Project), enhanced inspections of metering installations and improvement in billing accuracy. A number of new transmission projects, that target among others reduction in technical losses are currently under implementation such as the 400kV Nairobi- Mombasa line, 220kV Olkaria II -Olkaria IV-Suswa, the Nairobi Ring and the transmission and distribution substations and lines financed under the Project to be completed in FY 17. Second, supply interruptions have increased in line with the tremendous growth in the number of customers and improvements in the management information system used by KPLC that now enables more supply interruptions to be reported and monitored than before. Both indicators have recently been revised and performance will be monitored going forward.

18. Financial covenants: KenGen is partially non-compliant with the legal covenant on the current ratio but in compliance with covenants for both debt service coverage ratio and the self-financing ratio (June 2015 data). In May 2016, KenGen launched a rights issue program of about Kshs. 30 billion (about US$300 million). As part of the program, the debt owed to Government (constituting about 70 percent of the rights issue), mainly comprising on-lent loans, will be converted to equity. KPLC is in compliance with the current ratio and debt service coverage ratio but not compliant with the self-financing ratio as at December 2015. KPLC is implementing a debt restructuring exercise supported by a US$200 million IDA Guarantee in the Kenya Electricity Modernization Project that involves retiring part of its existing commercial debt amounting to approximately US$500 million. The debt restructuring, which is expected to be implemented in the calendar year 2016 will enable KPLC to raise new commercial debt with lower interest rates and longer terms.

19. An Inspection Panel report and Management Response associated with KEEP were discussed by the World Bank Board on October 20, 2015. The Request for Inspection was submitted by members of the Maasai community affected by the resettlement under the Olkaria IV sub-project. The resettlement was undertaken to mitigate potential health impacts identified in the project Environmental and Social Impact Assessment. In total, 150 households (comprising 126 household heads and about 1,200 people) were resettled to a 1,700 acre resettlement area called RAPland between August and September 2014. The Panel issued its Investigation Report on July 2, 2015 and found non-compliance with respect to the Bank's Operational Policy OP 4.10, Indigenous Peoples, and OP 4.12, Involuntary Resettlement. The Panel found that the Bank had complied with OP 4.11, Physical Cultural Resources, with regard to sites of cultural value.

The Management Report and Recommendation identifies proposed actions to address the Panel's findings around four specific themes: identification of project affected people; consultation, participation, and grievance redress; adequacy of resettlement site, infrastructure, and amenities; and livelihood restoration.

20. The European Investment Bank (EIB), a co-financier of the project, received a similar complaint through its Complaints Mechanism as the World Bank's Inspection Panel. As a result, EIB is leading a mediation process with the Requesters and KenGen, and the World Bank has joined the process as co-facilitator, having signed a Memorandum of Understanding with EIB. The mediation process is expected to shape the remedial actions in a more specific manner, and to result in the Requesters' endorsement of the proposed actions. The World Bank Board has instructed Management to seek approval from the Board on the outcome of the mediation process, as well as on the implementation of the agreed Action Plan, within a year (i.e., by October 2016). The next session of the mediation is expected by June 2016, when the Action Plan will be presented by KenGen to the community. If the mediation outcomes are acceptable to KenGen and the Requesters, the process can move to implementation of the Action Plan.

C. RATIONALE FOR ADDITIONAL FINANCING

21. The energy sector is an important part of the World Bank Group Country Partnership Strategy (FY14-18)[6], which highlights the need for economic growth to take off at rapid, sustained rates and in sectors that are most likely to reach the poorest. The strategy therefore promotes three domains of engagement: competitiveness and sustainability; protecting the vulnerable and helping them develop their potential; and building consistency and equity as a long-term goal that has devolution at its core.

22. The proposed AF, through its financing of geothermal plants and slum electrification, are key to achieving the World Bank Group's twin goals of reducing extreme poverty and boosting shared prosperity, by rapidly expanding access among poorer slum areas and making electricity affordable for consumers. The electricity produced by the Olkaria geothermal plants has contributed to further greening of Kenya's energy mix and is about 8 US$c/kWh compared to about 22 US$c/kWh for electricity produced by the fuel oil plants that it has displaced. The slum electrification has transformed the welfare outcomes of consumers with respect to income generation potential, study hours for children, women's safety and health outcomes. A beneficiary assessment is underway to draw lessons from this experience and quantify the development outcomes of slum dwellers. The AF will be linked to the existing KEEP Components A, C, and D to cover cost increases related to the Olkaria I and Olkaria IV steamfield developments contract under Component A; to scale-up support for slum electrification under Component C; and to scale-up sector institutional development and operational support under Component D. The rationale for additional financing in each of these areas is provided below.

[6] World Bank. 2014. *Main report*. Washington, DC: World Bank Group. Approved on 01/06/2014. http://documents.worldbank.org/curated/en/2014/06/19712239/kenya-country-partnership-strategy-period-fy2014-18-vol-2-3-main-report

23. ***Rationale to Finance Cost Increases for the Olkaria I and IV Additional Units 4 and 5 Steamfield Developments Contract (IDA US$53.2 million equivalent).*** The steam gathering and distribution system works for Olkaria I and IV geothermal plants, which delivers steam (fuel) to the 280 MW power plants, is financed by IDA and KfW on a 67 percent/33 percent basis. The initial contract price was US$139 million equivalent, but has increased by about US$53.2 million equivalent[7] for the following three sources:

- Measurement of final quantities of works led to increase of contract price by about US$25 million due to quantity variation, i.e., difference between actual work carried out compared to the quantities in the original contract. At the time of initiating procurement, only about 40 percent of the required number of wells had been drilled and drilling of the rest of the wells was in progress. Therefore, the design and specifications of most of the works was based on estimated quantities premised on crucial parameters such as number of wells, their location and characteristics. Some of the assumed well sites were changed due to insufficient steam, necessitating changes in design. Measurement and valuation of quantity of work executed upon completion was therefore higher than the provisional sum provided for in the contract.

- Additional works, in the amount of about US$17.4 million, were necessitated by design modifications to the steam field operating pressure as a result of prevailing steam characteristics and other variation orders instructed in accordance with the contract. The largest part of these works was the construction of three steam let down stations that enabled operation of the steam field at higher pressure to avoid silica scaling damage of the pipes without modification to the power plant design.

- The increase due to price adjustment was US$10.7 million and the price adjustment was calculated following contract provisions.

24. These costs have already been incurred (no additional activities will be financed under this component as part of the AF) and their coverage is justified by the positive impacts that the commissioning of the Olkaria I and IV plants has had on Kenya's installed generation capacity, reserve margin, energy mix/security, and cost of supply. With the commissioning of Olkaria I and IV, there has been a 12 percent increase in the total installed electricity generation capacity in Kenya and a 60 percent increase in geothermal capacity (from 373 MW in June 2014 to 598 MW in June 2015). Geothermal capacity now constitutes 26 percent of Kenya's total installed generation capacity, expanding renewable energy penetration to 64 percent of installed capacity.

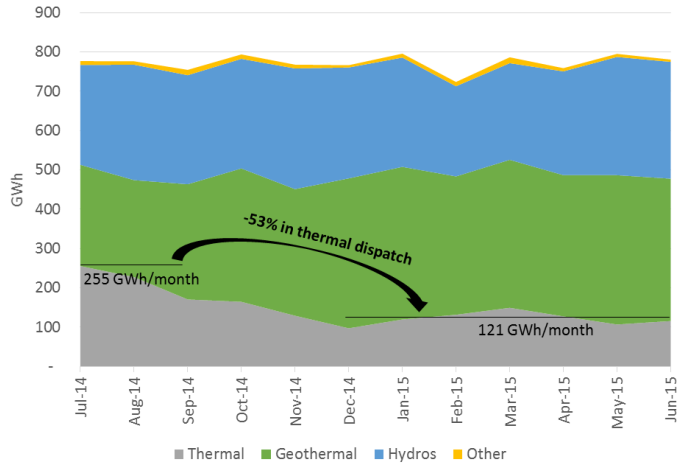
25. The commissioning of new generation units has also contributed to increase the reserve margin[8] to 32 percent (until June 2014, the system operated with an approximately 20 percent reserve margin). In addition, geothermal is Kenya's least cost base load and the availability of new geothermal power rapidly displaced more expensive thermal generation: after the commissioning of Olkaria I and IV, the share of thermal generation was reduced by 53 percent.[9]

[7] The contract price increase was reviewed and approved by the Bank's Operations Procurement Review Committee on December 16, 2015.
[8] The spread between effective capacity and peak demand.
[9] Comparing the level of thermal power dispatched during July 2014 with the average level from December 2014 and June 2015, with the share of hydropower remaining approximately constant over the year.

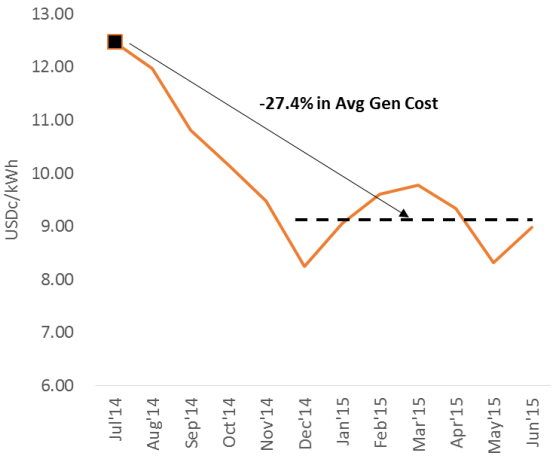
An Adjusted Weighted Average Generation Costs (in US$c/kWh) has been calculated for the period between July 2014 and June 2015 to quantify the impact of Olkaria I and IV on Kenya's generation costs; the results show that the commissioning of Olkaria I and IV have contributed to a 27.4 percent reduction in the average generation costs (from 12.5 US$c/kWh to 9.1 US$c/kWh). By commencing implementation of the steam gathering system and power plants works at the same time as drilling of the balance of the wells was ongoing, the GoK was able to reduce the implementation period of the 280 MW capacity by over a year.

Figure 5 – The impact of Olkaria I and IV in the power sector

Change in the generation mix (GWh/month)



Change in the Average Generation Costs (US$c/kWh)



Source: World Bank analysis using ERC data. (2016)

26. ***Rationale to Scale-up Support to Slum Electrification (US$13.5 million, of which IDA US$10.5 million equivalent and GPOBA US$3 million GPOBA)***. Providing electricity to the slum population is an important part of Kenya's ambitious national goals, including reaching universal energy access by 2020. A study of Nairobi slums reports that only 22 percent of slum households have an electricity connection; in comparison, for Nairobi as a whole, electricity access is 52 percent. Slum customers are frequently unable to pay the (relatively) high up-front cost of connection and, in some slums, illegal connections are rampant, which contribute to KPLC's system losses, public safety risk concerns, extortion, and illegal behavior. For this reason, the GoK and KPLC introduced a special reduced connection fee for slum residents amounting to US$15 per connection, which is substantially below the actual cost of connection incurred by KPLC.

27. KEEP has supported the connection of low-income customers in slums through an output-based mechanism supported by IDA and GPOBA in the amount of US$15.15 million (US$10 million IDA, US$5.15 million GPOBA) under the original KEEP. This has made electricity connections more affordable and encouraged households in slums to switch service from informal service providers to KPLC. Under this mechanism, the difference between the cost of connection (estimated at US$900[10] at the time of the project restructuring undertaken in

[10] Flat connection fees are charged to the customers whose premises are located within 600 meters of feeding reach of a low voltage line from an existing transformer.

May 2014)) and the customer's contribution (US$15 equivalent) is financed by subsidies from IDA (US$250 per connection) and GPOBA (US$125 per connection) once the actual connections are verified by the Independent Verification Agency (IVA). The remainder of the cost (approximately US$510 per connection) is covered by KPLC.

28. After initial delays, the pace of household connections significantly accelerated and the available IDA and GPOBA funds have been exhausted ahead of schedule. The total number of electricity connections in the target slums was 40,323 households by June 2015, exceeding the target of 40,000 households.

29. The proposed project design for this scale-up under the AF builds on KPLC's earlier experience with slum electrification, including the ongoing IDA/GPOBA slum electrification project, and integrates lessons learned and good practices from successful slum electrification programs worldwide (see Box 1 below). In particular, close engagement of communities and stakeholders, segmentation of target areas, cross-sectoral collaborations, strong leadership by top management, and flexible results-based financing instruments were instrumental in accelerating the successful implementation of the early phase.

