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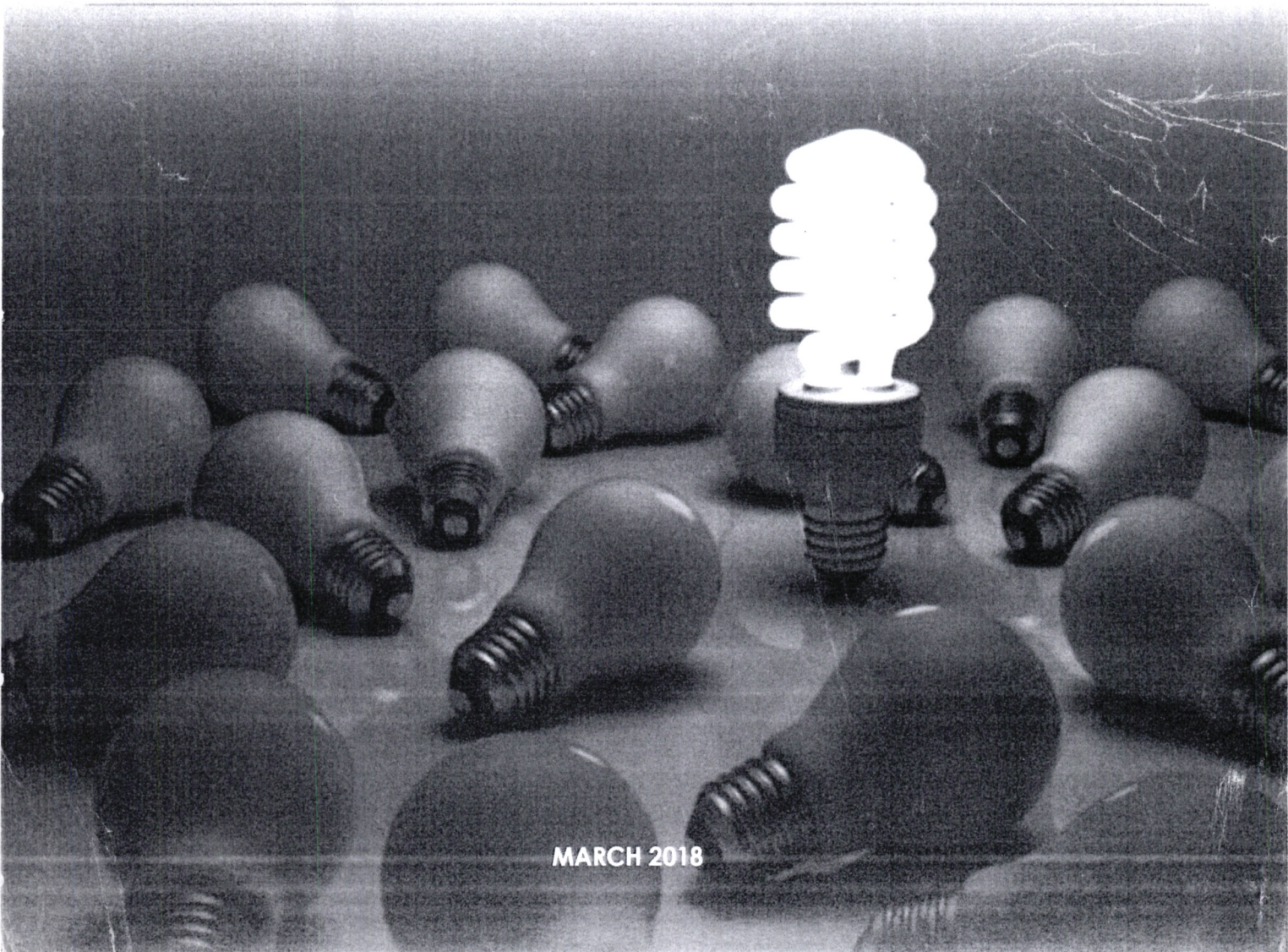
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**PERFORMANCE AUDIT REPORT ON  
IMPLEMENTATION OF EFFICIENT LIGHTING PROJECT  
BY  
KENYA POWER AND LIGHTING COMPANY**



MARCH 2018

## **Vision**

Effective accountability in the management of public resources and service delivery

## **Mission**

Audit and report to stakeholders on the fairness, effectiveness and lawfulness in the management of public resources for the benefit of the Kenyan People

## **Core Values**

Independence

Integrity

Professionalism

Innovation

Team Spirit

## **Motto**

Enhancing Accountability

## **Foreword by the Auditor-General**

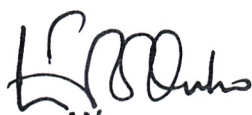
I have the honour to present this performance audit report, which assessed the Implementation of Efficient Lighting Project by the Kenya Power. My Office carried out the audit under the mandate conferred to me by Section 36 of the Public of the Audit Act, 2015. The Act mandates the Office of the Auditor-General to examine the Economy, Efficiency and Effectiveness with which public money has been expended pursuant to Article 229 of the Constitution.

Performance, financial and compliance audits form the three-pillar audit assurance framework that I have established to give focus to the varied and wide scope of the audit work done by my Office. The framework is intended to provide a high level of assurance to stakeholders that public resources are not only correctly disbursed, recorded and accounted for, but that the use of the resources results in positive impacts on the lives of all Kenyans. The main goal of our performance audits is to ensure effective use of public resources and promote services delivery to Kenyans of outstanding quality.

The audit has an environmental management perspective on the importance of conserving energy given that current domestic lighting demand places a strain on the national electricity supply while also contributing to climate change. I am hopeful that corrective action will be taken in line with our recommendations in the report. The recommendations if implemented will contribute towards the realization of Sustainable Development Goals No. 7, which calls for ensuring access to affordable, reliable, sustainable and modern energy for all.

The report shall be tabled in Parliament in accordance with article 229 (7) of the Constitution. I have as required in Section 36 (2) of the Public Audit Act, 2015 submitted the original copy of the report to Parliament. In addition, I have remitted copies of the report to the Cabinet Secretary-Ministry of Energy, Managing Director-Kenya Power, Principal Secretary-National Treasury as well as the Secretary-President Delivery Unit.

I wish to express my appreciation for the cooperation and assistance accorded to the audit team by the Kenya Power.



**FCPA Edward R.O. Ouko, CBS**  
**Auditor – General**

**6 March 2018**

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## List of Abbreviations

AFD	- French Development Bank
CDM	- Clean Development Mechanism
CFL	- Compact Fluorescent Lamp
ELP	- Efficient Lighting Project
EMCA	- Environmental Management and Coordination Act
GHG	- Greenhouse gas
GoK	- Government of Kenya
ICL	- Incandescent Lamp
ISO	- International Organization for Standardisation
KPLC	- Kenya Power and Lighting Company
kWh	- Kilowatt hour
MEPS	- Minimum Energy Performance Standards
MoEP	- Ministry of Energy and Petroleum
MtCO <sub>2e</sub>	- Mega Tonnes of carbon dioxide equivalent
MW	- Megawatts
NEMA	- National Environment Management Authority
tCO <sub>2e</sub>	- Tonnes of carbon dioxide equivalent
VAT	- Value Added Tax
W	- Watts

## Glossary of Terms

The following definitions apply for purposes of this report:

**Lamp:** any electric bulb producing light.

**Compact Fluorescent Lamp (CFL):** energy-saving light bulb, which last longer and use far less energy than traditional (or incandescent) light bulb for the same level of light intensity.

**Greenhouse gas:** A gas that is able to absorb and emit infrared radiation in the atmosphere, thereby causing global warming and hence climate change. Examples of greenhouse gases associated with climate change include Carbon dioxide (CO<sub>2</sub>), Nitrous Oxide (N<sub>2</sub>O), Methane (CH<sub>4</sub>) and Chlorofluorocarbons (CFCs).

**Incandescent Lamp (ICL):** energy intensive light bulb, which produces light by passing electric current through a filament, heating it up until it becomes incandescent, producing light.

**Retrofitting:** The act of replacing ICLs in the lighting system with CFLs

**Electricity peak demand:** a period of simultaneous or highest demand in electricity consumption. It usually occurs during the evening hours when domestic demand adds into the office and industrial demand.

## **Executive Summary**

### **Background to the Audit**

1. Prior to the discovery of geothermal, power generation in Kenya relied on hydro and fossil sources for most of power needs. Kenya experienced a series of extended power rationing in the years 2008 and 2009 mainly attributed to recurrent droughts and an increase in peak demand driven by increased domestic consumer connectivity. Apart from seeking alternative sources of energy such as wind and geothermal, the government, through the Ministry of Energy and Petroleum (MoEP) working in collaboration with the Kenya Power and Lighting Company (KPLC), developed a project to promote energy efficient lighting in the country. The pilot phase of this project was implemented by KPLC in the financial year 2009/10 and involved free exchange of functioning incandescent lamps (ICLs) with energy efficient compact fluorescent lamps (CFLs). Implementation of phase II of this project was being implemented as at the time of audit.
2. The Auditor-General was motivated by the following factors to undertake a performance audit on the implementation of this project:
  - The increased demand for electricity driven by the government's efforts to ensure universal access to electricity, which necessitates the need to efficiently utilize available power supply.
  - The government has increased the funding for the ELP from Ksh. 400 million in phase I to Ksh. 1.76 billion in phase II, thus the need to assess the value for money in this expenditure
  - Global calls to phase out ICLs due to their role in climate change, thus the need to assess what the government is doing to ensure that the efficient lighting project leads to the gradual phase-out of ICLs in Kenya.
  - Environmental risks associated with poor disposal of both CFLs and ICLs, hence the need to ensure safe disposal of ICLs recovered from the project and plan for end-life management of CFLs.