Box 1: Lessons Learned from KPLC's Previous Experience with Slum Electrification

First, understanding and engaging citizens and stakeholders is key to ensuring successful operations in most slums. KPLC has strengthened its frontline team who are sensitive to local leadership structures and political economy. Moreover, a community-supportive approach has been adopted to strengthen communication with citizens and the communities that would convert illegal connections to legal ones. This includes collaborating with youth groups to enroll slum dwellers and provide labor during construction activities, preparing improved marketing materials targeting the slum residents, and opening two-way feedback channels with citizens to seek feedback regularly.

Second, there is a need to differentiate target areas depending on their characteristics, and to adjust the mode of interventions accordingly. In close collaboration with an urban sector project, KPLC has identified slums nationwide, segmented them, and prioritized targeting the settlements in which ownership structure is relatively clearly established. On the other hand, in the areas in which illegal cartels are dominant, residents found it difficult to switch from their cartel-supplied electricity to that from KPLC. In these cases, KPLC has adopted a longer-term approach to engage local leadership, and focused on the pockets of communities that are more amenable for KPLC's engagement. The proposed activities will continue to adopt a segmented approach, and will select target sites carefully.

Third, and relatedly, cross-sectoral collaborations enable enhanced project implementation and integrated development solutions for the poor in a difficult environment. Under the ongoing KEEP slum electrification project, a first major leap in the result achieved is largely attributable to a stronger collaboration with other World Bank global practices, especially urban. The Bank team facilitated a partnership with the Kenya Informal Settlements Improvement Project (KISIP) Project Implementation Team in close coordination with the Ministry of Land, Housing, and Urban Development beginning in late 2013. As described above, KPLC benefited from the systematic screening criteria for target areas that KISIP had developed, which includes, among others, land tenure status, proximity to trunk infrastructure, and community readiness to participate. Moreover, the collaboration facilitated provisioning of integrated infrastructure services to the target areas. The proposed additional financing will provide electricity to additional KISIP sites which are currently ready for electricity infrastructure. The selected sites have been included in the list in Annex 3.

Fourth, strong support of the top management of KPLC has been found crucial in turning around the performance of the project. It has helped establish an authorizing environment for the project's engagement of various slums nationwide. Their close monitoring of implementation progress and participation in community campaigns has been essential for building trust in the slums as well as increasing KPLC staff resources for improving customer relations and feedback mechanisms with slum residents. The proposed project has benefited from strong leadership of KPLC's top management, and they will continue to be engaged during implementation. In addition, the project had a strong support of the Government and in a number of slum areas, the electrification activities were implemented in close collaboration with other government led upgrade program such as roads and sanitation.

Finally, the adoption of one-time subsidy disbursement underpinned by the verification of functional connections with pre-paid meters, rather than the original two-tranched disbursement, has cushioned KPLC's cash management, and incentivized the company to accelerate connections. Under the revised design, 100 percent of the output based aid subsidy was disbursed upon the verification of functional connections. The verification provides adequate proof of working connections and household consumption.

30. In order to maintain the momentum, the GoK and KPLC have requested additional funds to scale-up the "Last Mile Connection" program and cater to the basic needs of the urban poor in informal settlements all over the country.[11] The physical infrastructure for connecting households, such as poles, service drop lines, and meters are largely in place in the project areas. Therefore, the proposed AF will provide US$10.5 million of IDA support complemented by US$3 million financing from GPOBA to enable approximately 54,000 additional households to connect to the electricity network (customer contributions will remain unchanged in KSh terms while the subsidies from IDA will be reduced to US$195 per connection and GPOBA will be reduced to US$55 per connection, with KPLC absorbing the difference). Nairobi, home to some of the world's largest slums, was considered unsafe particularly in the night and was prone to urban gangs. In this program, KPLC changed the way of doing business adopting a community based approach in slum communities. This meant moving away from taking down illegal connections to listening to community and marketing the benefits of the legal connections – safety, reliability, and affordability. Specifically, customers only paid US$12 for a new connection, as compared to US$150 for regular customers. The slum electrification experience demonstrates the transformative ability of energy in the lives of slum dwellers with respect to their income generation potential, study hours of children, women's safety, and health outcomes. A knowledge product is underway to document the lessons learnt from this slum electrification experience and a beneficiary assessment to quantify the welfare outcomes to slum consumers.

Table 1. Cost Break-down of Scale-Up of Slum Electrification

	KEEP (40,023 new connections)		**KEEP AF (54,000 new connections)**	
	Support per connection (US$)	**Total (US$ million)**	**Support per connection (US$)**	**Total (US$ million)**
Customers[12]	15.0	0.6	10.0	0.5
IDA	250.0	10.0	195.0	10.5
GPOBA	125.0	5.0	55.0	3.0

[11] http://www.worldbank.org/en/news/feature/2015/08/17/bringing-electricity-to-kenyas-slums-hard-lessons-lead-to-great-gains

[12] Customers are charged the same amount of connection fees in KSh under KEEP and KEEP AF. Due to the depreciation of local currency, the amount denominated in US$ is reduced from US$15 to US$10.

KPLC	510.0	20.4	740.0	40.0
Total Cost/Connection[13]	**900.0**	**36.0**	**1,000.0**	**54.0**

31. ***Rationale to Scale-up Sector Institutional Development and Operational Support (IDA US$4.3 million equivalent).*** The AF will provide additional support for sector institutional development in the areas described below.

- **Capacity building on environmental and social safeguards.** Learnings from the KEEP Inspection Panel case presents an opportunity for the relevant Kenyan sector entities—KETRACO, KenGen, KPLC, MoEP, ERC and REA—to build capacity to address and mitigate environmental and safeguard-related risks in large energy projects. This is particularly important given that Kenya is experiencing a scale-up of energy sector investments, where the sector entities would benefit from an opportunity to enhance their skills and gain in-depth training at other utilities and through specialized courses related to environmental and social safeguards. In addition, sector staff would also gain from an enhanced ability to identify social risks and design effective mitigation mechanisms. To achieve this objective, a number of interventions are expected to be part of this capacity building exercise. First, a benchmarking exercise with utilities in other countries, such as ESKOM, Power Grid India, and Electricite de France, would be undertaken. Following this, "shadowing" of environment and social teams at utilities as they undertake the preparation and consultation process for complex projects would enable the Kenyan teams to learn state-of-the-art environmental and social/resettlement management practices, and discuss how best to adapt them to the Kenyan context and experience. Second, specialized training/courses in the preparation of Strategic Environmental Assessments and Cumulative Impact Assessments, now required by the Kenyan National Environmental Management Authority (NEMA) are important and will be provided by specialized agencies and consultancies. Courses in biodiversity protection and avian protection measures during construction of transmission lines are also a high priority. Third, in line with the GoK's stated commitment to increasing the responsiveness and accountability of government to citizens, specific training programs would encompass stakeholder analysis; social analysis and social impact assessment; understanding international financial institutions' policies on resettlement and indigenous peoples; tools for citizen engagement and inclusive participation for seeking citizens' feedback at regular intervals; preparation, implementation, and monitoring of resettlement action plans and indigenous peoples development plans; community driven development approaches; grievance redress mechanism; and mediation/arbitration techniques.

  In addition, this sub-component could also finance the action plan emerging out of the mediation process underway to address the outstanding issues related to the Olkaria resettlement process (described in para 19 and 20).

[13] Due to price increases in connection materials, the overall connection cost for KPLC has increased from US$900 at the time of the project restructuring in May 2014 to US$1,000 as of March 31, 2016.

- **Capacity building on health and safety.** There have been a number of incidents (some of them that resulted in fatalities) in the Olkaria IV development, implemented by KenGen, and at the distribution level, implemented by KPLC that necessitates capacity building in health and safety. These issues are a key concern for the GoK, the power companies and the WB. Therefore, the actions to be developed as part of the AF will include the provision of consultancy services to ensure that: (i) measures are put in place to ensure that the safety and health track record at KenGen, KPLC, KETRACO, GDC and REA are enhanced to meet best international standards; (ii) actions are proposed to enable all previous violations of occupational and community health and safety standards to be quickly resolved to the satisfaction of KenGen KPLC, KETRACO, GDC and REA and the relevant authorities (NEMA, Ministry of Labor); and (iii) the capacity of all environmental health, safety, and security teams are enhanced as necessary.

- **Feasibility study for Olkaria VII.** The feasibility study will carry out technical options, financing options (public private partnership or public investment), and environmental and social analysis for a proposed project site located within the Olkaria field concession area (Olkaria VII). The objective of the study is to assess the feasibility of adding 140 MW of geothermal power from the Olkaria geothermal field to the national grid including financing options. The study will cover the following aspects: (i) identification, evaluation, and selection of a suitable site for the proposed 140 MW geothermal power plant; (ii) evaluation of the economic and financial viability of the proposed plant; (iii) financing options; and (iv) the environmental and social impact assessment. Based on the financing option, if it is public investment, then preparation of the conceptual design, cost estimates, implementation schedule, and bidding document; if it is public private partnership, then Request for Qualification Document and Bidding Document.

- **Monitoring and evaluation system for slum electrification.** The scale-up of slum electrification will require development of a consumer awareness campaign, establishment of a feedback system, and launch of a beneficiary assessment for slum consumers.

32. As a complementary activity, the Bank with financing from the Energy Sector Management Assistance Program (US$0.55 million), will support the development of a National Geothermal Strategy and Private Sector Consultation Forum with the objective of enabling increased investment in the sector and thus an acceleration in the current pace of geothermal development. The activity will include: (i) an in-depth assessment of the main challenges facing the geothermal sector (stock-taking of the work carried out to date towards resource confirmation; systematic analysis of key tenders carried out by GDC and KenGen; review of the policy, legal and regulatory framework; pricing structure and incentives; risk identification and mitigation; environmental, social and land issues; private sector consultation forum; etc.), including recommendations for short and medium term actions, to be presented in an Approach Paper; (ii) a private sector consultation forum in May 2016 to gather direct feedback from potential developers and financiers on the main issues identified; and (iii) specific consultancies to address some of the main short and medium term needs identified, to be agreed with the GoK. The final Geothermal Strategy document will also include an investment plan for subsequent development of the known geothermal fields in Kenya. Specific dissemination activities on the Geothermal Strategy will be supported in coordination with the GoK.

33. A summary of the IDA and GPOBA financing under the KEEP and the proposed AF is shown in the table below.

Table 2. KEEP Summary of IDA and GPOBA Financing (US$ million)

Component	Original IDA Credit	Original GPOBA Grant	AF IDA Credit	Additional GPOBA Grant	TOTAL
A. Geothermal Generation	117.82	0.0	53.20	0.00	171.02
B. Transmission	59.00	0.0	0.00	0.00	59.00
C. Distribution	147.00	5.15	10.50	3.00	165.65
D. Sector Institutional Development and Operational Support	6.18	0.00	4.30	0.00	10.48
Total	**330.00**	**5.15**	**68.00**	**3.00**	**406.15**

III. PROPOSED CHANGES

Summary of Proposed Changes

This Project Paper proposes additional financing in the amount of a US$68 million IDA credit plus a US$3 million GPOBA grant to the KEEP to finance: (i) cost increases related to the Olkaria I and IV steamfield developments contract under Component A; (ii) expanded investments in slum electrification under Component C; and (iii) increased support for technical assistance and capacity building under Component D. Disbursement estimates, components and costs, and the implementation schedule are revised to reflect the AF. The project results framework is also updated to reflect the expanded scope of investments.

Change in Implementing Agency	Yes [ ] No [X]
Change in Project's Development Objectives	Yes [ ] No [X]
Change in Results Framework	Yes [X] No [ ]
Change in Safeguard Policies Triggered	Yes [ ] No [X]
Change of EA category	Yes [ ] No [X]
Other Changes to Safeguards	Yes [X] No [ ]
Change in Legal Covenants	Yes [ ] No [X]
Change in Loan Closing Date(s)	Yes [ ] No [X]
Cancellations Proposed	Yes [ ] No [X]
Change in Disbursement Arrangements	Yes [ ] No [X]
Reallocation between Disbursement Categories	Yes [ ] No [X]
Change in Disbursement Estimates	Yes [X] No [ ]
Change to Components and Cost	Yes [X] No [ ]
Change in Institutional Arrangements	Yes [ ] No [X]
Change in Financial Management	Yes [ ] No [X]

Change in Procurement	Yes [ ] No [X]
Change in Implementation Schedule	Yes [X] No [ ]
Other Change(s)	Yes [ ] No [X]

Development Objective/Results

Project's Development Objectives

Original PDO

The project has two development objectives:
(a) increase the capacity, efficiency, and quality of electricity supply; and
(b) expand access to electricity in urban, peri-urban, and rural areas

Change in Results Framework

Explanation:

The results framework is updated to include two new indicators:

- At PDO level: New slum consumers connected to the grid (number).
- At intermediate level: KPLC conducts an annual customer satisfaction survey for slum consumers. KPLC will take customer feedback into account and the results of this survey will be used by KPLC to inform its slum electrification program and consumer marketing plans.

A number of refinements to the results framework were approved in the recently completed level two restructuring of KEEP. The full results framework is presented in Annex 1.

Compliance

Other Changes to Safeguards

Explanation:

An updated Environmental and Social Management Framework (ESMF) has been re-disclosed for the slum electrification component on KPLC's web site on April 19, 2016 and at the World Bank Infoshop on April 21, 2016.

Conditions

Source Of Fund	Name	Type
IDA	Subsidiary Loan Agreements, Article V, 5.01	Effectiveness

Description of Condition

The Subsidiary Loan Agreements have been executed on behalf of the Recipient and the Project Implementing Entities.

Source Of Fund	Name	Type
IDA	Financing Agreement, Schedule 2, Section IV, B.1	Disbursement

No withdrawal shall be made for payments made prior to the date of this Agreement, except that withdrawals up to an aggregate amount not to exceed 4,800,000 SDR equivalent may be made for payments made prior to this date, but on or after June 1, 2016, for Eligible Expenditures under Category (1).

Source Of Fund	Name	Type
GBOPA	Grant Agreement, Article V, 5.01-5.03	Effectiveness

Description of Condition		
(a) The execution and delivery of this Agreement on behalf of the Recipient has been duly authorized or ratified by all necessary corporate action. (b) If the World Bank so requests, the condition of the Recipient, as represented or warranted to the World Bank at the date of this Agreement, has undergone no material adverse change after such date.		
Source Of Fund	**Name**	**Type**
GBOPA	Grant Agreement, Schedule 2, Section III B 1(b) and 2.	Disbursement

Description of Condition
No withdrawal shall be made for: (a) for payments made prior to the date of this Agreement; and (b) payments under Category 1 unless a Verification Report satisfactory to the World Bank has been received from the Recipient. Withdrawals for expenditures under Category 1 shall be made upon verification of new and functional electricity connections to eligible consumers.

Risk

Risk Category	Rating (H, S, M, L)
1. Political and Governance	Moderate
2. Macroeconomic	Moderate
3. Sector Strategies and Policies	Moderate
4. Technical Design of Project or Program	Moderate
5. Institutional Capacity for Implementation and Sustainability	Moderate
6. Fiduciary	Moderate
7. Environment and Social	Substantial
8. Stakeholders	Moderate
9. Other	
OVERALL	Moderate

Finance

Loan Closing Date - Additional Financing (Additional Financing: Kenya Electricity Expansion Project - P153179)

Source of Funds	Proposed Additional Financing Loan Closing Date
Global Partnership on Output-based Aid	31-Dec-2017
International Development Association (IDA)	31-Dec-2017

Change in Disbursement Estimates (including all sources of Financing)

Explanation:

Disbursement estimates for the IDA AF credit and the GPOBA grant are shown in the table below. Disbursement estimates are updated to reflect the expanded scope of investments and to take into account the recently approved new closing date.

Expected Disbursements (in USD Million)(including all Sources of Financing)

Fiscal Year	2017	2018
Annual	58.00	13.00

Cumulative	58.00	71.00

Allocations - Additional Financing (Additional Financing: Kenya Electricity Expansion Project - P153179)

Source of Fund	Currency	Category of Expenditure	Allocation	Disbursement %(Type Total)
			Proposed	Proposed
IDA	XDR	(1) Works, Goods and Consultants' Services under Parts A and D5 of the Project.	38.95	100.00
		(2) Works, Goods, and Consultants' Services under Parts C and D4 of the Project	7.55	100.00
		(3) Consultants' Services and training under Parts D1, D2, D3 and D6 of the Project.	1.50	100.00
		Total:	48.00	
GPOBA	USD	(1) Connection Fees	3.00	100.00
		Total:	3.00	

Components

Change to Components and Cost

Explanation:

The proposed activities under the AF will be linked to the existing KEEP components A, C, and D as described below.

- ***Component A: Geothermal Generation (IDA US$53.2 million equivalent)***. The AF will support the cost increase in the contract for Olkaria I and IV steam gathering and distribution system works. The contract is between the implementing agency, KenGen, and the contractor, Sinopec International Petroleum Service Corporation, of Beijing China.

- ***Component C: Slum Electrification (IDA US$10.5 million equivalent and GPOBA US$3 million).*** Additional IDA and GPOBA funds will support, through an output-based mechanism, the connection of an additional 54,000 low-income households in Kenya's slums. Current implementation arrangements will be maintained. The level of IDA subsidy will be reduced from US$250 to US$195 per connection while the level of GPOBA subsidy will be reduced from US$125 to US$55 per connection. The areas of proposed slum electrification across the country are presented in Annex 3.

- ***Component D: Sector Institutional Development and Operational Support (IDA US$4.3 million equivalent).*** The AF will support four major activities:
  (i) Capacity building on environmental and social safeguards to support relevant sector entities, including KETRACO, KenGen, MoEP, REA and KPLC, to enhance staff skills related to

environmental and social safeguards through various training opportunities (e.g., twinning arrangements with other utilities, participation in specialized courses, etc.) as well as to support implementation of remedial actions that are expected to emerge from the mediation process and action plan under the KEEP Inspection Panel case. This activity, estimated at US$1.8 million, will be managed by MoEP

(ii) Capacity building on health and safety to include measures to ensure that the safety and health track record at KenGen, KPLC, KETRACO, GDC and REA at the plant and associated construction sites are enhanced to meet best international standards. This activity will involve actions to enable all previous violations of occupational and community health and safety standards to be quickly resolved to the satisfaction of KenGen, KPLC, KETRACO, and REA, NEMA, and the Ministry of Labor; and activities to enhance the capacity of the agencies' environmental health, safety, and security teams. This activity, estimated at US$0.3 million, will be managed by MoEP

(iii) Monitoring and evaluation system for slum electrification to include a consumer awareness campaign, establishment of a feedback system, and launch of a beneficiary assessment for slum consumers. This activity, estimated at US$0.2 million, will be managed by KPLC.

(iv)Feasibility Study for Olkaria VII covering geothermal resource assessment/confirmation for 140 MW power plant and the associated infrastructure concept design, topographical survey, geo-survey investigations, geotechnical investigations, Environmental and Social Impact Assessment Project Report Study, power evacuation study, risk analysis and mitigation, economic and financial analysis and bidding documents. This activity, estimated at US$2 million, will be managed by KenGen.

Current Component Name	Proposed Component Name	Current Cost IDA & GPOBA (US$M)	Proposed Cost IDA & GPOBA (US$M)	Action
Geothermal Generation	Geothermal Generation	117.82	171.02	Revised
Transmission	Transmission	59.00	59.00	
Distribution	Distribution	147.00	160.50	Revised
Sector Institutional Development and Operational Support	Sector Institutional Development and Operational Support	6.18	10.48	Revised
	Total:	330.00	401.00	

Other Change(s)

Implementing Agency Name	Type	Action
KENYA POWER AND LIGHTING COMPANY	Implementing Agency	No Change
Rural Electrification Authority	Implementing Agency	Change
KENGEN	Implementing Agency	No Change
Ministry of Energy and Petroleum	Implementing Agency	No Change
The National Treasury	Implementing Agency	Change

Change in Implementation Schedule

Explanation:

To allow sufficient time to ensure the completion of project activities included in this AF, the project

implementation schedule has been updated to reflect the closing date of December 31, 2017. KenGen, KPLC, and MoEP are the implementing agencies for KEEP AF.

Appraisal Summary

Economic and Financial Analysis

Explanation:
Rationale for public funding: The Bank has consistently supported geothermal generation in Kenya over the last decades and Kenya is now considered a leader in geothermal development. Typically, geothermal generation is risky and globally, public resources have been dominant. Under KEEP, the World Bank, along with other financiers, supported the addition of 280 MW of geothermal energy into the grid[14], diversifying the energy mix and enhancing the contribution of renewable energy. Public funds, however, will not meet the growing needs of the geothermal sector in Kenya. The World Bank supported National Geothermal Strategy, will emerge with recommendations on policies and regulations to establish a more private sector friendly enabling environment to harness the huge investment resources required for scale-up of geothermal as a baseload energy up to 2035.

Public provision of basic infrastructure and services in urban cities and their vulnerable neighborhoods in SSA's Lower Middle Income countries is critical for a number of reasons: (i) rapid urbanization is often associated with gaps and disparities in basic services and infrastructure, thereby justifying the continuation of public financial support in the urban development sector; (ii) despite the responsibilities transferred to urban utilities for the provision of basic public services such as electricity or potable water supply, these entities usually do not have commercial incentives to assume their mandate in slum settlements; (iii) the absence of public involvement in these areas--which often comprise the largest percentage of a city's population— usually leads to the development of informal sectors and the resurgence of security issues, justifying public sector intervention. In Kenya where all the above mentioned urban development issues are concentrated, the noticeable good results of the original project are a clear demonstration that multi-sectoral collaboration along with strong commitment and involvement of public sector and related agencies can help to increase sustainable generation and scale up access to basic public infrastructure and services in slum neighborhoods. The AF aims to build on these results and expand its support to GoK efforts to promote sustainable development and increase access to electricity to people living in informal settlements.

World Bank's value added: The World Bank's added value is its significant capacity building and technical expertise, its coordination support, and its ability to channel globally-gained knowledge towards the provision of geothermal energy and urban infrastructure and services in vulnerable urban settlements.

Economic and financial analysis: An economic and financial analysis has been carried out to assess the economic and financial viability of the AF. Economic and financial internal rates of return (EIRRs and FIRRs) and net present values (NPVs) by component are calculated using a standard cost-benefit methodology. The economic evaluation is restricted to the project activities that generate benefits for which an economic value can be clearly identified and measured, notably benefits associated with investments under components A and C. Component D is excluded because of the difficulty in valuing the outcomes of technical assistance. The updated economic analysis shows that the generation component (Component A) largely exceeds the recommended thresholds, with a NPV of US$1,148 million (with a six percent discount rate) and an EIRR of 13 percent. This EIRR is smaller compared to the one estimated originally for the KEEP (23 percent). However, this is largely explained by a decrease in the estimated long-run marginal cost of electricity for the system rather than by the impact of the cost overruns. For the slum electrification component (Component C), the NPV of the AF scale up is estimated at US$97.8 million (with a six percent discount rate) with an EIRR of 27 percent.

[14] Olkaria I units 4 and 5 (140 MW) and Olkaria IV (140 MW)

The updated utility financial analysis of KenGen shows that KenGen has been able to maintain profitability. According to the modelling results, KenGen should have enough liquidity to pay its immediate obligations (current liabilities) in the medium term (i.e., through 2020) as the current ratio points at values higher than 1.00 (or marginally below in 2018). The year 2018 is the most critical, as by that time KenGen will have accounted for all the new borrowings in its balance sheet. From 2019 the improvement in the financial ratios is due to the reduction of capital investments resulting in increasing current assets available to the company. The Debt Coverage Ratios suggest that KenGen's operating earnings should be able to meet its financial interest payments in the following years, with the Interest Coverage Ratio always well above 2.0, the Self Financing Ratio rising to over 100 percent in 2020, and the Debt Service Coverage Ratio remaining above 1.2 during the period analyzed. The detailed analysis, including a table summarizing the ratios, is included in Annex 2.

The updated financial analysis for the slum electrification component shows a positive NPV of US$7.5 million (at 12 percent discount rate) and the 15 percent FIRR. Therefore, the project is financially viable in spite of the increase in connection costs mentioned above. The sensitivity analysis demonstrates that "all else being equal" the project financial sustainability would be undermined if operating and maintenance costs were to increase beyond 76 percent (switch value). Finally, when judging the above financial indicators with regard to the project financial sustainability, it should be noted this latter would be affected by many factors that could not be fully captured in this analysis, such as the impact on electricity demand of multiple productive uses of energy by households and small businesses in the targeted slum settlements.

The full details of the updated economic and financial analysis is included in Annex 2.