### **Objective, Scope and Methodology**

3. The objective of the audit was to assess the implementation of efficient lighting project by KPLC. The specific objectives of the audit were:
  - To establish whether KPLC used the lessons learned from the implementation of phase I to improve performance of phase II of ELP;
  - To assess whether the procurement of the bulbs was done in an economical manner;
  - To establish whether KPLC has put in place measures to minimize the negative environmental impacts of the project; and
  - To establish whether there are measures in place to ensure continuity of efficient lighting among electricity consumers even after the completion of the project.
4. The audit focused on the whole country covering a period of seven years, from July 2009 to June 2016. We examined the implementation of the ELP by KPLC with respect to whether its implementation is focused on ensuring that the project encourages a sustainable widespread use of energy-saving bulbs in residential lighting.
5. Data was collected through interviewing key project actors, reviewing documents and physical verifications.

### **Major Findings**

#### **Inadequate Utilisation of lessons learnt from phase I to improve on phase II of the project**

6. Although KPLC is expected to use the lessons learnt from phase I to improve the performance of phase II in accordance with the Plan-Do-Check-Improve model of ISO 9001:2008, the audit observed that not all the shortcomings of phase I were addressed in phase II.
7. Just like in the pilot phase, there was no plan for pre-identification of project beneficiaries in phase II, providing a loophole that can encourage diversion of bulbs to non-eligible customers as was witnessed during phase I of the project. Further, the disposal of ICLs recovered in phase II is focused on the destruction of the bulbs to avoid their reintroduction into the market and not their safe disposal. While all the ICLs recovered from phase I were crushed, the waste handler is storing the recovered components, including toxic Lead Oxides, unsafely in his premises.

8. Phase I of the ELP was not adequately monitored hence KPLC was only able to pick up the obvious lessons while some of the shortcomings were not captured. There is, therefore, the risk that some of the shortcomings of phase I will still be carried on in phase II jeopardizing the project's ability to encourage sustainable widespread use of energy-saving bulbs.

**Although KPLC procured high quality CFLs at the prevailing market price, the delivery of these bulbs was not done in a timely manner**

9. KPLC used a competitive procurement approach as provided for in the Public Procurement and Disposal Act, 2015 to pick the bidder who met the strict technical specifications set and also offered the lowest price.
10. However, the delivery of the bulbs to designated project stores was faced with significant delays. While the supply contract was supposed to run for six months from 17<sup>th</sup> July 2015 to 17<sup>th</sup> January 2016, only one out of the designated twenty stores had received the bulbs by this date necessitating a one month extension of the contract to 17<sup>th</sup> February 2016. Out of the eight stores visited during the audit, only one (Mlolongo) reported receiving the bulbs by 17<sup>th</sup> January 2016 while three (3) others (Ruaraka, Dagoretti and Machakos) received their bulbs by 17<sup>th</sup> February 2016. The remaining four (4) stores visited received their bulbs after the contract date of 17<sup>th</sup> February 2016.
11. The delays were attributed to KPLC's failure to procure the storage containers in time. Interviews and document reviews revealed that the supplier had shipped the bulbs into the country in time, but KPLC did not have space to store the bulbs.
12. This has delayed the implementation of other components of the project. Distribution was scheduled to begin in November, 2015 after delivery of at least 40% of the bulbs, but it had not started by the time of finalizing the audit in April, 2016.

**Lack of a long-term sustainability plan for the project outcomes**

13. While one of ELP's goals is to encourage widespread use of energy saving bulbs among electricity consumers, the audit found out that the project has no plan for ensuring continuity of the goal. Nonetheless, a survey conducted on 140 electricity consumers spread across the country during the audit revealed that the majority of Kenyans i.e 81%, are already using energy saving bulbs in their houses following the implementation of phase I. However, 44% of this number reported using a mixture of ICLs and energy savers. Besides, the audit revealed that some of the phase I beneficiaries (18 out of the 64

interviewed) reverted back to ICLs after their bulbs reached end of life. These beneficiaries mainly cited the high cost and availability of low quality energy savers in the market as their reasons for going back to ICLs. The same reasons were cited by both KPLC and MoEP staff interviewed as the main barriers to adoption of energy-saving bulbs in Kenya.

14. The sustainability of ELP outcomes was overlooked during planning with the assumption that the savings provided by the bulbs will be enough to encourage beneficiaries to continue using them. This, therefore, poses a risk to the achievement of the project's goal of encouraging widespread use of energy-saving bulbs. The beneficiaries might revert back to ICLs once the CFLs issued blow out.

**Inadequate management of project's negative environmental impacts**

15. CFLs contain mercury considered hazardous, thus require special treatment, according to Section 26 of the Environmental Management and Coordination (Waste Management) Regulations, 2006. The audit found out that KPLC did not have an end of life management plan for CFLs distributed during phase I. Out of the 64 beneficiaries interviewed during the audit, 52 already had some or all of the bulbs received reached their end of life. Disposal in the dustbin together with other household waste was the most common disposal method reported by 94% of the 52 beneficiaries. Such waste is eventually taken to the dump site for final disposal posing an environmental pollution and human health risk.
16. However, a national waste management strategy for all light bulbs is being developed by KPLC as part of the technical assistance for phase II as per Clause 11.11 (b) of the financial agreement between AFD and GoK. The responsibility for its implementation was, however, not clear. While NEMA would be better placed to spearhead its implementation, the draft copy of the strategy shared with the audit team did not place any responsibility on NEMA and KPLC staffs interviewed were non-committal on who should take the responsibility for implementation. It may, therefore, remain just a strategy on paper without actual implementation while environmental pollution due to unsafe disposal of CFLs continues.
17. Further, KPLC intends to engage the same waste handler that disposed of ICLs during phase I being the only NEMA licensed facility in Kenya. This is despite the handler having not been able to dispose of the recovered components after crushing the bulbs. There is, therefore, a risk that the ICLs recovered from phase II might not be disposed of just like in phase I and the

Lead Oxides might end up in the environment with attendant risk to human health.

18. The inadequate management of project's environmental impacts was attributed to several factors, namely: more emphasis on blocking the reintroduction of recovered ICLs back to the market as opposed to safe disposal; lack of clarity on what constitutes safe disposal of hazardous Lead Oxides and Mercury in EMCA (Waste Management) Regulations; and the perceived long lifespan of CFLs used in the project (10 to 15 years) hence the less emphasis on end of life management of the same.

### **Conclusions**

19. Based on the issues presented in the findings, a conclusion can be drawn that the implementation of ELP has been faced with several shortcomings limiting the project's ability to encourage sustainable widespread use of energy-saving bulbs among electricity consumers. More specific conclusions were made as follows:
  - While KPLC incorporated some of the experiences of phase I into phase II, the risk of diversion of bulbs to non-eligible beneficiaries still remain. This is due to the fact that pre-identification of beneficiaries is not considered important in phase II just like it was the case in phase I. Further, the planning phase of phase II has not managed to adequately address the safe disposal of ICLs thereby increasing the risk of environmental pollution from the project.
  - While KPLC procured high quality CFLs at prevailing market price, it failed to adequately plan for storage of the bulbs leading to the lack of space that caused delays in the delivery of the bulbs to the stores.
  - Further, KPLC did not adequately plan for safe disposal of ICLs and end of life management of CFLs posing environmental pollution and human health risk.
  - Sustainability of ELP outcomes lies in a continuous supply of cost-effective energy-saving bulbs, but the project has not given this any serious consideration. The outcomes of ELP may thus not be sustainable in the future.

## Recommendations

20. In view of the findings of the audit, the Auditor-General made the following recommendations that the Accounting Officer in the MoEP and the KPLC should consider taking to ensure successful implementation of the ELP:

- To ensure adequate capturing and Utilisation of project lessons
  - KPLC should consider developing a comprehensive monitoring plan for the project that covers both implementation and post implementation phases.
  
- To ensure sustainability of ELP goal/outcomes:-
  - KPLC should establish strategies to ensure a continuous supply of high-quality energy-saving bulbs at an affordable price. This could be done through setting up of energy shops within KPLC premises to ensure that customers get cost effective energy-saving bulbs.
  - The MoEP should work with the Kenya Bureau of Standards to fast track the implementation of the Minimum Energy Performance Standards (MEPS) for CFLs. This will eliminate substandard CFLs currently available in the market.
  - MoEP and KPLC should consider working with the Ministry of Industrialization and Enterprise Development to develop MEPS for all light bulbs used in Kenya. This will lead to gradual phase out of energy inefficient ICLs in the market.
  
- To minimize the environmental impacts of the project:-
  - The MoEP and KPLC in consultation with NEMA should fast-track the development and implementation of the national waste management strategy for light bulbs
  - NEMA should fast-track the enactment of the draft EMCA (E-Waste Management) Regulations
  - KPLC should consider working closely with NEMA and Advanced Recycling Facility to ensure that the recovered Lead Oxides are safely disposed.

## Chapter 1

### Background of the Audit

#### Introduction

- 1.1 Prior to the discovery of geothermal, power generation in Kenya relied on hydro and fossils sources for most of power needs. Kenya experienced a series of extended power rationing in the years 2008 and 2009 mainly attributed to recurrent droughts experienced in the first decade of the 21st Century as documented in the National Climate Change Response Strategy, 2010. This period also coincided with the time during which more domestic consumers were connected to the national grid with a commensurate increase in peak demand. To address this challenge, the government, through the Ministry of Energy and Petroleum (MoEP) working in collaboration with the Kenya Power and Lighting Company (KPLC), developed a project in the financial year 2009/2010 to promote energy efficient lighting.
- 1.2 Energy efficient lighting involve the use of energy-saving bulbs like CFLs, which are capable of saving up to 80% of the energy used by incandescent lamps (ICLs) of same lighting intensity (UNEP, 2012). Despite the benefits, the uptake of energy efficient lighting technologies has been slow in Kenya. This is due to several barriers, including: the high cost of energy-saving bulbs; lack of knowledge and awareness regarding benefits of energy-saving bulbs; lack of understanding of quality issues; and the perceived risk of bulbs failing soon after installation (Sessional Paper No. 4, 2004).
- 1.3 According to project documents and interviews with KPLC staff, the pilot phase (phase I) of this project was implemented by KPLC in the financial year 2009/10 and involved free replacement of 1.25 million ICLs with energy efficient compact fluorescent lamps (CFLs). KPLC is now implementing phase II, which involves free replacement of 3 million ICLs with CFLs, which is expected to save approximately 100MW of electricity annually.
- 1.4 While these efforts reflect the government's commitment to promoting energy efficiency in Kenya's electricity sub-sector, sustainable efficient lighting goes beyond the free distribution of CFLs to address such pertinent issues as public sensitization on the benefits of efficient lighting technologies, the future sustainability of project outcomes and end of life management of the energy-saving bulbs.

## Motivation of the Audit

1.5 The following factors motivated the Auditor-General to undertake the audit:

- **Increased demand for electricity:** The number of consumers connected to the national electricity grid doubled within a period of just four years from 1.8 million in June, 2011 to 3.6 million in June, 2015. This demand is expected to further increase with the implementation of the Last Mile Connectivity Programme which targets to connect 70% of domestic users by the year 2017 up from the current 35% and achieve universal access by the year 2020. Successful implementation of the Efficient Lighting Project (ELP) therefore presents an opportunity to save electricity consumption, especially during peak time demand. The savings can be used to supply the increased demand without necessarily incurring additional investments in electricity generation.
- **Increased funding for the project:** The government has increased the funding for ELP from Ksh. 400 million in Phase I to Ksh. 1.76 billion in phase II. Phase II is being funded by a loan from the French Development Bank<sup>1</sup>. It was, therefore, necessary to audit the implementation of this project to assess whether there is value for money in the expenditure.
- **Global calls phase out of ICLs due to their role in climate change:** According to UNEP (2012), lighting constitutes only 19% of global electricity use per annum, but results in greenhouse gas emissions of 1, 889 MtCO<sub>2e</sub> per year, equivalent to 70% of world passenger vehicle emissions. This is mainly attributed to the use of incandescent bulbs. In realizing the role played by lighting in climate change, countries across the world have developed strategies to gradually phase out incandescent bulbs. It is, therefore, necessary to assess the measures put in place by KPLC and the MoEP to ensure ELP's effectiveness in gradual phase-out of incandescent bulbs.
- **Environmental risks associated with poor disposal of both CFLs and ICLs:** Both CFLs and ICLs contain mercury and Lead Oxides respectively, which are hazardous and harmful to human health and the environment. Therefore, an energy efficient lighting project can only be considered sustainable if the recovered ICLs are safely disposed of and an end-life management plan of CFLs is put in place.

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<sup>1</sup> The funding for ELP is discussed in detail under the description of the audit area section

## Chapter 2

### Design of the Audit

#### Objective of the Audit

- 2.1 The audit objective was to assess the implementation of Efficient Lighting Project by Kenya Power and Lighting Company.
- 2.2 With this broad objective, the specific objectives of the audit were:
- To establish whether KPLC used the lessons learned from the implementation of phase I to improve the performance of phase II of ELP;
  - To assess whether the procurement of the bulbs was done in an economical manner;
  - To establish whether KPLC has put in place measures to minimize the negative environmental impacts of the project; and
  - To establish whether there are measures in place to ensure continuity of efficient lighting among electricity consumers even after the completion of the project.
- 2.3 The examination of these objectives was guided by the following audit questions:
- How were the experiences of phase I used to improve the performance of phase II of ELP?
  - How did KPLC ensure that the bulbs procured are of high quality, low cost and delivered in a timely manner?
  - What measures are put in place to minimize the negative environmental impacts of the project?
  - To what extent are the positive impacts of ELP likely to continue?

#### Scope of the Audit

- 2.4 The audit focused on a period of seven years, from July 2009/10 to June 2016, and examined the implementation of the ELP by KPLC. This was examined with respect to both phase I and II since phase II builds on the pilot phase. The project was examined with a focus on its activities, i.e. planning, procurement of CFLs, disposal of both CFLs and ICLs and sustainability of the project.
- 2.5 Our examination of procurement was only limited to quality, cost and timely delivery of CFLs and not the entire procurement process. Besides, distribution of CFLs could not be examined since the component had not

been implemented as at the time of the audit and phase I distribution lapsed more than five years ago.

- 2.6 The audit focused on the whole country. However, physical verification of project activities was carried out in seven (7) sampled KPLC regions, namely Nairobi North, South and West, Central Rift, North Rift, Mount Kenya and Coast. It was believed that these regions would provide relevant information for understanding of the audit problem.

#### **Methods of Gathering Audit Evidence**

- 2.7 We conducted the audit in accordance with International Standards of Supreme Audit Institutions (ISSAI) guidelines issued by the International Organization of Supreme Audit Institutions (INTOSAI), and audit policies and procedures established by the Office of the Auditor General (OAG). We used the following methodology.

#### **Sampling and Sample size**

- 2.8 We used both stratified and purposive sampling to pick the KPLC branches used in this audit. The project has categorized the country into nine (9) regions which formed our strata. We purposively picked seven (7) regions out of the 9 strata. The regions picked were: Nairobi North, South and West; Central Rift, North Rift, Coast and Mount Kenya. One branch, hosting the store with the highest allocation of bulbs, was picked from each sampled region. This gave us a sample of seven stores out of the total 20 stores designated for phase II. The branches sampled were: Machakos, Dagoretti, Ruaraka, Eldoret, Nakuru, Nyeri and Mombasa.
- 2.9 For purposes of the survey, we randomly sampled 20 KPLC customers from each sampled branch giving a sample size of 140 respondents. The sampled customers consisted of both project beneficiaries as well as non-beneficiaries.

#### **Interviews**

- 2.10 We conducted interviews with KPLC staff directly involved in the implementation of the ELP. We also conducted interviews with the MoEP officials as well as the Director of Sintmond Group Limited. **Appendix 1(a)** provides details of the people interviewed during the audit.

#### **Survey**

- 2.11 We used a survey to collect information from KPLC customers about public awareness, disposal and sustainability of the project. A list of the places visited is provided in **Appendix 1(c)**.

### Documents review

- 2.12 To gain a clear understanding of the audit object, the team reviewed various documents as outlined in **Appendix 1(b)**.

### Physical Verification

- 2.13 Physical verification was carried out to confirm the delivery of CFLs to the designated 8 stores, namely Mlolongo, Machakos, Ruaraka, Dagoretti, Lanet, Nyeri, Mbaraki and Eldoret. Physical verification was also carried out to confirm the status of project activities on the ground. A list of the places visited is provided in **Appendix 1(c)**.

### Assessment Criteria

- 2.14 Our main assessment criteria are as summarized in **Table 1**. The criteria are discussed in detail in the findings section

**Table 1: Summary of Assessment Criteria**

<b>Audit Issue</b>	<b>Assessment Criteria</b>
Utilisation of lessons learnt in phase II to improve performance of phase II of ELP	<b>ISO 9001:2008:</b> KPLC, being an ISO 9001:2008 certified company is expected to use the experiences of phase I to improve on phase II as per the Plan-Do-Check-Improve model of quality management
Economy in the procurement of the bulbs	<b>Sections 54(2)(3) and 106(3) of the Public Procurement and Asset Disposal Act, 2015:</b> KPLC is expected to procure the bulbs through a competitive open tender process in which the winning bidder should be one that offers the lowest price, but meets the tender requirements. <b>ELP Supply Contract Document:</b> The supplier is expected to deliver the bulbs to the designated project stores within the stipulated delivery dates
Management of project's environmental impacts	<b>Section 26 of EMCA (Waste Management) regulations, 2006 and Clause 11.11 (b) of the financial agreement between AFD and GoK:</b> KPLC is expected to put in place adequate plan for the management of environmental impacts of the project
Sustainability of ELP	<b>ELP Goal:</b> The implementation of ELP is expected to lead to widespread use of energy saving bulbs among electricity consumers.

Source: KPLC documents

## Chapter 3

### Description of the Audit Area

#### Efficient Lighting Project

- 3.1 Efficient Lighting is a project that was developed by the Ministry of Energy and Petroleum (MoEP) working in collaboration with KPLC, in response to the extended power rationing experienced in the years 2008 and 2009. The rationing was attributed to the insufficient power supply coupled with increased peak time demand due to increased domestic customer connectivity.
- 3.2 The pilot phase of the project, implemented by KPLC in the financial year 2009/10, involved free exchange of 1.25 million functioning ICLs with energy efficient CFLs. The recovered ICLs were crushed to avoid them illegally filtering back into the market. The technical success of the pilot phase, i.e. all CFLs distributed and 59.82MW savings in electricity realized according to the evaluation report, prompted KPLC to extend the project. The current phase is being implemented as a Clean Development Mechanism (CDM) project, registered under Green Light for Africa and funded by the French Development Bank (AFD). It involves free retrofitting of 3 million functioning ICLs with CFLs.
- 3.3 The project's goal, objectives, target groups, activities and expected outputs as outlined in the project documents are as discussed below:-

#### Goal

- 3.4 The overriding goal of ELP is to reduce electricity system peak demand. In this regard, phase I and II purposed to reduce the electricity system peak demand by at least 60MW and 100MW per year respectively and also encourage widespread use of energy-saving bulbs. In addition, phase II aims to reduce greenhouse gas (GHG) emissions by 120,000tCO<sub>2e</sub> per year. Greenhouse gases such as Carbon dioxide, Nitrous Oxide and Methane have the property of enhancing absorption of infrared radiation emitted by the earth's surface thereby leading to global warming.

#### Objectives

- 3.5 The ELP was designed to achieve the following objectives;
- Reduce household electricity demand
  - Improve consumer confidence through reductions in power bills
  - Expose households to energy-saving bulbs by introducing CFLs to areas where social-economic conditions and low-income levels limit the uptake of energy efficient lighting.