Technical Analysis

Explanation:

Component A (Geothermal Development). This component will support the cost increase of US$53.2 million already incurred under the steamfield developments contract. This cost variation was expected and incorporated in the contract design because of the uncertainty at the time of contract signature of the final location of geothermal wells and their characteristics. In addition, the decision by KenGen to construct some pressure let down stations in December 2013 in order to mitigate risks of silica scaling in the pipes was discussed with the Bank during implementation support missions. The cost increase emerged from three sources mentioned above and further elaborated below.

Increases of Bills of Quantity Items due to Re-measurement (US$25 million equivalent):
The steam gathering and distribution system contract was a re-measure contract. At the time of the procurement of the contract, the actual quantities of the works to be executed under the contract could not accurately be defined. At that point in time, only about 40 percent of the required number of wells had been drilled while drilling works for the rest were in progress. The design, associated technical specifications, and bills of quantities (BOQs) in the tender documents were, therefore based approximately on 40 percent of proved steam capacity from the drilled wells and the balance were based on estimated quantities premised on crucial parameters such as number of wells, their location, and characteristics. The BOQs in the contract provided unit rates and estimation of quantities of materials to be used for each item. As is the practice, the contract provided that during implementation the employer through their supervising engineer would progressively design and issue the remaining designs and instructions for construction as the data from wells drilled became available. The contractor would then execute the works based on the instructions for construction received. The employer was obligated to provide all the instructions for construction to the contractor at least ten months prior to the expected contract completion date so as to enable the contractor to procure the equipment and complete the works within contractual schedule

As drilling progressed, some of the well sites assumed in the feasibility report and technical specifications and BOQs in the tender documents were found unsuitable. Thus the positions of some production and reinjection wells changed as drilling progressed. This resulted in a difference between the estimates used in the tender document BOQs (which are also the BOQs in the original signed contract) and instructions for construction designs. As the sites are located in the Hells Gate National park, changes in the location of the wells necessitated changes in the number of animal crossings.

Additional Works (US$17.4 million equivalent):
Additional works were identified during the execution of the project that were over and above the original scope of works. These works could not be foreseen at the time of the project design and were not part of the re-measurements. The additional works were covered under seven variation orders agreed between KenGen and the contractor in accordance with Clause 13 of the contract and included: (a) road maintenance; (b) pipe bench; (c) additional costs of air freight; (d) additional fencing; (e) installation of pressure let-down stations at Olkaria I and Olkaria IV plants and at the north east fields; (f) additional works inside the Olkaria IV and Olkaria I Power Plants; and (g) additional cladding. The prices of the additional works were established in accordance with the provisions of the contract. Of these additional works, six variation orders were less than 25 percent of the total and below US$1 million each. The variation order for the pressure let down system was the major additional cost item (approximately US$13.1 million, or 75 percent of the variations).

KenGen commissioned Mannvit Engineering of New Zealand to carry out an optimization study in 2012 following change of wells drilling practice from the shallow drilling of under 2,000 meters to deep well drilling of up to 3,000 meters. The optimization study assessed the impact of deeper-well drilling on the field and plant operations. The optimization study found that there was a high risk of silica scaling in the pipelines if the steam field was operated at the initially design pressures of pressure of 5.2 bars (six bar system) for Olkaria IV and 4.2 bars (five bar system) for Olkaria I, which was based on shallow drilling. The optimization study recommended an optimal steam field operating pressure of 13 bars to mitigate the problem. Silica scaling is the deposition of silica solids along the surface of the pipes leading to accumulation and eventual blockage of pipe passage to fluids (steam and brine) resulting in their replacement, the disruption of the plant operation, and the consequent loss of revenue and curtailment of power supplies to the system.

At the time the optimization study was being considered, the power plant contractor had already designed and placed orders for the turbine manufacture based on the lower pressures for Olkaria IV and Olkaria I units per the original West Japan feasibility study report. The supervising consultant had also progressed on design and issued for construction more than 60 percent of the drawings. Procurement of the steam-field equipment and materials was also in progress based on previously issued instruction for construction drawings.

After analyzing options available to address the situation that included discussions with Geothermal Board of Consultants, KenGen was resolved to maintain the design of the power generation system and invest in three steam let down stations to reduce the steam supply pressure before interface with the power plant. The pressure let down stations were constructed at Olkaria I and Olkaria IV power plants at the North-East steam field. A pressure let down station essentially is an in-line valve mechanism positioned after the separators, plus associated equipment that is able to constrict steam flow and build higher pressure backwards in the steam field (at 13 bars) and at the same time reduce the pressure downstream towards the turbine to six bars and five bars, respectively, avoiding the pipes scaling up all the way to the turbines.

The implication therefore of the adopted pressure increase of the field operation was that the new steam-field design would result in an overall requirement of upgrading the steam field pipes and material

schedules/gauges to withstand the expected high pressure of 13 bars.

The pressure let-down variation order cost was estimated at about US$13.15 million equivalent. About 43 percent of the cost of the pressure let-down station was based on signed contract rates, while 14 percent was based on rates for "similar" items in the contract that did not require price negotiations; and 43 percent was determined based on new rates that were established in accordance with the methodology stated in the contract.

Price Escalation (US$10.7 million equivalent):
An additional amount of US$10.7 million is as a result of price escalation in accordance with the provisions of the contract. Nineteen payment certificates have been issued and paid from August 2012 to November 2014. The prevailing indices applicable for each payment certificate were extracted from the index source for the appropriate date as defined in the contract. A provisional sum has been added for the two invoices which are under process.

KenGen requested the Bank's no objection to increase the contract price for the steam gathering and distribution system on August 18, 2014 and December 1, 2015. The request was approved by the Bank on December 16, 2015. The approved increase in the currencies of the contract is as follows:

- **Original contract price**: KES 1,884,861,401.12+ CNY 517,545,025.11+ US$ 38,526,972.81 (an equivalent of US$139.0 million, at the exchange rate prevailing at bid evaluation on August 9, 2011),
- **Proposed increase in contract price:** KES 1,121,920,277.96+ CNY 131,412,714.15+ US$21,571,507.49 (an equivalent of US$53.2 million, at exchange rates of November 11, 2015).
- **Final contract price:** KES 3,006,781,679.08 +CNY 648,957,739.26+US$60,098,480.30 (an equivalent of US$191.5 million, at exchange rates of November 11, 2015).

Component C (Distribution). Overall the design for the scale-up of slum electrification will feature: (a) reduced electricity theft by using insulated low voltage (LV) connection cables which cannot easily be hooked onto; (b) lower technical losses due to reduced network loading of the LV lines; and (c) higher quality of electricity service as there will be reduced outages arising out of fuse blow-outs or transformer failures due to overloads.

Based on the experience KPLC gained from the ongoing GPOBA pilot, KPLC will continue expand slum electrification to connect approximately 54,000 additional households; the list of proposed areas to be connected is presented in Annex 3. KPLC will continue to use pre-payment meters and smaller transformers (25 KVA) that serve about 17 customers each. KPLC will penetrate the slum areas using only single phase transformers erected on single concrete poles since they have low installation costs in terms of transportation, labor and maneuverability. No new LV network will be constructed and only insulated service cables will come from the transformer installation. The small number of customers per transformer will create a sense of ownership to the transformer, enhancing the distribution system security from people intending to steal power or vandalize the transformer. The use of small size transformers will limit large affected areas if and when it fails.

Due to lack of wayleaves into most slum interiors, the proposed 11 KV high voltage network will use fully insulated Aerial Bundles Cables. On the main streets where there are adequate wayleaves, the conventional bare conductor will be used. Use of insulated cables, though slightly expensive, will offer safe clearances to the houses and limits possible electric shocks and fires. The 11 KV Aerial Bundles Cables will over-fly the

households. Concrete poles will be used because they will not catch fire and can be installed right inside the households. They will not rot with time and hence will not require to be replaced. The concrete poles reduce maintenance costs as they have a life span of more than 35 years. The top of each pole will also house one half of the "split" meters for each household (individual meters for each household). The other half of the meter will be part of a ready board installed in the house. The ready boards are well suited for slum settlements because they are low cost and do not require household wiring. Each board contains a light and an alternating current socket for plugging in appliances. With regards to the illegal connections already in the areas, disconnection of all illegal lines should be done hand in hand with the installation of the small size transformers and removal of the LV network so that those disconnected customers ready to pay are connected at the same time to the KPLC system instead of reverting to cartels. The areas of proposed slum electrification projects are presented in Annex 3.

Fiduciary Analysis

Explanation:

Procurement. Procurement will be carried out in accordance with World Bank's "Guidelines: Procurement of Goods, Works and Non-Consulting Services under IBRD Loans and IDA Credits & Grants by World Bank Borrowers" dated January 2011, Revised July 2014 (and replaces the one dated May 2004 revised October 2006) and "Guidelines: Selection and Employment of Consultants by World Bank Borrowers" dated January 2011, Revised July 2014 (and replaces the one dated May 2004 revised October 2006), and the provisions stipulated in the Financing Agreement. The project will be carried out in accordance with the provisions of the "Guidelines on Preventing and Combating Fraud and Corruption in Projects financed by IBRD Loans and IDA Credits and Grants" dated October 15, 2006 and revised in January 2011. Procurement methods to be applied to project goods, works and consulting services are provided in the Procurement Plan discussed and agreed during the negotiations, including the circumstances under which the methods may be used. The procurement risk of the AF is rated moderate. A General Procurement Notice including the proposed new activities will be published on the United Nations website and on the Bank's external website by June 30 2016.

Financial Management. MoEP, KPLC, KenGen, and REA are currently implementing components of the ongoing KEEP. The financial management implementation arrangements will remain the same as under the original credit except that REA will not be an implementing entity for the AF. The Bank's financial management team conducted a desk review of the financial management arrangements of MoEP, KenGen, and KPLC. MoEP, KPLC, and REA are also implementing the KEMP, which became effective in 2015. MoEP is also implementing the Kenya Petroleum Technical Assistance Project (P145234). There are no overdue audit reports from these entities. All the four entities received unqualified (clean) audit opinion. However, there were key issues included in the management letters that need to be addressed, these included: underutilization of budget due to delays in implementation, incurring training costs beyond the amount approved in the No Objection. The entity concerned has since refunded excess cost over and above the No Objection Approval.. The Bank's Financial Management Specialist will continue monitoring financial management arrangements and will work closely with fiduciary agents like the Kenya National Audit Office and Internal Audit Department of National Treasury. The financial management residual risk rating for the AF implementing entities is assessed as moderate. The proposed financial management arrangements meet the minimum requirements for financial management under OP/BP 10.00.

Social Analysis

Explanation:

Component A (Geothermal Development): There are no new investments under Component A of the AF and as such there will be no displacement of communities or acquisition of land and assets. OP 4.10

(Indigenous Peoples) was triggered under the original project (KEEP, P103037) because of the possible presence of hunter-gather groups, such as the Sengwer, Ogiek, Waata, and Boni. During implementation of the original project it was confirmed that these groups were not present in the project area, which is the same area to which the AF applies. The Indigenous Peoples Planning Framework prepared under the original project did not apply to the Maasai due to then-prevailing interpretations of the scope of OP 4.10 to hunter-gatherer groups only. Since early 2013, the Bank and the GoK have agreed to application of the policy to the Maasai for subsequent operations. For this AF, however, OP 4.10 is not triggered because: (a) the AF under Component A only finances cost overruns for investments already made under the original project, and hence does not entail an expansion of the project footprint or new social impacts; (b) the resettlement and livelihood impacts on the Maasai who were affected by the original project (including those investments that involved cost overruns covered by this AF) have been addressed through the design and implementation of the original project's Resettlement Action Plan (RAP); (c) the RAP was prepared fully taking into account key principles of OP 4.10, including informed and culturally-appropriate consultation, culturally-appropriate design of resettlement of the Maasai and other project affected persons, and security of community land rights. Furthermore, in accordance with Management's recommendation to the Board in response to the Inspection Panel report, outstanding issues related to the resettlement are currently being addressed through a mediation process (described above in paragraph 21 and 22) that is expected to produce an agreed Action Plan by June 2016. KenGen is responsible for implementing the Action Plan presently being prepared.

Component C (Distribution): The construction of transformers and distribution lines will not result in acquisition of land. In the rare event of any displacement or loss of livelihood, the project will prepare action plans in line with the updated KEMP ESMF.

Environmental Analysis

Explanation:

The safeguards category of the parent project (KEEP, P103037) is A, Full Assessment, due to the significant and potentially irreversible adverse environmental impacts of the geothermal installations at Olkaria within the Hells Gate National Park. The following safeguard policies were triggered under the KEEP: OP 4.01 Environmental Assessment; OP 4.04 Natural Habitats; OP 4.10 Indigenous Peoples; and OP 4.12 Involuntary Resettlement. As described above, OP 4.10 will not be triggered for the AF.