- Create awareness on energy efficiency among Kenyan households to join in the global efforts to mitigate climate change

#### **Target Group**

- 3.6 The pilot phase of ELP targeted middle and low-level category of KPLC customers whose monthly electricity consumption was within 10-200kWh for domestic consumers and 10-100kWh for schools, health centres and small businesses. Phase II targets low-income<sup>2</sup> domestic customers in urban and rural areas.

#### **Project Activities**

- 3.7 The implementation of the phase II of ELP involves the following main activities, discussed in detail under process description section;
- a) Project planning
  - b) Procurement of CFLs, storage containers, installation contractors and disposal services
  - c) Retrofitting of CFLs and collection of ICLs replaced
  - d) Marketing and awareness campaigns
  - e) Disposal of ICLs and development of waste management strategy for CFLs
  - f) Monitoring for CDM component

#### **Project Output**

- 3.8 The expected outputs of both phase I and II of ELP included:
- a) 1.25 million and 3 million CFLs distributed in phase I and II respectively
  - b) Equivalent number of ICLs recovered and disposed of
  - c) Reductions in peak demand
  - d) Reductions in GHG emissions

#### **Administrative Framework for the Implementation of the ELP**

- 3.9 ELP is being implemented by KPLC as part of its demand-side energy efficiency interventions under the supervision of the MoEP. The concept paper for the ELP was developed by a task force consisting of officials, both from KPLC and the MoEP. The MoEP considered KPLC as the most appropriate implementer given its mandate that allows it to interact directly with electricity consumers. KPLC has the mandate to purchase bulk

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<sup>2</sup> Low-income as used by KPLC refers to monthly electricity consumption and not monthly income. Low income consumers are considered to be customers with a maximum monthly power consumption of 100kWh.

electricity, generate electricity in off – grid areas, transmit, distribute and retail electricity to end-use consumers throughout the country.

- 3.10 KPLC is a state corporation established under the Company's Act, Cap 486. It is a public listed company with the government controlling 50.1% of the shareholding and private investors 49.9%. Kenya power envisions “to provide world-class power that delights its customers.” Its mission is “powering people for better lives.”
- 3.11 The MoEP is responsible for the sectoral policy formulation and implementation. One of the MoEP's strategic objectives as per its 2013-2017 Strategic Plan is to promote efficient utilisation and conservation of energy. The MoEP's role in the implementation of the ELP is that of oversight.

#### **Other Key Actors in the Implementation of ELP**

##### **a) French Development Bank (AFD)**

- 3.12 French Development Bank (AFD) is the main implementing agency for France's official development assistance to developing countries and overseas territories. AFD is the key financier of phase II of ELP through a loan to the government of Kenya amounting to 46 million Euros to cover four components<sup>3</sup> of which the ELP was allocated 8.5 million Euros. AFD is playing a supervisory role in the project and has to give no objection before KPLC can proceed with the execution of any component of the project.

##### **b) Additional Energy Limited**

- 3.13 Additional Energy Limited is providing technical assistance obligations previously held by Standard Bank Plc in the implementation of phase II of ELP. Its role is to assist KPLC in developing and implementing phase II of ELP to ensure that the project meets CDM requirements.

##### **c) KPLC Customers**

- 3.14 KPLC customers are the target beneficiaries in the ELP. They have to allow access to their premises for replacement of ICLs with CFLs and surrender the retrofitted ICLs to ensure technical success of the project.

##### **d) National Environmental Management Authority (NEMA)**

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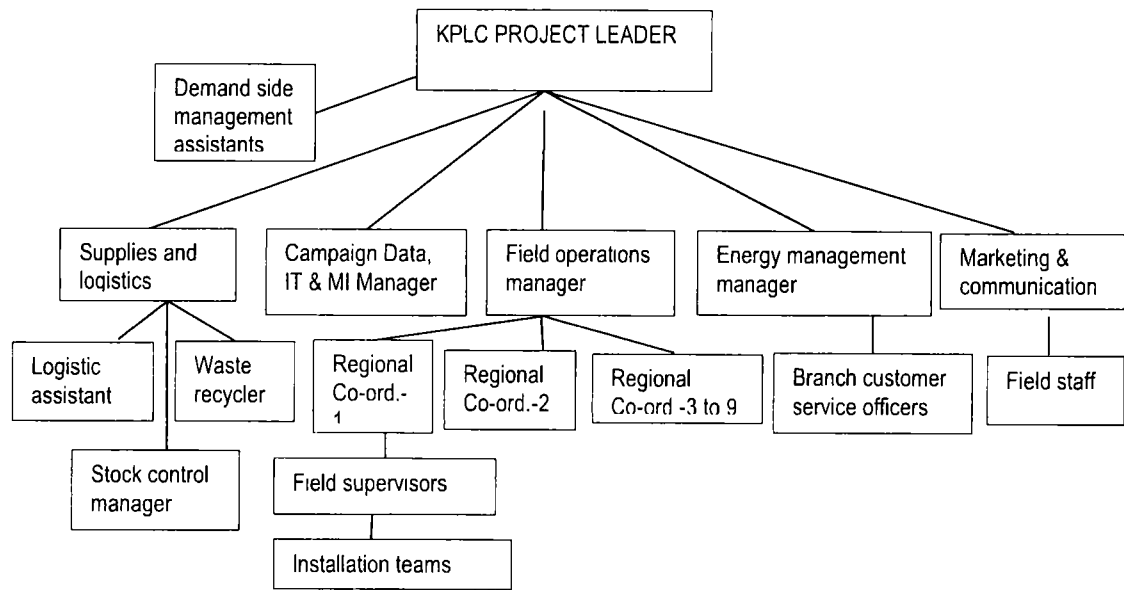
<sup>3</sup> The four components covered by the loan are: (i) Scale up of the pilot revolving fund (Stima Loan); (ii) Free distribution of compact fluorescent lamps (CFLs); (iii) Densification of transformers in rural areas; and (iv) Capacity building and technical assistance

- 3.15 As the country's environmental regulator, NEMA role is to ensure that ELP is implemented in an environmentally sound manner. The Authority assisted KPLC in identifying a waste handler for the disposal of recovered ICLs.

#### **The Implementation Structure**

- 3.16 ELP is being implemented by the KPLC's Department of Commercial Services. Its implementation is being coordinated by a project implementation team based at the KPLC head office. The project implementation team consists of representatives from various departments, namely; energy management, marketing and customer relations, stores and stock control, technical/internal audit, and marketing and communications. The team is headed by the project leader, who is a senior officer from the Demand Side Management and Metering Solutions division in the Department of Commercial Services. The project leader is responsible for coordinating all project activities and is the chair of the project's procurement committee.
- 3.17 At the regional level, the project is being coordinated by regional project coordinators (i.e. KPLC regional managers) who are in charge of project implementation at the regional level and are responsible for the following functions; demand side management, installation management, marketing and customer relations and stores and stock control. The regional project coordinators are assisted by field supervisors (KPLC county business managers) responsible for the same functions at the county level. The actual retrofitting is done by sub-contracted installation teams under the supervision of field supervisors. The implementation structure for Phase II of ELP is shown in **Figure 1**. Phase I had a similar structure as shown in **Appendix 2**.

**Figure 1: ELP Phase II Implementation Structure**

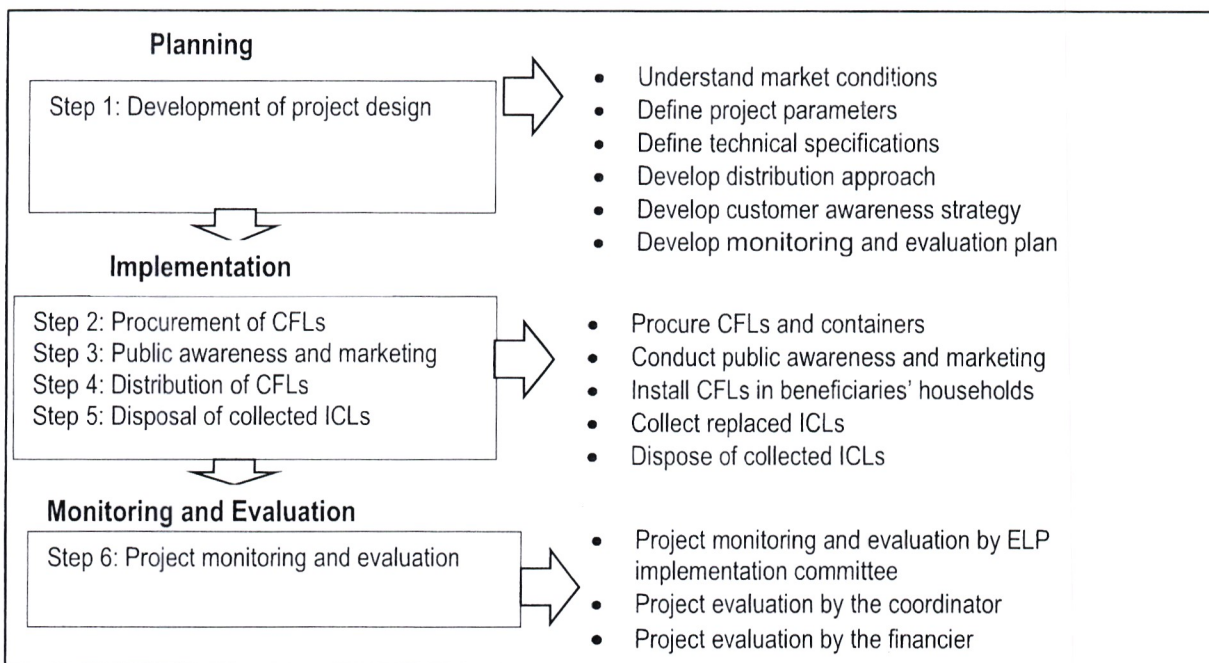


Source: ELP Phase II Distribution Plan

**Process description**

3.18 The implementation of ELP goes through three important phases, namely: planning, implementation, and monitoring and evaluation as shown in **Figure 2**. KPLC uses the process discussed in the World Bank’s toolkit on Implementation of large scale CFL exchange programmes, which is shown in **Figure 2**.

**Figure 2: ELP Process Description**



**Source: OAG Conceptualization, 2015**

**a) Planning**

3.19 KPLC's project implementation team undertakes a series of activities during the planning phase to define the key elements of project design. The planning activities include:

- i) **Market survey:** to aid in understanding the market, including: local manufacturing capacity for CFLs; market prices for CFLs and ICLs; current supply of CFLs in the market; import duties; timing of peak loads; customer perceptions of CFLs; current use of CFLs; and lamp quality.
- ii) **Defining key project parameters:** a statement of project objective and definition of such key project parameters as procurement strategy; plans for public awareness and marketing; CFL branding; target customers; and distribution strategy is then done guided by the understanding of market conditions.
- iii) **Defining technical specifications:** Using the International Electro-technical Commission (IEC) standards, the project implementation committee defines the technical specifications of the CFLs, including but not limited to, bulb wattage, lumen output, rated lifetime, power factor, mercury content, and warranty.

- iv) **Developing a distribution approach:** A distribution plan- detailing the distribution strategy, bulb sharing criteria, installation procedures and ICL collection and disposal strategy- is developed at this stage.
- v) **Developing a customer awareness plan:** The project implementation committee also prepares a customer awareness and marketing plan, which should be informed by a baseline survey to understand local attitudes toward CFL technology.
- vi) **Developing a monitoring and evaluation plan:** A monitoring plan covering both pre and post monitoring and evaluation as well as continuous monitoring during the implementation of the project is also developed at this level

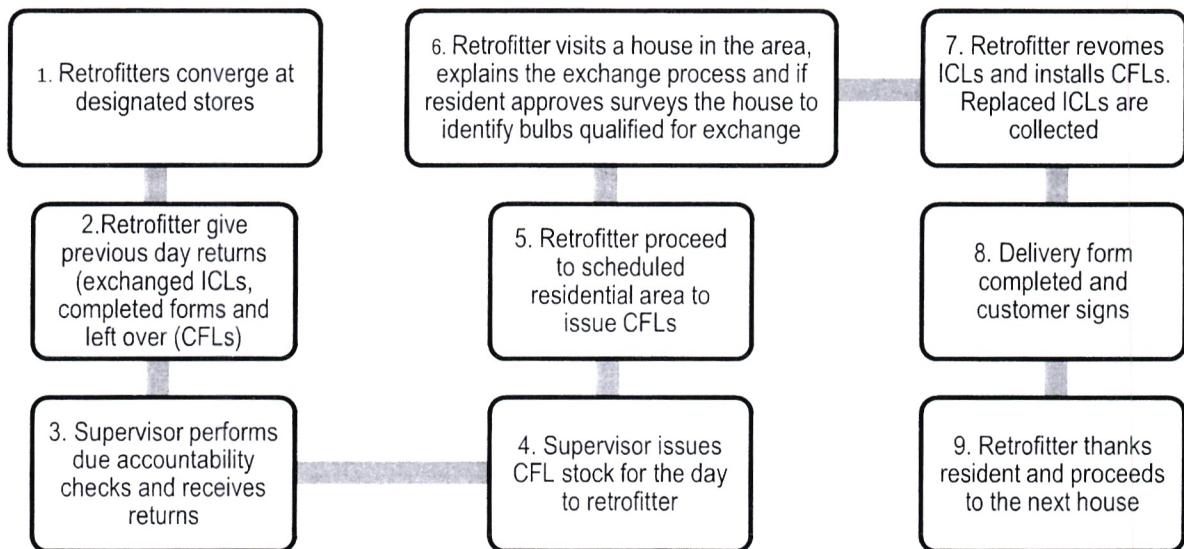
**b) Implementation/Execution**

3.20 The execution phase involves important activities, namely; supply of CFLs and storage containers, distribution of the CFLs; and public awareness and marketing. The procedures for carrying out these functions are as discussed below.

- i) **Supply of CFLs and storage containers:** The procurement of CFLs is done through a competitive bidding process as per the national guiding procurement regulations and AFD procurement guidelines. The process begins with floating of a public tender to which potential suppliers respond to through submission of bids. The submitted bids are subjected to a comprehensive tender evaluation process, which involves preliminary, technical and financial evaluations. The successful bidder is then awarded the tender and proceeds to make arrangement for manufacturing and shipment of the bulbs. To confirm adherence to set specifications, implementation team undertakes inspections and acceptance tests at the company in which the bulbs are being manufactured. The CFLs are then delivered to KPLC's designated stores where they are received by KPLC officials. A flow-chart process description for the procurement of CFLs is presented in **Appendix 3**. Procurement for the containers also follows a similar process.
- ii) **Distribution of CFLs:** Distribution involves installation of the CFLs in customers' houses as well as the collection of the replaced ICLs for eventual disposal to avoid their leakage back to the market. Another key element of distribution is capturing of information such as customer name and meter number, quantity and wattage of ICLs replaced and wattage of CFLs installed to guide monitoring and evaluation of the project.

The distribution process begins with installation/retrofitting team converging at the designated stores to pick CFL stock and associated equipment and documents for the day. The CFL installers are also expected to give returns from the previous day, which include exchanged ICLs, completed documentation and any CFL stock left. The returns are checked and received by the relevant supervisors before issuing new stock for the day. The installers then proceed to the scheduled areas and visit the residences to exchange the ICLs. The delivery forms are completed for each installation and signed by the customer before proceeding to the next house. A flow chart conceptualization of KPLC's CFL distribution process is as shown in **Figure 3**.

**Figure 3: CFL Distribution Process**



Source: OAG, 2015

iii) **Public awareness and marketing:** KPLC conducts CFL awareness and marketing campaigns both through print and electronic media. The campaign starts shortly before and proceeds through the CFL distribution period. The information conveyed in the awareness campaign is intended to achieve public buy-in into the project and transform electricity consumers' behaviour towards efficient lighting technologies.

**c) Monitoring and evaluation**

3.21 Completion of the implementation phase is then followed by an internal evaluation of the project by KPLC. Separate evaluations are done both by the project

coordinator and the financier. Phase II requires several ex-post evaluations both by AFD as the financier and Additional Energy Limited as the coordinator/ technical assistant since it is being implemented under the CDM Small Scale Programme of Activities (CDM-POA). Internal monitoring of the project is done during implementation/execution phase through progress reports and monitoring of peak demand and system load factor.

#### Funding for ELP

- 3.22 Phase I of the ELP was financed by the GoK while phase II is being funded through a loan from AFD. The total cost of phase I was approximately Ksh. 400 million as outlined **Appendix 4**.
- 3.23 Phase II of the ELP is a component under the *Scaling Up of Energy Access Project* funded by the AFD to the tune of 46 million Euros. The budgeted cost of phase II is Ksh. 1.76 billion of which Ksh. 719.3 million has been spent so far in the planning and procurement of: CFLs, storage containers, installation services as well as consultancy services for the project, as outlined in **Table 2**.

**Table 2: Budgeted Costs and Expenditure of Phase II of ELP**

Item Description		Budgeted Cost (Ksh.)	Amount spent so far (Ksh.)
CFL Procurement	Tender advertisement	594,291	594,291
	Bulbs cost	710,000,000	710,016,830.55
Storage containers procurement	Tender advertisement	475,105	475,105
	Containers cost	20,000,000	3,985,999
Environmental costs	EIA license	199500	199500
	National Waste Management Strategy for CFLs	3,270,000	3,270,000
CFL Distribution	Installation Tender advertisement	722,572	722,572
	Actual distribution	210,000,000	0
Marketing & awareness campaigns		50,000,000	0
ICL disposal costs		71,000,000	0
CDM costs (validation, monitoring, certification, supervision, etc.)		350,000,000	0
<b>Total</b>		<b>1,416,261,468</b>	<b>719,264,298</b>
<b>Contingencies (10%)</b>		<b>141,626,147</b>	<b>0</b>
<b>Total</b>		<b>1,766,261,468</b>	<b>719,264,298</b>

Source: OAG's analysis of ELP phase II documents

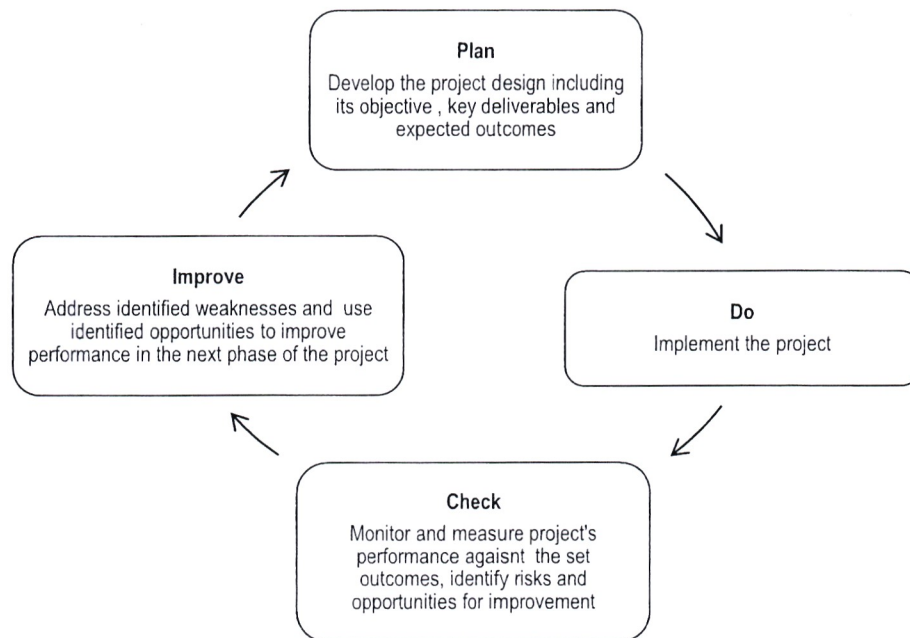
## Chapter 4

### Audit Findings

#### Inadequate Utilisation of lessons learnt from phase I to improve on phase II of the project

- 4.1 As an ISO 9001:2008 certified company, KPLC is expected to continually improve the quality of its processes through the use of Plan-Do-Check-Improve model illustrated in **Figure 4**. In this regard, Phase I of ELP was designed as a pilot phase meant to provide useful lessons for future implementation of the project. Phase II is, therefore, expected to utilize these lessons to improve its performance.