Component C (Distribution) is focused on slum electrification, the key environmental issues of which are largely related to safety, given the urban setting of these projects. A key component is communication -- the need to raise awareness among local communities to avoid climbing poles, using electrical cables for alternative uses, to report fallen cables, etc. The replacement of the existing, largely illegal connections in informal settlements with insulated cable, the installation of meters on the top of poles, and the use of cement poles already reduces the fire and safety risks inherent in illegal connections. These risks include the use of non-insulated cables, using tin roofs for conductivity, stringing cable underground leading to electrocution during floods, etc.

The implementing agency, KPLC, will continue to stress the importance of the consistent use of Personal Protective Equipment. KPLC will apply the ESMF prepared for the ongoing KEMP peri-urban electrification component, given that the nature of the investment works is similar, the only significant difference being that the slum electrification takes place in informal settlements and the method of metering employed is different. The ESMF contains an environmental social screening process and includes environmental guidelines for contractors. If it is determined through the screening process that any sub-projects would require a full environmental assessment, NEMA approval will be sought before commencement of detailed design to ensure that good practices are included in the technical design. The

ESMF will serve as the environmental safeguards document in cases where a full environmental assessment is not deemed necessary based on the findings of the screening. The ESMF also requires that all construction materials (in particular wooden poles treated with creosote) are sourced from firms that have undergone a satisfactory environmental impact assessment (EIA)/audit and have received NEMA approval. The ESMF has been re-disclosed under the proposed AF on KPLC's web site on April 19, 2016 and at the World Bank Infoshop on April 21, 2016.

Site-specific Environmental Management Plans will be prepared for each batch of electrification works undertaken under the slum electrification component, and consultations to include safety awareness training will be undertaken with local communities prior to the commencement of works. With respect to social safeguard issues, the construction of transformers or the distribution lines will not result in acquisition of land, in the event of any displacement or loss of livelihood, the project will prepare action plans per the existing Resettlement Policy Framework.

Component D (Technical Assistance) includes the preparation of a feasibility study for a 140 MW geothermal project, Olkaria VII. KenGen has confirmed that Olkaria VII is located outside the perimeters of Hells Gate National Park. Also, KenGen will confirm the location of associated wells and the geothermal steam field system, including pipelines both for steam gathering, brine and condensate reinjection, and steam separators. KenGen was required to undertake a Strategic Environmental Assessment (SEA) for the Olkaria Geothermal Field as one of the conditions for the approval of the Environmental and Social Impact Assessment (ESIA) for drilling additional geothermal steam production wells in Olkaria as agreed with NEMA through a letter dated July 24, 2012. This SEA, completed in 2014, recommended that the high-use, non-concession area, the closed area, and the low-use area of Hells Gate National Park and the Gorge south of the National Park should be protected. The aim is to prevent any further impacts on the scenery or the wildlife by future geothermal developments, thereby complying with the Memorandum of Understanding between KenGen and Kenya Wildlife Service. Should any of Olkaria VII's associated infrastructure be located in a low use zone, it may be possible to identify mitigating measures, such as identifying and setting aside an offset area of equivalent ecological importance, or designing pipeline routing to avoid wildlife corridors. This activity will include an ESIA as part of the feasibility study to ensure compliance with World Bank and NEMA policies.

Borrower capacity in implementing safeguards. As part of the KEMP, a review was undertaken of EIAs prepared by KPLC for electricity infrastructure of similar nature to those planned under the proposed AF. These EIAs were prepared in line with Kenyan environmental regulations and the Environmental Framework documentation of the Bank that is used as a guideline in assessing environmental compliance and screening of sub-projects. The EIAs were generally of good quality. KPLC will need to ensure, as a standard practice, that timely and informed consultation with stakeholders is undertaken early in the project preparation process and during implementation to seek citizen feedback at regular intervals. The consultations should be adequately documented and KPLC responses should be publicly available. Any grievances from stakeholders should be recorded and responded to in a timely manner.

Under Component D, Sectoral Institutional Development and Operational Support, the relevant Kenyan sector entities, KETRACO, KenGen, KPLC, and REA, will be provided with an opportunity to enhance their skills and gain in-depth training at utilities with good environmental and social risk management practices, and would have access to specialized courses related to environmental and social safeguards. Activities are likely to include undertaking benchmarking exercises with utilities in other countries, such as ESKOM, Power Grid India, and Electricite de France. "Shadowing" environment and social teams at utilities as they undertake the preparation and consultation process for complex projects would enable the Kenyan teams to learn best practice and state-of-the-art environmental and social/resettlement management practices, and discuss how best to adapt them to the Kenyan context and experience.

Sector entities could also attend specialized training/courses in the preparation of SEAs and Cumulative Impact Assessments, now required by both NEMA and the World Bank. Courses in biodiversity protection and avian protection measures during construction of transmission lines are also a high priority, as are courses in safe labor practices, and environmental and community health and safety.

Risk

Explanation:

As shown in the risk table, the overall risk rating of the AF (as with the original project) is moderate. All risks are considered moderate with the exception of the "Environmental and Social" risks, which are rated substantial. The risks in this area are being managed as part of the ongoing mediation described above.

Climate and Disaster Risks: The AF has been screened for risks related to climate change and disaster risk management. Projected temperature increases may impact Component A due to decrease of power plant efficiency resulting from higher temperatures of cooling water. Climatic events, such as floods, may decrease fuel availability, which may impact on proper functioning of power plants. Also, precipitation change may impact on the quality of coal by affecting its moisture content. The design of the power stations planned under Component A have addressed these risks by improving the robustness of installations to withstand extreme events may become critical. At the same time, the use of renewable energy will lead to greenhouse gas (GHG) reductions that are expected to reduce the climate and disaster risks in the long-term (see Annex 2 for the GHG accounting analysis). Locations chosen are in areas with lower risk of flooding and other extreme weather conditions. The climate risks have limited impact on the transmission and distribution components.

V. WORLD BANK GRIEVANCE REDRESS

34. Communities and individuals who believe that they are adversely affected by a World Bank (WB) supported project may submit complaints to existing project-level grievance redress mechanisms or the WB's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaint to the WB's independent Inspection Panel which determines whether harm occurred, or could occur, as a result of WB non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank's attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank's corporate Grievance Redress Service (GRS), please visit http://www.worldbank.org/GRS. For information on how to submit complaints to the World Bank Inspection Panel, please visit www.inspectionpanel.org.

ANNEX 1: RESULTS FRAMEWORK

Project Name:	Additional Financing: Kenya Electricity Expansion Project (P153179)		Project Stage:	Additional Financing	Status: FINAL
Team Leader(s):	Sudeshna Ghosh Banerjee	Requesting Unit:	AFCE2		
Product Line:	IBRD/IDA	Responsible Unit:	GEE01		
Country:	Kenya	Approval FY:	2016		
Region:	AFRICA	Lending Instrument:	Investment Project Financing		
Parent Project ID:	P103037	Parent Project Name:	Electricity Expansion (P103037)		

Project Development Objectives

Original Project Development Objective:

The project has two development objectives:
(a) increase the capacity, efficiency, and quality of electricity supply; and
(b) expand access to electricity in urban, peri-urban, and rural areas

Proposed Project Development Objective - Additional Financing (AF):

There is no change to the PDO under the AF.

Results

Core sector indicators are considered: Yes

Results reporting level: Project Level

Project Development Objective Indicators

Status	Indicator Name	Core	Unit of Measure		Baseline	Actual(Current)	End Target
No Change	People provided with access to	☐	Number	Value	0.00	10,733,505.00	11,000,000.00

	electricity by KPLC			Date	30-Jun-2010	30-Jun-2015	31-Dec-2017
				Comment			This indicator captures the number of people connected to the grid by KPLC during the project period; assumes 5 people per household.
New	New slum consumers connected to the grid	☐	Number	Value	120,000.00	120,000.00	174,000.00
				Date	30-Apr-2016	30-Apr-2016	31-Dec-2017
				Comment			Consumers are households.
No Change	Electricity losses per year in the project area	☒	Percentage	Value	16.30	17.51	15.90
				Date	30-Jun-2010	30-Jun-2015	31-Dec-2017
				Comment			The sub-indicators on non-technical and technical losses are not separately measured due to the lack of appropriate metering system.
No Change	Total net injected generation	☒	Megawatt hour(MWh) Sub Type	Value	0.00	1270.00	2020.00

			Supplemental				
No Change	1. Electricity generation from renewable generation capacity constructed under the project, net	☐	Gigawatt-hour (GWh)	Value	0.00	1270.70	2020.00
				Date	30-Jun-2010	30-Jun-2015	31-Dec-2017
				Comment			
No Change	3. Interruptions per 1,000 customers	☐	Number	Value	9.10	9.79	8.50
				Date	30-Jun-2010	30-Jun-2015	31-Dec-2017
				Comment			
No Change	5. Direct project beneficiaries (CORE)	☐	Number	Value	0.00	10733505.00	11000000.00
				Date	30-Jun-2010	30-Jun-2015	31-Dec-2017
				Comment			

Intermediate Results Indicators

Status	Indicator Name	Core	Unit of Measure		Baseline	Actual(Current)	End Target
No Change	Meters installed under the project	☐	Number	Value	0.00	255000.00	255000.00
				Date	30-Jun-2010	30-Jun-2015	31-Dec-2017
				Comment			
New	KPLC conducts an annual customer satisfaction survey for slum consumers	☐	Yes/No	Value	No	No	Yes
				Date		30-Apr-2016	31-Dec-2017
				Comment			
No Change	Community electricity connections constructed under the project	☒	Number	Value	0.00	6471.00	450.00
				Date	30-Jun-2010	30-Jun-2014	31-Dec-2017
				Comment			
No Change	Community electricity connections constructed –Grid	☒	Number Sub Type	Value	0.00	6471.00	450.00
				Date	30-Jun-2010	30-Jun-2015	31-Dec-2017

			Breakdown	Comment			
No Change	Distribution lines constructed or rehabilitated under the project	☒	Kilometers	Value	0.00	4452.00	2280.00
				Date	30-Jun-2010	30-Jun-2015	31-Dec-2017
				Comment			
No Change	Distribution lines constructed under the project	☒	Kilometers	Value	0.00	4452.00	2280.00
			Sub Type	Date	30-Jun-2010	30-Jun-2015	31-Dec-2017
			Breakdown	Comment			
No Change	Transmission lines constructed or rehabilitated under the project	☒	Kilometers	Value	0.00	76.00	334.00
				Date	30-Jun-2010	30-Jun-2015	31-Dec-2017
				Comment			
No Change	Transmission lines constructed under the project	☒	Kilometers	Value	0.00	76.00	334.00
			Sub Type	Date	30-Jun-2010	30-Jun-2015	31-Dec-2017
			Breakdown	Comment			
No Change	Generation Capacity of Renewable Energy (other than hydropower) constructed	☒	Megawatt	Value	0.00	280.00	280.00
				Date	30-Jun-2010	30-Jun-2015	30-Sep-2016
				Comment			Achieved.
No Change	Generation Capacity of Renewable Energy constructed - Other	☒	Megawatt	Value	0.00	280.00	280.00
			Sub Type	Date	30-Jun-2010	30-Jun-2015	30-Sep-2016
			Breakdown	Comment			Achieved.
No Change	Generation Capacity of Renewable Energy constructed-Geo-thermal	☒	Megawatt	Value	0.00	280.00	280.00
			Sub Type	Date	30-Jun-2010	30-Jun-2015	30-Sep-2016
			Breakdown	Comment			Achieved.
No Change	6. Generation capacity of renewable energy (geothermal)	☐	Megawatt	Value	0.00	280.00	280.00
				Date	30-Jun-2010	30-Jun-2015	30-Sep-2016

	constructed or rehabilitated under the project (CORE)			Comment			Achieved.
No Change	7. Transmission lines constructed or rehabilitated under the project (CORE)	☐	Kilometers	Value	0.00	76.00	334.00
				Date	30-Jun-2010	30-Jun-2015	31-Dec-2017
				Comment			
No Change	8. Distribution lines constructed or rehabilitated under the project (CORE)	☐	Kilometers	Value	0.00	4452.00	2280.00
				Date		30-Jun-2015	31-Dec-2017
				Comment			
No Change	9. Substations constructed or rehabilitated by KPLC under the project	☐	Number	Value	0.00	0.00	26.00
				Date		30-Jun-2014	31-Dec-2017
				Comment			
No Change	12. Community (public facilities) electricity connections provided under the project (CORE)	☐	Number	Value	0.00	6471.00	450.00
				Date		30-Jun-2015	31-Dec-2017
				Comment			
No Change	Community Center	☐	Number	Value	0.00	6471.00	450.00
			Sub Type	Date		30-Jun-2015	31-Dec-2017
			Breakdown	Comment			
No Change	13. Business electricity connections provided under the project (CORE)	☐	Number	Value	0.00	8692.00	15000.00
				Date		30-Jun-2015	31-Dec-2017
				Comment			
No Change	14. Roadmap for implementation of the wholesale electricity market is adopted by MoE	☐	Yes/No	Value	No	Yes	Yes
				Date		30-Jun-2015	30-Sep-2016
				Comment			Achieved.
No Change	15. Rural Electrification Master	☐	Yes/No	Value	No	Yes	Yes

	Plan (REMP) annually updated			Date		30-Jun-2015	30-Sep-2016
				Comment			Achieved.
No Change	16. Cost of service study completed one year before 2014 tariff review is launched	☐	Yes/No	Value	No	Yes	Yes
				Date		30-Jun-2015	30-Sep-2016
				Comment			Achieved.