**Figure 4: Plan-Do-Check-Improve management model**



Source: Adopted from ISO 9001:2008

- 4.2 Interviews and a review of documents revealed that KPLC used some of the experiences from the pilot phase to improve the performance of the project as outlined in **Table 3**.

**Table 3: Improvements from phase I of ELP**

Activity area	Shortcomings during phase I	Improvements made in phase II
CFL supply	Only 11W procured for exchange with 40-100W ICLs. These bulbs did not provide the equivalent light intensity of high wattage ICLs being replaced	Two wattage categories were procured: 15W to replace 40-60W and 23W to replace 75-100W ICLs (expected to provide sufficient light equivalent to ICLs being replaced)
Distribution	-KPLC used its staff to do the installation, but they were too few and overwhelmed hence the distribution shortcomings experienced during phase I	- Installation services are subcontracted to private firms
	-Minimal supervision of the distribution process	-The implementation structure has been adjusted to allow for more supervision
Public awareness	-Language barrier as campaigns were conducted in English and Kiswahili only	-There is plan to translate the awareness messages into various local languages and use several vernacular radio and TV stations
CFL end-life management	-No plan in place for end of life management of CFLs	-A national waste management strategy for CFLs is being developed

Source: OAG's analysis of audit minutes and ELP documents, 2016

- 4.3 However, the audit revealed that the most critical shortcomings that led to the inadequate performance of phase I have not been addressed. There, is therefore, a risk that some of the shortcomings of phase I will still occur in phase II jeopardizing the project's ability to encourage the sustainable widespread use of energy-saving bulbs in Kenya's residential lighting.
- 4.4 The failure to address these shortcomings can be attributed to inadequate monitoring of phase I of ELP. A review of phase I final evaluation report revealed that monitoring of the project only focused on delivery of project outputs and did not capture any lessons for future Utilisation. Hence, KPLC was only able to pick up the obvious lessons from the project. Some of the critical shortcomings that have not been addressed are as follows:
- a) Lack of pre-identification of project beneficiaries**
- 4.5 The audit revealed that the beneficiaries of phase I of ELP were not pre-identified. KPLC officers involved in the CFL distribution process were expected to randomly select customers to issue with the bulbs so long as they fall within the project's target group. The draft phase II marketing and awareness plan document shared with the audit team had proposed pre-identification of beneficiaries in which case

interested KPLC customers who fall within the target group were to register through a Short Messaging System (SMS). The project team would then vet the registrations and identify those who deserve to benefit from the project. However, interviews with the project leader as well as a review of the final public awareness and marketing plan revealed that this strategy was dropped and beneficiaries are to be selected randomly just like in the pilot phase.

- 4.6 The random selection of beneficiaries provided a loophole that encouraged diversion of bulbs to non-eligible customers as well as the issuance of bulbs to beneficiaries above the agreed sharing formula during the implementation of phase I of ELP. A review of phase I beneficiaries database revealed several instances where more than 3 bulbs issued to individual names. However, the audit team was informed by KPLC staff that the many bulbs recorded under individual names do not necessarily mean that those bulbs were issued to one individual, but to several households sharing a single metre registered under one name. Nonetheless, this appeared not to be the case as 21 out of the 64 beneficiaries interviewed during the audit reported receiving more than 3 bulbs as shown in **Table 4**.

**Table 4: Respondents Who Reported Receiving more than 3 Bulbs**

Number of bulbs	Frequency of Respondents
11	1
10	1
8	2
7	2
6	2
5	6
4	7
<b>Total</b>	<b>21</b>

Source: OAG analysis, 2016

- 4.7 Further, only public schools, small businesses and small health care centres were eligible to benefit from the project, but a review of ELP phase I beneficiaries database revealed that bulbs were issued to non-eligible public and private institutions. Besides, schools, small businesses and health care centres were only entitled to 4 bulbs. The audit team established that a total of 33038 bulbs were diverted to non-eligible institutions while another 2705 were issued to schools above the agreed sharing number. Nairobi North region had the highest number of bulbs (23568) diverted to non-eligible institutions while West Kenya only had 34 bulbs diverted.

- 4.8 While it was not possible to tell from the database whether the project benefited 400,000 households as was targeted, the diversion of bulbs denied many poor Kenyans, who cannot afford quality energy saving bulbs at their market price, a chance to benefit from the project. The 35,743 bulbs either diverted to non-eligible institutions or issued to schools above the agreed number would have benefitted 11,900 eligible households. The breakdown of the 35,743 bulbs is as shown in **Table 5**. Besides, the allocation of too many bulbs to schools also led to wastage since the management of all the five schools visited during the audit informed the audit team that they removed the bulbs shortly after they were installed because of low wattage and reverted back to ICLs.

**Table 5: Regional Comparison of Diversion of Bulbs during Phase I of ELP**

Region	No. diverted to non-eligible institutions	No. issued to schools, small businesses and health care centres above the agreed number	Total
Nairobi West	4484	957	5441
Nairobi North	23568	144	23712
Nairobi South	763	215	978
Central Rift	58	72	130
North Rift	658	106	764
Mt Kenya North	552	283	835
Mt Kenya South	2786	928	3714
West Kenya	34	0	34
Coast	135	0	135
<b>Totals</b>	<b>33038</b>	<b>2705</b>	<b>35743</b>

Source: ELP phase I beneficiaries database

- 4.9 Interviews with KPLC regional offices revealed that ELP's focus was more on having all the bulbs distributed, but placed little emphasis on the efficiency with which the distribution process was undertaken. As such, installers were only expected to account for the number of CFLs distributed by returning the same number of ICLs to the stock control unit.

**b) Disposal of ICLs still focuses on the destruction of the bulbs and not safe disposal of the same**

- 4.10 The disposal of ICLs is focused on the destruction of the bulbs to avoid their re-introduction into the market and not the safe disposal of the same just as was the case during phase I. Safe disposal of ICLs would mean that the bulbs are crushed using a special machine capable of separating the various components. The glass and metal components should be recycled while the Lead Oxides should either be recycled or buried safely under NEMA's supervision.

- 4.11 A visit to the waste handler's site in City Cabanas, Nairobi revealed that all the 1.25 million ICLs recovered during phase I were crushed using a special machine. However, the recovered components, including 750kg of hazardous Lead Oxides, are still being kept unsafely at the facility. The waste handler, however, informed the audit team that he is still looking for the safest way to dispose of the Lead Oxides. KPLC officials interviewed informed the audit team that the phase I disposal contract was only about crushing the bulbs, hence the waste handler is at liberty to decide what to do with the recovered components.
- 4.12 There is a plan to engage the same waste handler to dispose of the 3 million ICLs to be recovered from phase II since NEMA recommended it as the only licensed facility in Kenya. A look at draft phase II disposal terms of references does not give any indication as to how the waste handler is expected to dispose of the recovered components, but states that the disposal should be done using NEMA guidelines and under the supervision of NEMA. The risk of environmental contamination, therefore, remains so long as there are no clear terms of reference on the disposal of Lead Oxides and other components recovered from crushing of the bulbs.

**Although KPLC procured high quality CFLs at the prevailing market price, the delivery of these bulbs was not done in a timely manner**

- 4.13 Public Procurement and Disposal Act, 2015 recommends a competitive process for procurement of public goods, services and works. According to Section 106(3) of the Act, "the successful quotation shall be the quotation with the lowest price that meets the requirements set out in the request for quotations." Section 54(2) of the Act further states that "standard goods, services and works shall be procured at the prevailing market price." The Public Procurement and Oversight Authority prepares a quarterly market price index to act as a reference guide to assist accounting officers to make informed price decisions in accordance with Section 54(3) of the Act.
- 4.14 The audit revealed that KPLC developed strict technical specifications against which interested bidders were evaluated to ensure that the highest bidder provides high-quality bulbs. Some of the technical specifications of the bulbs are as shown in **Table 6**. The ELP implementation team also performed factory acceptance tests to confirm that the bulbs manufactured met the specifications set<sup>4</sup>.

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<sup>4</sup> A comprehensive list of all the technical specifications of the bulbs used in this project can be obtained from the CFL supply contract.

**Table 6: Technical Specifications of the CFLs**

	<b>Set Specification</b>	<b>Winning Bidder's Offer</b>
Wattage	13-15W and 20-23W	15W and 23W
Light Intensity	13-15W - $\geq$ 715 lumens 20-23 - $\geq$ 1350 lumens	15W – 900 lumens 23W – 1500 lumens
Mercury Content	< 2.5mg	1.4mg
Lifespan	15000 hours	15000 hours
Guarantee	24 months	24 months

Source: Phase II Supply Contract Document

- 4.15 A review of the CFL supply tender evaluation report revealed that the supply tender was awarded to the lowest qualified bidder, who offered a price of Ksh. 230.30 for the 15W bulbs and Ksh. 238.28 for the 23W<sup>5</sup>. This price is within the Public Procurement and Oversight Authority' price index for the third quarter of 2014/15, the period coinciding with the supply bidding period. According to this price index, a 15W energy saver bulb was expected to cost an average of Ksh. 274. The market price index, however, did not provide any price for the 23W energy saver bulbs.
- 4.16 According to the supply contract, the delivery of CFLs was expected to be in accordance with the delivery and completion schedule specified in the Schedule of Requirements in the contract. The bulbs were expected to be delivered in three phases, i.e. 90 days, 126 days and 180 days after the signing of the contract and were not supposed to go beyond 210 days.
- 4.17 The audit revealed that the bulbs were not delivered within the planned delivery period. While the supply contract was supposed to run for a period of six months from 17<sup>th</sup> July 2015 to 17<sup>th</sup> January 2016, interviews revealed that only one out of the twenty stores had received the bulbs by this date necessitating a one month extension of the contract to 17<sup>th</sup> February 2016. Further, only one (Mlolongo) out of the eight stores visited during the audit reported receiving the bulbs by 17<sup>th</sup> January 2016 as outlined in **Table 7**. Again, only Ruaraka Dagoretti and Machakos stores received their bulbs by 17<sup>th</sup> February 2016 while the remaining four (4) stores visited received their bulbs after the revised contract date. As a result, the implementation of the project is behind schedule while consumers continue the use of the inefficient incandescent bulbs. The distribution of the bulbs was scheduled to begin in November, 2015, but this had not yet started as at the time of finalizing the audit in April, 2016.