ANNEX 2: ECONOMIC AND FINANCIAL ANALYSIS OF THE PROJECT COMPONENTS

1. This section presents the economic and financial analysis prepared for the AF. While the AF comprises three components (generation, distribution, and institutional and operational support), the economic evaluation is restricted to the project activities that generate benefits for which an economic value can be clearly identified and measured, notably benefits associated with investments under Components A (generation) and C (distribution). Component D (institutional and operational support) is excluded because of the difficulty in valuing the outcomes of technical assistance.

Economic Analysis

Component A: Generation

For the economic analysis of the generation component, the following assumptions have been updated as compared to the original project:

Item	Original Value	Update	Source / Comment
Capital expenditures	US$1,206 million	US$ 1,259 million	KenGen and WB; update figure includes US$ 53 million of AF
Operations and Maintenance expenditures	US$29.3 million/yr	US$20.9 million/yr	WB based on KenGen data
Sent out energy	2057 GWh/yr	2,178 GWh/yr	Actual generation figures for 2014; 2015-onwards, estimated based on 2015 actual values.
Value	0.21 US$/kWh	0.121 US$/kWh	Marginal system costs extracted from Medium Term Plan (Lahmeyer)

2. Based on the above assumptions, the economic analysis shows that the generation component largely exceeds the recommended thresholds, with a NPV of US$1,148 million (at six percent discount rate) and an EIRR of 13 percent, the main reduction in the economic benefits is caused by the decrease in the system marginal costs as per the newly developed Medium Term Expansion Plan (published by MoEP on September 2015). The table below presents the details of the economic analysis calculation.

Economic Analysis for the Generation Component

Year	Capital Expenditure	Fixed O&M	Production Wells	Hot Wells	Cold Wells	Drill Rigs	Variable O&M	Total Cost	Sent out energy	Value	Total Benefit	Net Benefit
	US$m	US$m	US$m	US$m	US$m	US$m	US$m	US$m	GWh	US$/kWh	US$m	US$m
2010	105.4							105.4				-105.4
2011	251.6							251.6				-251.6
2012	493.2							493.2				-493.2
2013	360.5							360.5				-360.5
2014	48.3	6.1					2.8	57.1	718.0	0.114	81.8	24.7
2015		12.1					8.5	20.6	2,178.0	0.114	248.1	227.5
2016		12.1	18.2	9.6		4.0	8.5	52.4	2,178.0	0.114	249.0	196.6
2017		12.1	30.3	6.4	2.6	4.0	8.5	63.9	2,178.0	0.107	232.9	169.0
2018		12.1	18.2	6.4	2.6	4.0	8.5	51.8	2,178.0	0.113	245.2	193.4
2019		12.1	6.1	3.2			8.5	29.9	2,178.0	0.121	263.7	233.8
2020		12.1	18.2	3.2			8.5	42.0	2,178.0	0.121	263.7	221.7
2021		12.1	18.2				8.5	38.7	2,178.0	0.121	263.7	224.9
2022		12.1	6.1				8.5	26.6	2,178.0	0.121	263.7	237.0
2023		12.1	6.1				8.5	26.6	2,178.0	0.121	263.7	237.0
2024		12.1	12.1	3.2			8.5	35.9	2,178.0	0.121	263.7	227.8
2025		12.1	6.1	3.2			8.5	29.9	2,178.0	0.121	263.7	233.8
2026		12.1	6.1				8.5	26.6	2,178.0	0.121	263.7	237.0
2027		12.1	6.1				8.5	26.6	2,178.0	0.121	263.7	237.0
2028		12.1					8.5	20.6	2,178.0	0.121	263.7	243.1
2029		12.1	6.1				8.5	26.6	2,178.0	0.121	263.7	237.0
2030		12.1					8.5	20.6	2,178.0	0.121	263.7	243.1
2031		12.1	6.1				8.5	26.6	2,178.0	0.121	263.7	237.0
2032		12.1					8.5	20.6	2,178.0	0.121	263.7	243.1
2033		12.1					8.5	20.6	2,178.0	0.121	263.7	243.1
2034		12.1	6.1				8.5	26.6	2,178.0	0.121	263.7	237.0
2035		12.1					8.5	20.6	2,178.0	0.121	263.7	243.1
2036		12.1					8.5	20.6	2,178.0	0.121	263.7	243.1
2037		12.1	6.1				8.5	26.6	2,178.0	0.121	263.7	237.0
2038		12.1					8.5	20.6	2,178.0	0.121	263.7	243.1
2039		12.1					8.5	20.6	2,178.0	0.121	263.7	243.1

	Original	Update
NPV in USD million @ 6% DR:		$1,148.1
NPV in USD million @ 12% DR:	$841.0	$120.1
Economic Internal Rate of Return (EIRR):	23%	13%

3. A switch analysis has been performed on two relevant figures – fix operations and maintenance costs and sent out energy – in order to evaluate the impact of higher maintenance values and lower generation on the ability of the project to generate economic benefits. The results are presented in the table below and as it can be observed that they demonstrated that the economic analysis is very resilient to a change in the future operation of the generation facilities.

Variable	Original figure	Switch value	Comment
Fix O&M	12.1 US$ million	141.9 US$ million	1071% increase on fixed O&M costs would be required to make the NPV=0
Sent out energy	2178 GWh/yr	1050 GWh/yr	52% decrease in yearly generation on the overall lifetime of the plant would be needed to make the NPV = 0

4. Finally, the economic analysis shows that, under the updated assumptions used for the AF, the project would be required to operate until 2022 (six more years than originally assumed) in order to exceed the EIRR threshold of six percent.

Component C: Slum Electrification

5. The original Slum Electrification project has achieved 40,323 connections, exceeding the revised target of 40,000 following the 2014 project restructuring. The additional IDA and GPOBA funding under the AF aims to build and expand on these strong results by providing electricity to 54,000 new slum households. At the end of implementation of this second phase, the slum electrification component would have provided electricity to about 94,000 slum households (equivalent to approximately 470,000 people). The economic and financial analysis of the additional funding (US$10.5 million IDA plus US$3 million GPOBA) is conducted under the same assumptions used for the original project. It assumes 30 percent of the targeted number of connections will continue to be conversions of illegal connections and the rest will be new connections. Similarly, five percent of the connections are expected to be businesses. All assumptions used in the economic analysis remain based on surveys or actual data provided by KPLC.

Key cost assumptions for slum electrification

Willing to Pay (WTP) slum households and businesses (weighted average)	1,009 Ksh/month
kWh consumption equivalent - non-electrified customers	29 kWh
WTP per kWh non-electrified	35 Ksh/kWh
Average tariff low consumption electrified households (in peri-urban areas)	6.13 Ksh/kWh
Peri-urban average consumption electrified customers	94 kWh/month
Annual increase in energy consumption (productive uses)	3%
O&M costs (including energy cost of KPLC)	3% of CAPEX
Exchange rate (February 2016)	1 US$ = 101.4Ksh
Unit connection cost of the original project	US$900/hh
Unit connection cost of the additional funding	US$1,000/hh
Slum user contribution to connection fee	US$10
KPLC contribution to connection fee	US$740
IDA contribution to connection fee	US$195
GPOBA contribution to connection fee	US$55

6. Based on the modeling assumptions and the methodology developed in KEEP, the economic benefits of the slum electrification can be estimated at US$267.44 per customer and year. The NPV of the project was calculated for the planned additional 54,000 connections using a six percent discount rate. Results of this analysis are summarized in the table below.

Results of the Economic Analysis

Nature of Project Investment	ORIGINAL PROJECT		ADDITIONAL FUNDING PROJECT	
	NPV (million $)	EIRR	NPV (million $)	EIRR
Slum Electrification Project	-	74%	$97.8	27%

7. The analysis indicates that the additional funding for electricity connections in slum settlements remains economically viable as exemplified by: (i) its EIRR, which is four times the six percent opportunity cost of capital; and (ii) the positive NPV. The large gap observed between the original project's EIRR and the additional funding is mainly explained by the conservative assumption on connection costs at the time of the original analysis.

8. Sensitivity Analysis. A sensitivity analysis was run for the following scenarios: (i) overestimation of willingness to pay (WTP) of non-electrified customers by 20 percent; and (ii) no increase of electricity consumption by connected households. The table below summarizes the results. In all cases, the project yields acceptable EIRRs and positive NPVs (at a six percent discount rate).

Sensitivity Analysis

Scenario	NPV (US$ million)	EIRR (%)
WTP of non-electrified households reduced by 20%	65.2	20%
No increase in consumption of electrified households	67.2	23%

Financial Analysis

Component A - Generation

9. The financial analysis under Component A is targeted to the financial performance of KenGen, the developer of Olkaria I units 4 and 5 and Olkaria IV, financed under the KEEP. KenGen is the main player in electricity generation in Kenya, with an installed capacity of 1,616.7 MW in 2015. Its core functions entail developing, managing and operating power generation plants in Kenya; the power generated is sold to KPLC, who is in charge of distributing and selling electricity to final customers. KenGen relies on various sources to generate electricity, ranging from hydro, geothermal, thermal, and wind. With an installed capacity of 820 MW, hydro represents 51 percent of the company's total generation; geothermal comes second, with a total of 509 MW (32 percent).

10. KenGen revenues rose by a compound average growth rate (CAGR) of 11 percent over the past five years, to reach US$260.8 million in 2015 (see Chart 1). Almost the entire sales growth is related to the geothermal capacity expansion: during 2015, Olkaria IV was

commissioned, together with the doubling of Olkaria I Units 4 and 5 capacity (overall, 300 MW additional capacity), and five new wellheads units (for a total of 22.5 MW).

11. Power revenues per MW installed increased by more than 20 percent, from US$143,000 in 2011 to US$161,000 in 2015. The performance was reached despite new geothermal plants not commissioned at the beginning of the year and the decline in the capacity factor for hydro and thermal units that were partially displaced by the new running geothermal capacity (see Chart 2).

Chart 1 – Power revenues/MW (Constant 2015 US$ million)

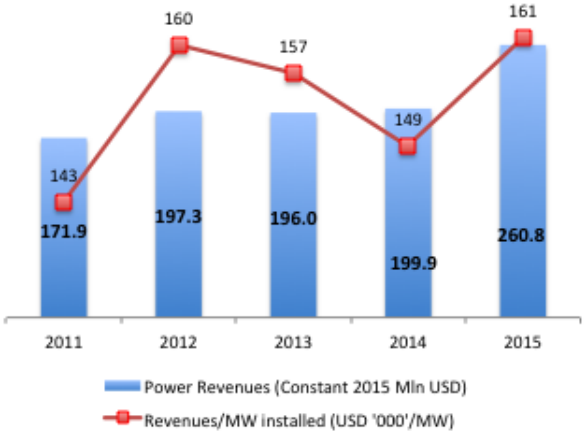
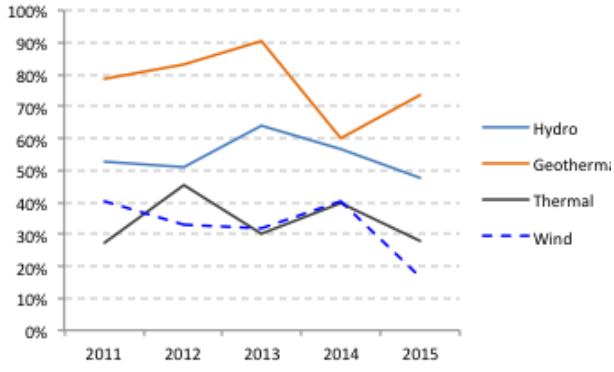


Chart 2 – Supply load factor (%)



Source: KenGen Annual Reports and World Bank.