<sup>5</sup> Price indicated in the supply contract document is USD 2.5 for 15W and USD 2.59 for 23W. The Kenyan shillings price quoted in this report is computed using the contract exchange rate of USD to Ksh.: 92.1083

**Table 7: Comparison of Scheduled and Actual Delivery of bulbs to KPLC stores**

Store	Date delivered	Bulb Type	Quantity delivered	Days delivery made from contract date
Mlolongo	3/12/2015	23W	86040	123
	8/12/2015	15W	21660	128
	8/12/2015	23W	67600	128
Ruaraka	27/01/2016	15W	200,970	190
	27/01/2016	23W	12800	190
	28/01/2016	23W	74880	191
	29/01/2016	23W	74880	192
	1/2/2016	23W	83070	195
Dagoretti	1/2/2016	15W	127200	195
	2/2/2016	15W	30500	196
	2/2/2016	23W	62400	196
Machakos	10/2/2016	23W & 15W	51,620	201
Nakuru	22/2/2016	23W & 15W	221000	215
Nyeri	09/3/2016	23W & 15W	216000	233
Mbaraki	08/3/2016	23W & 15W	235650	232
Eldoret	13/3/2016	23W & 15W	134000	237

Source: OAG Analysis of Phase II delivery notes

4.18 The delays were attributed to KPLC's failure to procure the storage containers in time, which may have resulted from poor planning. Interviews with ELP procurement committee members revealed that the tenders for the bulbs and containers were floated at the same time, but more weight was given to the bulbs as they were to be manufactured overseas whereas containers could be obtained locally. This resulted into the supplier shipping the bulbs into the country before KPLC could provide storage space. Supply of storage containers tender evaluation minutes dated 18<sup>th</sup> December 2015 indicated that the supplier had already shipped in 70% of the bulbs, which were being stored in his warehouse since KPLC did not have space to store the bulbs.

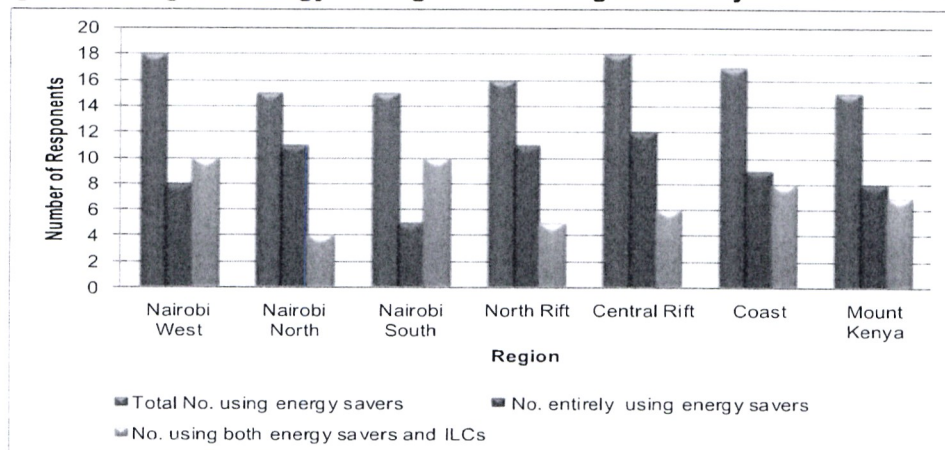
**Lack of long-term sustainability plan for the project outcomes**

4.19 In addition to reducing the electricity system peak demand, ELP set its goal to encourage widespread use of energy efficient bulbs among electricity consumers in Kenya. To achieve this goal, both KPLC and the MoEP are expected to have a strategy in place for ensuring that the non-beneficiaries are encouraged to use energy saving bulbs and beneficiaries of the project do not revert back to ICLs.

A survey conducted on 140 randomly sampled KPLC customers during the audit revealed that the majority of electricity consumers has embraced energy saving

bulbs. 114 or 81% of the 140 respondents, reported using energy saving bulbs. Of these respondents, 56% reported entirely using energy saving bulbs while the remaining 44% reported using a mixture of energy saving bulbs and ICLs in their houses. Further, in every region visited during the audit, more than half of the respondents interviewed reported using energy saving bulbs as shown in **Figure 5**. The figure also shows that Central Rift, North Rift and Nairobi North had the highest number of respondents entirely using energy saving bulbs in their houses while Nairobi South had the lowest number of respondents entirely using energy saving bulbs

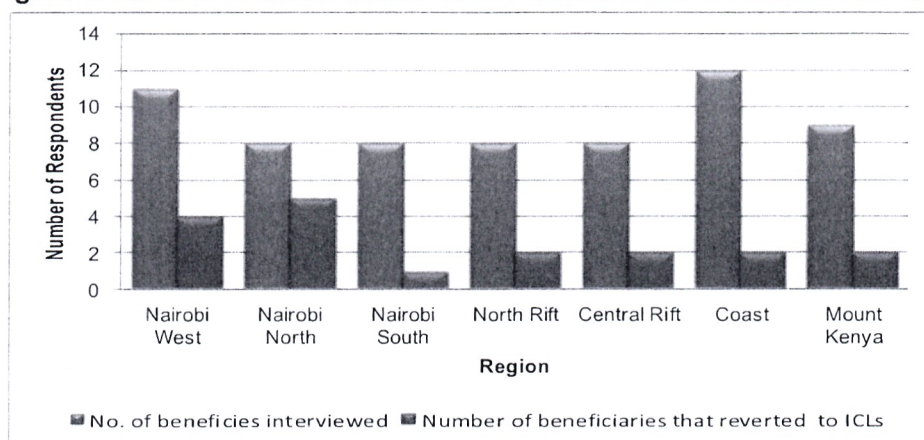
**Figure 5: Usage of Energy Saving Bulbs among Electricity Consumers in Kenya**



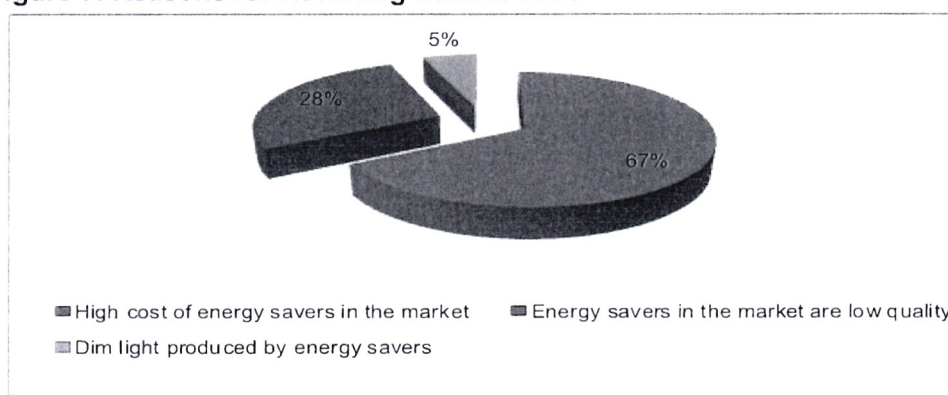
Source: OAG Analysis of a sample of KPLC Customers

- 4.20 The audit, however, revealed a substantial minority of ELP phase I beneficiaries who reverted back to ICLs after the bulbs issued by KPLC in 2010 reached their end of life. Out of the 64 beneficiaries interviewed, 18 (28%) reported replacing the failed CFLs with ICLs. Nairobi North region recorded the highest number of beneficiaries that reverted back to ICLs while Nairobi South recorded the least as illustrated in **Figure 6**.
- 4.21 Beneficiaries that reverted back to ICLs stated the following reasons as illustrated in **Figure 7**:
- i) the high cost of energy saving bulbs in the market;
  - ii) low quality of energy saving bulbs in the market; and
  - iii) the dim light produced by energy saving bulbs.
- 4.22 The same reasons were cited by respondents who reported either partially or completely not using energy saving bulbs. Out of the 50 respondents who provided reasons for not using energy savers, 64% considered energy saving bulbs too expensive, while another 18% of the same respondents blamed it on the low quality of energy saving bulbs available in the market.

**Figure 6: Number of Beneficiaries that Reverted Back to ICLs in Each Region**



**Figure 7: Reasons for Reverting Back to ICLs**



Source: OAG analysis, 2016

4.23 The survey revealed that the average price of an energy saving bulb varies depending on the source, which by default dictates the quality of the bulb. The bulb price stated by respondents ranged from Ksh. 60 in local kiosks to Ksh. 450 in the supermarket as outlined in **Table 8**.