12. Despite the massive capacity investments and the larger asset base, KenGen was able to keep the group profitability solid. This is particularly true for the net earnings and it can be substantially explained by the nature of the concessional borrowing used by the company, which allows a grace period and low interest rates that allowed for management of financial expenditures.

13. Earnings before interest, taxes, depreciations and amortizations (EBITDA) increased from US$115.6 million in 2011 to US$181.6 million in 2015 (+12 percent CAGR 2011-15), with EBITDA margin rising to almost 70 percent, or +230 basis points if compared to 2011 (see table below). Operating expenses (OPEX) increased by nine percent – in real US$ – on average per year, owing to the costs associated with operating and maintaining the newly completed plants. The combined effect of increasing units sold and control of cost efficiency resulted in an improvement in EBIT to US$115.5 million (a growth of 17 percent per annum) and in EBIT Margin, to 44.3 percent in 2015, from 35.4 percent in 2011.

14. On the other hand, net profits had a more erratic path. In 2015, it reached the record level of US$117 million (41 percent CAGR 2011-15), favorably impacted by tax credits from capital allowances, following the commissioning of the new geothermal plants, wellheads and Ngong wind power plant.

KenGen Revenues and Operating Profit (Constant 2015 US$ million)

US$ Mln	2011	2012	2013	2014	2015	CAGR 15/11
Total Revenues	175.2	203.3	203.1	207.4	267.2	11%
OPEX	-59.6	-83.1	-72.9	-80.5	-85.6	9%
EBITDA	**115.6**	**120.2**	**130.2**	**126.9**	**181.6**	**12%**
EBITDA Margin	67.3%	60.9%	66.4%	63.5%	69.6%	
Depreciation& Amortization	-54.7	-60.2	-54.6	-54.3	-66.0	
EBIT	**60.9**	**60.0**	**75.7**	**72.6**	**115.5**	**17%**
EBIT Margin	35.4%	30.4%	38.6%	36.3%	44.3%	
Net Profit before Taxes	**43.6**	**35.1**	**48.0**	**47.7**	**88.5**	**19%**
Taxes	-18.8	-15.1	14.3	-15.3	28.8	
NET PROFIT	**24.9**	**20.0**	**62.3**	**32.4**	**117.3**	**47%**

Source: KenGen Annual Reports and World Bank.

15. Since 2011, KenGen has significantly increased its investments in order to finance the development of new capacity. Over the past three years, the company invested approximately US$1.4 billion to expand its geothermal assets (notably, Olkaria IV and Olkaria I Units 4 and 5, in addition to five new wellheads units; see Charts 3 and 4).

16. Nonetheless, the Company's operating performance had a positive impact over the free cash flow generation and the net debt position during the period, despite the new loans issued to finance the investment plan. As Chart 3 shows, since 2011 the amount of capital expenditures has always exceeded the Company's EBITDA, which means that operative cash flow was not large enough to cover the rising investments in new infrastructures, therefore external financing has been required to close the financial gap.

17. As a consequence, the Group's total net debt[15] has risen from US$783 million in 2011 to over US$1.4 billion in 2015, with the Gearing ratio (equal to Net Debt on Shareholders' Equity) increasing up to 1.65 in 2014, from 0.94 in 2011. The Net Debt on EBITDA ratio[16] reached a critical level in 2014, suggesting that such a level of capex might not have been sustainable by the Company's own cash flow generation; this ratio has decreased in 2015 thanks to the commissioning of the geothermal power plants and the reduction in the level of new loans.

[15] Net debt is a metric that shows a company's overall debt situation by netting the value of a company's liabilities and debts with its cash and other similar liquid assets. It is equal to: Short Term Liabilities + Long Term Liabilities - Net Cash.

[16] This ratio gives indications on whether a company is or is not likely to be able to handle its debt burden and/or to take on the additional debt required to grow the business.

Chart 3 – Capex and Cash Flow Generation

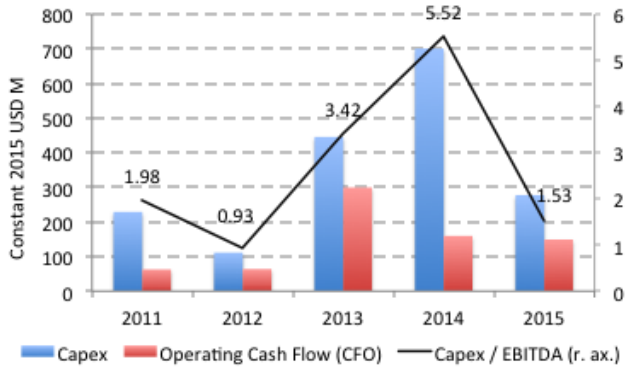
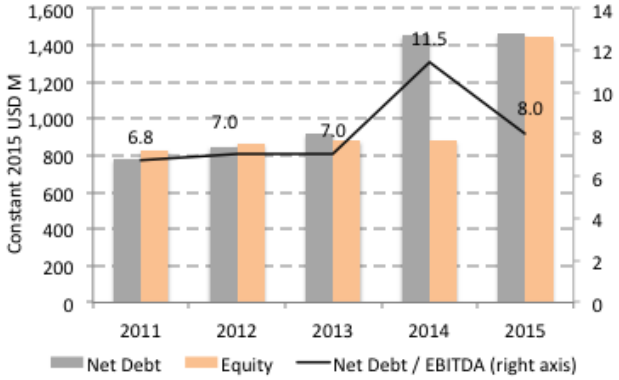


Chart 4 – Net Debt and Net Debt / EBITDA



Source: KenGen Annual Reports, The World Bank's elaborations.

18. KenGen enshrines the Country's Vision 2030 on energy supply targets, under MoEP's guideline, aiming at expediting development of new energy generation projects. In order to attain to the Vision 2030 objectives, since 2012 KenGen has undertaken a new expansion strategy and an ambitious investment plan with the following targets: (1) change the generation mix towards geothermal as a based-load renewable power source (and less volatile compare to hydropower); and (2) improve the Company's efficiency and reduce operating costs.

19. As a generation company, the main growth driver for KenGen is represented by capacity investments. According to the Company's strategic plan, by 2020, 390 MW additional installed capacity should be commissioned. The completion of the geothermal Olkaria V (140 MW) and Olkaria I Unit 6 (70 MW) and of 75 MW of new wellheads will add up a total of 285 MW by 2019. Further exploitation of the Olkaria area is expected to continue with the six MW expansion of the geothermal plant Olkaria I and the commissioning of Olkaria VI (140 MW); together with Meru wind power plant development in 2020, the total capacity expected for KenGen at the end of 2020 is at 1,926 MW. Based on these assumptions on capacity development, in 2020 KenGen units sold are expected to reach 7,760 GWh (+10.5 percent compared to 2015) on the back of the following factors: (i) a decrease in the geothermal capacity factor; (ii) the crowding out of the expensive diesel generation by the new geothermal and wind power capacity; (iii) the commissioning of the Ethiopia interconnector and the Lamu coal unit; and (iv) new geothermal from IPPs.

20. KenGen's financial performance and debt-carrying capacity is largely determined by electricity sales which are directly linked to the tariff formula included in the different PPA signed between KenGen and KPLC. As described by KenGen (the Bank team did not review the PPA), tariff charges are divided into capacity and energy charge, specific to the different generation sources.

21. The tariff formula has components which are escalable (inflation and FX devaluation adjusted) and some other components which are non-escalable (fixed in KSh, no adjustment allowed). However, the escalable part of the tariff formula does not allow a complete indexation for inflation. Nonetheless, KenGen is allowed to recoup the impact of the devaluation of specific cost components denominated in foreign currency (basically, debt repayment and fuel cost).

22. This tariff structure has some important financial implications for KenGen, the most important ones are: (i) despite the fact that the tariff provides some important components to be adjusted by foreign exchange devaluation, the rest of the components are not even inflation adjusted; thus, any deviation of the observed inflation with respect to the one used to calculate the tariff generates an impact on the project's rate of return; and (ii) the escalable part of the tariff formula does not recognize 100 percent pass-through of local inflation. This rule erodes revenues that KenGen requires to finance expenses that increases following the domestic inflation. This could be particularly relevant in the long term where the difference of accumulated inflation becomes very relevant.

23. The projected capital investment for the new power plants will necessarily put pressure on the KenGen's ability to generate free cash flow until 2020, together with the periodic repayment of the new borrowings for the development of operating activities. After 2016, cash flow from operations will only partially be able to cover the capital investments needs, dividend payments and borrowing reimbursement, thus making necessary to recur to external financing for operating activities' development. According to the Bank's projections, the repayment of existing debt capital share and dividends' payments, is seen to decline towards negative value in 2018. However, after 2020, free cash flow should go back to positive, generating extra funds to cover the financial charges and repay its debt obligations, with a favorable impact on the net cash.

KenGen Selected Financial Ratios

	2014	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**Target**
Financial Covenants:								
Current Ratio	1.10	0.95	1.25	1.07	0.94	1.09	1.37	1.00
	(1.80)							
Self Financing Ratio[17]	39%	35%	57%	72%	57%	71%	136%	25%
DSCR[18]	1.4	1.9	1.9	1.6	1.4	1.6	1.4	1.2
	(1.3)							
Other Financial Ratios:								
ROA[19]	3.6%	4.2%	5.1%	4.5%	3.5%	3.4%	3.8%	
	(6.6%)							
Quick Ratio (Acid Test)	1.07	0.91	1.21	1.03	0.89	1.05	1.33	
Cash Ratio[20]	0.37	0.15	0.36	0.24	0.17	0.40	0.58	
Interest Coverage Ratio	2.5	3.8	3.3	2.8	2.5	3.1	3.1	
Leverage[21]	49%	40%	36%	39%	42%	41%	41%	
	(50%)							

Source: World Bank

Note: Values in parenthesis = figures forecasted in KEEP PAD

[17] Self financing ratio = Cash flow from operations / CAPEX (three year average).
[18] DSCR = EBITDA / Total debt service.
[19] ROA = Net profits / Assets.
[20] Cash ratio = Cash / Current Liabilities.
[21] Leverage = Long-term debt / Assets.

24. The analysis of KenGen liquidity and debt coverage ratios give a better understanding of its ability to face its long-term debt obligations. According to the modelling results, it should have enough liquidity to pay its immediate obligations (current liabilities) during all the upcoming years, as both Current Ratio[22] and Quick Ratio[23] always point at values higher than 1x – only marginally below in 2018. The year of 2018 is the most critical one, as by that time the Company will have accounted for all the new borrowings in his Balance Sheet. From 2019, the improvement in both Ratios is due to the reduction of capital investments resulting in increasing current assets available for the company.

25. Looking at Debt Coverage Ratios, we note that KenGen operating earnings should be available to meet its financial interest payments along the following years, with Interest Coverage Ratio[24] always standing well above 2, the Self Financing Ratio rising to over 100 percent in 2020, and Debt Service Coverage Ratio (DSCR) remaining above 1.2x during all the period analyzed.

Component C – Slum Electrification

26. The financial analysis takes into account the investment costs for connecting the targeted 54,000 households. Of the total investment costs, IDA and GPOBA subsidies provide 25 percent while the user initially contributes only one percent upfront for the connection. The financing gap (74 percent) is supported by the electricity utility KPLC. The investment costs include the cost of connections for the households, assuming the whole additional batch of connections will be completed in 20 months. For the remainder of the project, the customer electricity payments are inflows for KPLC and the outflows are the cost of energy, operating and maintenance costs, and revenue "leakages." Although the technical design is intended to greatly reduce commercial losses in the slum areas, it is expected that there will still be some losses due to theft and tampering. The analysis also captures the benefit to KPLC of being able to recoup past loss by converting a significant number of illegal connections into legal, revenue generating connections. This lost revenue is considered an outflow at the beginning of the project, and converted to revenue one year later once the households are converted to legal connections. The financial analysis assumes finally a three percent increase in annual electricity consumption based on the assumption that targeted beneficiaries will gradually find productive uses of electricity thereby increasing their energy consumption. The results of financial analysis for the additional funding are shown in the table below.

Results of the Financial Analysis

Nature of Project Investment	**Original Project**		**Additional funding project**	
	NPV (million $)	FIRR	NPV (million $)	FIRR
Slum electrification component	-	24%	7.5	15%

27. The positive NPV (at 12 percent discount rate) and the 15% FIRR suggest the project is still financially viable in spite of the large increase in connection costs mentioned earlier. This

[22] Current Ratio = Current Assets / Current Liabilities.
[23] Quick Ratio = (Current Assets – Inventories) / Current Liabilities.
[24] Interest Coverage Ratio = EBIT / Interest Expenses.

factor also explains the difference between the FIRR under the original project and the FIRR under the AF. However, the sensitivity analysis demonstrates that, "all else being equal" the project financial sustainability would be undermined if operating and maintenance costs were to increase by 76 percent (switch value). Finally, when judging the above financial indicators with regard to the project financial sustainability, it should be noted the sustainability would be affected by many factors that could not be fully captured in this analysis, such as the impact on electricity demand, of multiple productive uses of energy by households and small businesses in the targeted slum settlements.

28. The slum electrification efforts are expected to expand the contribution to the development of income generating activities in project intervention areas through the productive uses of electricity. While the analysis does not quantify these expected benefits due to lack of usable data, interviews conducted during supervision missions of the original project among local beneficiaries indicate that the first project has facilitated the creation of local small businesses and the generation of income (salary). Furthermore, these interviews indicate other socioeconomic benefits (enhanced access to education and health infrastructure and services) are accruing to many beneficiaries of the original project. The proposed AF aims to expand these socioeconomic benefits and catalyze stakeholders 'energies to envision and develop a more ambitious program targeting slum settlements, building on the results and lessons learned from both operations.

Greenhouse Gas Accounting Analysis

29. The proposed AF covers geothermal power generation under Component A. Since the original appraisal did not cover GHG accounting, the project's impact on GHG emissions is assessed here.

30. According to the information received from the KenGen, the commissioning of 280 MW of geothermal power (Olkaria I and Olkaria IV), which is a part of the original project scope, displaced 134 GWh/month (approximately 1,608 GWh/year) of diesel power generation. The expected lifetime of these geothermal plants is 20 years. This data is used as the basis to estimate net GHG emissions.

31. The baseline emission of 1,608 GWh/year is with diesel generation. The emission factor of diesel generation is assumed as 0.65tCO2/MWh, according to the Bank's GHG accounting manual. With 20 years of economic life, the baseline emission is 20,904,000 tCO2.

32. The project emission of 1,608 GWh/year is with geothermal power generation. The emission factor of diesel generation is assumed as 0.02587tCO2/MWh, according to the Bank's GHG accounting manual. With 20 years of economic life, the project emission is 831,980 tCO2.

33. In net, the project reduces 20,072,020 tCO2 of GHG in 20 years of economic life.

ANNEX 3: AREAS OF PROPOSED SLUM ELECTRIFICATION PROJECTS

No.	SCHEME NAME	REGION	TOWN	COUNTY	DCS REF	Customers	Remark
1	Rhonda	Central Rift	Nakuru	Nakuru	S23102015090070	300	KISIP
2	Kaptembwa B Slum - Suppl.	Central Rift	Nakuru	Nakuru	123102015112943	1,500	KISIP
3	Kaptembwa B Slum - Suppl.	Central Rift	Nakuru	Nakuru	123102015112939	3,000	KISIP
4	Kaptembwa B 1 Slum	Central Rift	Nakuru	Nakuru	S23102014100006	1,572	KISIP
5	Kaptembwa Slum	Central Rift	Nakuru	Nakuru	S23102014070005	200	KISIP
6	Gilani's Slum	Central Rift	Nakuru	Nakuru	S23102015090072	150	KISIP
7	Kingongo Huruma Kapsaos Slum	North Rift	Soy	Uasin Gishu	S27102015020003	60	KISIP
8	Karagita Slum	Central Rift	Naivasha	Nakuru	S23102014070001	200	KISIP
9	Kamere Project - Naivasha	Central Rift	Naivasha	Nakuru	S23102014070003	160	KISIP
10	Maweni Scheme	Coast	Malindi	Kilifi	S22122015090020	270	KISIP
11	Laibon/ Majengo	Central Rift	Kericho	Kericho	S24302014110003	30	KISIP
12	Swahili Village	Central Rift	Kericho	Kericho	S24302014110002	50	KISIP
13	Hilton II	Central Rift	Nakuru	Nakuru	S23102015090007	300	KISIP
14	Kibaoni Timboni	Coast	Malindi	Kilifi	S22222014090042	31	KISIP
15	Hill Tea & Hill Farm People Settlement	Central Rift	Eldama Ravine	Baringo	S23402015090011	550	
16	Kimose	Central Rift	Eldama Ravine	Baringo	S23402015090002	100	
17	Kampi Nane Slum	Central Rift	Kabarnet	Baringo	S23552015070004	95	
18	Kaprogonya Slum - Kabarnet	Central Rift	Kabarnet	Baringo	S27502015040006	41	
19	Kisok & Katunoi Slums	Central Rift	Kabarnet	Baringo	S23552015090013	140	
20	Loruk Slum	Central Rift	Kabarnet	Baringo	S23552015090009	150	
21	Lower Bondeni Slum - Kabarnet	Central Rift	Kabarnet	Baringo	S27502015040004	93	
22	Kamirai & Kapjoshua Settlement	Central Rift	Chemagel	Bomet	S23702015110025	230	
23	Chemagel Settlement Scheme	Central Rift	Chepalungu	Bomet	S23702015090004	300	
24	Sotik Town Settlement	Central Rift	Chepalungu	Bomet	S23702015090002	600	
25	Ainamoi & Kipchimchim	Central Rift	Belgut	Kericho	S23602015070023	270	
26	Momul & Sanga Markets	Central Rift	Belgut	Kericho	S23602015070029	170	
27	Samutet & Kabokyek Slums	Central Rift	Belgut	Kericho	S23602015090001	220	
28	Sbi & Ngecherok Settlements	Central Rift	Belgut	Kericho	S23602015070011	331	
29	Sophia Wanjohi Village	Central Rift	Kipipiri	Laikipia	S23302015050007	180	
30	Migingo Slum - Kiligoris	Central Rift	Kiligoris	Narok	S23212015040003	300	
31	Maji Moto - Ewuaso Nyiro	Central Rift	Mau Narok	Narok	S23212015090005	500	
32	Mulot	Central Rift	Mau Narok	Narok	S23212015090003	400	
33	Geta Center	Central Rift	Kipipiri	Nyandarua	S23302015090005	400	
34	Kagongo Village	Central Rift	Kipipiri	Nyandarua	S23302015090010	150	
35	Malewa & Environs	Central Rift	Malewa	Nyandarua	S23302015090009	200	
36	Idsowe Village	Coast	Garsen	Garsen	S22202015040014	285	
37	Ngao Village	Coast	Garsen	Garsen	S22202015040003	314	
38	Oda Slum	Coast	Garsen	Garsen	S22202015040005	400	
39	Tarasa Slum	Coast	Garsen	Garsen	S22202015040006	310	
40	Majengo Mapya - Shariani	Coast	Bahari	Kilifi	S22122015090026	505	
41	YMCA System AFD	Coast	Bahari	Kilifi	S22122014100018	122	
42	Sokoni Stage	Coast	Bhari	Kilifi	S22122014080028	209	
43	Ramada - Gongoni	Coast	Gongoni	Kilifi	S22222015090003	103	
44	Kakuyuni Slum	Coast	Kakuyuni	Kilifi	S22222015030003	170	
45	Mahenzo Village	Coast	Kaloleni	Kilifi	S22222015090001	86	
46	Mwezangombe	Coast	Kaloleni	Kilifi	S22122015060012	175	

47	Ramisi Barabarani	Coast	Msambweni	Kwale	S22712015030015	216	
48	Mtongwe A	Coast	Likoni	Mombasa	S22112015030008	861	
49	Mikindani Kwa Kopa	Coast	Mikindani	Mombasa	S22122015030001	476	
50	Birikani Village	Coast	Voi	Taita Taveta	S22412015090004	476	
51	City Cotton Slum 2 - Buruburu	Nairobi North	Buruburu	Nairobi	S21132015010019	900	
52	Kiambiu Slum Next To City Cotton	Nairobi North	Buruburu	Nairobi	S21122015020001	1,000	
53	Dandora Phase 3	Nairobi North	Dandora	Nairobi	S21132015080032	500	
54	Mathare 4A Part 1 Slums	Nairobi North	Mathare	Nairobi	S21122015020002	700	
55	Mathare 4A Slum Near Tx 31339 Part 3	Nairobi North	Mathare	Nairobi	S21122015020012	720	
56	Kangundo	Nairobi South	Kangundo	Machakos	S21132015090018	350	
57	Kayole Matopeni A	Nairobi South	Embakasi	Nairobi	S21132015010020	560	
58	Kayole Matopeni B	Nairobi South	Embakasi	Nairobi	s21132015010021	440	
59	Kayole Matopeni C	Nairobi South	Embakasi	Nairobi	S21132015010022	620	
60	Mukuru Kwa Reuben - Gateway	Nairobi South	South B	Nairobi	S21132015080007	3,000	
61	Gatina Primary School	Nairobi West	Dagoreti	Nairobi	S21112015030011	4,000	
62	Congo - Kawangware	Nairobi West	Kawangware	Nairobi	S21112015100002	2,000	
63	Kianda Kibera	Nairobi West	Kibera	Nairobi	S21112015030023	3,000	
64	Raila II Slum	Nairobi West	Kibera	Nairobi	S21112015030025	1,890	
65	Bullar Punda	North Eastern	Garrissa Town	Garissa	S28112015070011	2000	
66	Modika	North Eastern	Garrissa Town	Garissa	S28112015070015	400	
67	Sankuri	North Eastern	Garrissa Town	Garissa	S28112015070013	400	
68	Kibichiku	North Eastern	Kikuyu	Kiambu	S28712015070005	200	
69	Kakeani	North Eastern	Kakaeni	Kitui	S28112015070008	600	
70	Kakumuti	North Eastern	Kalindilo	Kitui	S28112015070012	600	
71	Mwitika 2	North Eastern	Wikiliye	Kitui	S28112015070010	400	
72	Kyevaluki Slum	North Eastern	Kangundo	Machakos	S21432015090006	50	
73	Bulla Jamhuri	North Eastern	Mandera	Mandera	S28112015070026	300	
74	Bulla Mpya	North Eastern	Mandera	Mandera	S28112015070025	300	
75	Bulla Shaf Shafey	North Eastern	Mandera	Mandera	S28112015070033	200	
76	Bulla Tawakal	North Eastern	Mandera	Mandera	S28112015070027	600	
77	Elwak	North Eastern	Mandera	Mandera	S28112015070028	500	
78	Lafey	North Eastern	Mandera	Mandera	S28112015070031	100	
79	Rhamu	North Eastern	Mandera	Mandera	S28112015070030	400	
80	Takaba	North Eastern	Mandera	Mandera	S28112015070029	600	
81	Shauri Yako	South Nyanza	Homa Bay	Homa Bay	S24422014080005	600	
82	Kendu Old Town & Environs	South Nyanza	Kendubay	Homa Bay	S24422015050005	800	
83	Makongeni Homabay & Environs	South Nyanza	Kendubay	Homa Bay	S24422015050003	800	
84	Mjini Slum	South Nyanza	Kendubay	Homa Bay	S24422014080009	159	
85	Lwanda Nyamasare & Environs	South Nyanza	Mbira	Homa Bay	S24422014090008	200	
86	Magena Market	South Nyanza	Nyamache	Kisii	S24402015050009	1,450	
87	Mogonga Market	South Nyanza	Nyamache	Kisii	S24402015050013	900	
88	Nyatike Market	South Nyanza	Nyamache	Kisii	S24402015050012	450	
89	Athiko Slum - Awendo	South Nyanza	Awendo	Migori	S24402015030005	360	
90	Bundo Village	South Nyanza	Nyamira	Nyamira	S24412015050004	600	
91	Kijauri Stage Slum	South Nyanza	Nyamira	Nyamira	S24412015040002	650	
92	Nyabite Market	South Nyanza	Siamani	Nyamira	S24412015050002	550	
93	Uplands - Malaba	West Kenya	Amagoro	Busia	S24602015050015	250	
94	Karibuni - 48 Estate	West Kenya	Amukura	Busia	S24602015050001	215	
95	Machakusi	West Kenya	Amukura	Busia	S24602015050017	305	
96	Musoma	West Kenya	Nambale	Busia	S24602015050005	200	
97	Sykunya	West Kenya	Nambale	Busia	S24602015050006	230	

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