**Table 8: Comparison of Prices of Energy Saving Bulbs from Different Sources**

Source	Highest Price Mentioned (Ksh.)	Lowest Price Mentioned (Ksh.)	Average Price (Ksh.)
Supermarket	450	100	241
Electrical shop	250	100	187
Local Kiosk	250	60	119
Hardware	100	100	100

Source: OAG analysis, 2016

- 4.24 We corroborated this information through a review of bulb prices in Kenyan Supermarkets, which also revealed that CFLs is still very expensive and unaffordable to the low-class consumers who form the target group of this project. A comparison of CFL and ICL prices is shown in **Table 9**.

**Table 9: Cost comparison of CFLs and ICLs**

Brand	CFL average market price (Ksh.)	ICL average market price (Ksh.)	Price difference
Osram	320	50	225
Philips	295	50	250
Illumatt	265	45	250
<b>Average price</b>	<b>293</b>	<b>48</b>	<b>245</b>

Source: OAG analysis, 2016

- 4.25 Interviews with KPLC staff revealed no evidence of a plan for project sustainability. This is in spite of the fact that both KPLC and MoEP staff interviewed cited high cost and availability of substandard bulbs in the market as the main barriers to adoption of energy saving bulbs in Kenya. Besides, neither KPLC nor the MoEP provided any evidence to show that a post-implementation monitoring has been done to check whether the beneficiaries of phase I of ELP continued to use energy saving bulbs after the ones they received reached their end of life.
- 4.26 The sustainability of ELP outcomes was overlooked during the design stages of this project with the assumption that the savings provided by the bulbs would be enough to encourage electricity consumers to use these bulbs. This, therefore, poses a risk to the achievement of the ELP goal of encouraging widespread use of energy-saving bulbs, even with the implementation of phase II of this project. The beneficiaries might revert back to ICLs once the CFLs issued blow out.

**Inadequate management of project's negative environmental impacts**

- 4.27 Both ICLs and CFLs contain toxic substances. While CFLs contain mercury, ICLs contain Lead Oxides. According to the Fourth Schedule of the Environmental Management and Coordination (Waste Management) Regulations 2006, both lead and mercury are hazardous substances hence any waste containing such substances should be disposed of according to procedures outlined in Section 26 of the same regulation. Clause 11.11 (b) of the financial agreement between AFD and GoK also requires KPLC to establish a procedure for proper management of the end of life of CFLs.
- 4.28 Interviews revealed that KPLC did not have an end of life management plan for CFLs distributed during phase I or for the second phase. The team was, however, informed that a national waste management strategy for all light bulbs is being developed by a KPLC contracted consultant as part of the technical assistance for

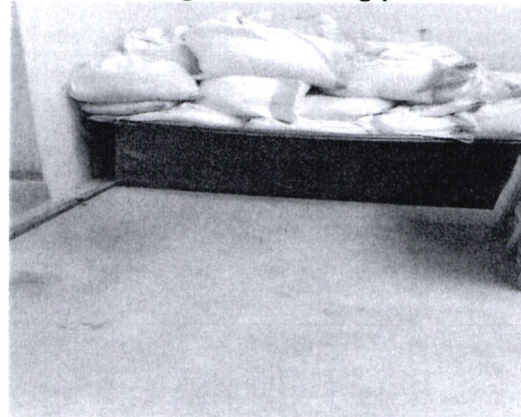
phase II. This is expected to address the disposal challenge for all used bulbs in Kenya. The first draft of this strategy has been submitted to KPLC and was shared with the team during the audit. Nonetheless, KPLC's officials interviewed were noncommittal on who will spearhead the implementation of the strategy stating that the strategy will guide the management of all used bulbs in the country hence should be implemented either by MoEP or NEMA. While both NEMA and the MoEP should have played a critical role in the development of this strategy, interviews revealed that they were only involved during stakeholder consultation.

- 4.29 There is, therefore, a risk that the strategy might not be implemented while environmental pollution due to unsafe disposal of CFL continues. Out of the 64 beneficiaries interviewed, 52 already had some or all of the bulbs received reached their end of life. Disposal in the dustbin together with other household waste was the most common disposal method reported by 94% of the 52 beneficiaries. Such waste is eventually taken to the dump site for final disposal.
- 4.30 Other methods of disposal reported included burying and reusing the failed bulbs as toys for children. This is notwithstanding the fact that the mercury contained in these bulbs can easily spill when the bulbs break, posing an environmental pollution and human health threat. Further analysis of survey data revealed that the beneficiaries of phase I were not provided with information on safe handling of CFLs after their end of life. Only 3 (5%) out of the 64 beneficiaries reported that they were given some information on safe disposal.
- 4.31 Interviews and document review further revealed that KPLC intends to contract the same waste handler that disposed ICLs during phase I. However, our visit to the waste handler revealed that the components recovered from crushing of the bulbs in 2014, including toxic Lead Oxides, are still lying in the facility awaiting disposal as illustrated in **Figure 8** and **Figure 9**. Approximately 9.6 tonnes of glass chips were still stored in gunny bags within Sintmond Group Ltd premises since 2014, the date of crushing of the bulbs. However, the waste handler informed the audit team that he is still in the process of identifying the best way to dispose of the Lead Oxides while the glass chips shall be recycled together with the ones recovered after crushing phase II ICLs.

**Figure 8: Glass chips recovered from crushing of ICLs collected during phase I**



**Figure 9: Lead Oxides recovered from crushing of ICL during phase I**



Source: OAG

4.32 The inadequate management of the project's environmental impacts was attributed to several factors including:

- i) KPLC's focus for disposal of ICLs was more on avoiding the reintroduction of the recovered bulbs back to the market and not the safe disposal of the same. While the terms of reference for disposal of ICLs during phase II states that the disposal process should be supervised by NEMA, this is only as far as the crushing of the bulbs is concerned as was the case during phase I. There is, therefore, a risk that the ICLs recovered from phase II might not be safely disposed just like in phase I and the Lead Oxides might end up into the environment posing a risk to human health and environmental contamination.
- ii) Review of both EMCA (Waste Management) Regulations, 2006 and Occupational Safety and Health Act, 2007 revealed that the law is not clear on safe disposal of wastes containing mercury and lead oxides but they both recommend safe disposal. However, the disposal of bulbs is covered in the draft EMCA (E-Waste Management) Regulations.
- iii) KPLC officials interviewed informed the audit team that the CFLs used in the project have a lifespan of up to 15 years hence the less emphasis on the end of life management plan of the same.

## Chapter 5

### Conclusion

5.1 Based on the issues presented in the findings, a conclusion can be drawn that the implementation of ELP has been faced with several shortcomings limiting the project's ability to encourage sustainable widespread use of energy-saving bulbs among electricity consumers. More specific conclusions were made as follows:

- While KPLC incorporated some of the experiences of phase I into phase II, the risk of diversion of bulbs to non-eligible beneficiaries still remain. This is due to the fact that pre-identification of beneficiaries is not considered important in phase II just like it was the case in phase I. Further, the planning phase of phase II has not managed to adequately address the safe disposal of ICLs thereby increasing the risk of environmental pollution from the project.
- While KPLC procured high quality CFLs at prevailing market price, it failed to adequately plan for storage of the bulbs leading to the lack of space that caused delays in the delivery of the bulbs to the stores.
- Further, KPLC did not adequately plan for safe disposal of ICLs and end of life management of CFLs posing environmental pollution and human health risk.
- Sustainability of ELP outcomes lies in a continuous supply of cost-effective energy-saving bulbs, but the project has not given this any serious consideration. The outcomes of ELP may thus not be sustainable in the future.

## Chapter 6

### Recommendations

6.1 In view of the findings of the audit, the Auditor-General made the following recommendations that the Accounting Officer in the MoEP and the Kenya Power and Lighting Company Ltd should consider taking to ensure successful implementation of the ELP.

- To ensure adequate capturing and Utilisation of project lessons
  - KPLC should consider developing a comprehensive monitoring plan for the project that covers both implementation and post implementation phases.
  
- To ensure sustainability of ELP outcomes:-
  - KPLC should establish strategies to ensure a continuous supply of high-quality energy-saving bulbs at affordable prices. This could be done through setting up of energy shops (kiosks) within KPLC outlets to ensure that customers get cost-effective energy-saving bulbs.
  - The MoEP should work with the Kenya Bureau of Standards to fast track the implementation of the Minimum Energy Performance Standards (MEPS) for CFLs. This will eliminate substandard CFLs currently available in the market.
  - KPLC should consider working with the Ministry of Industrialization and Enterprise Development to develop MEPS for all light bulbs used in Kenya. This will lead to gradual phase out of energy inefficient ICLs in the market.
  
- To minimize the environmental impacts of CFLs and ICLs:-
  - The MoEP and KPLC should fast-track the development and implementation of the national waste management strategy for CFLs
  - NEMA should fast-track the enactment of the draft EMCA (E-Waste Management) Regulations
  - KPLC should consider working closely with NEMA and Advanced Recycling Facility to ensure that the recovered Lead Oxides are disposed safely

## Appendices

### Appendix 1: Methods of gathering evidence

#### a) List of People Interviewed

Person to be interviewed	Reasons
<b>Project Leader</b>	To obtain information on ELP, including its purpose, structures in place for its implementation and the expected outcomes
<b>Demand side management assistants</b>	To obtain information on the measures in place for implementation of ELP
<b>An officer from KPLC's Marketing and Communications section</b>	To obtain information on the plans in place for the public awareness and marketing component of the project.
<b>An officer from KPLC's Safety, Health and Environment section</b>	To obtain information on the plans in place for the management of environmental impacts of the project.
<b>KPLC regional managers and staff</b>	To obtain information on the measures in place for implementation of ELP at the regional level
<b>KPLC store managers</b>	To obtain information on delivery of bulbs to the stores and measures in place for distribution of bulbs from the stores
<b>Ministry of Energy and Petroleum officials</b>	To obtain information on the Ministry's role in energy efficiency as well as its responsibility in the implementation of the ELP
<b>Director, Sintmond Group Limited (Advanced Recycling Facility)</b>	To obtain information on how ICLs recovered during phase I was disposed and plans for disposal of ICLs recovered from phase II.

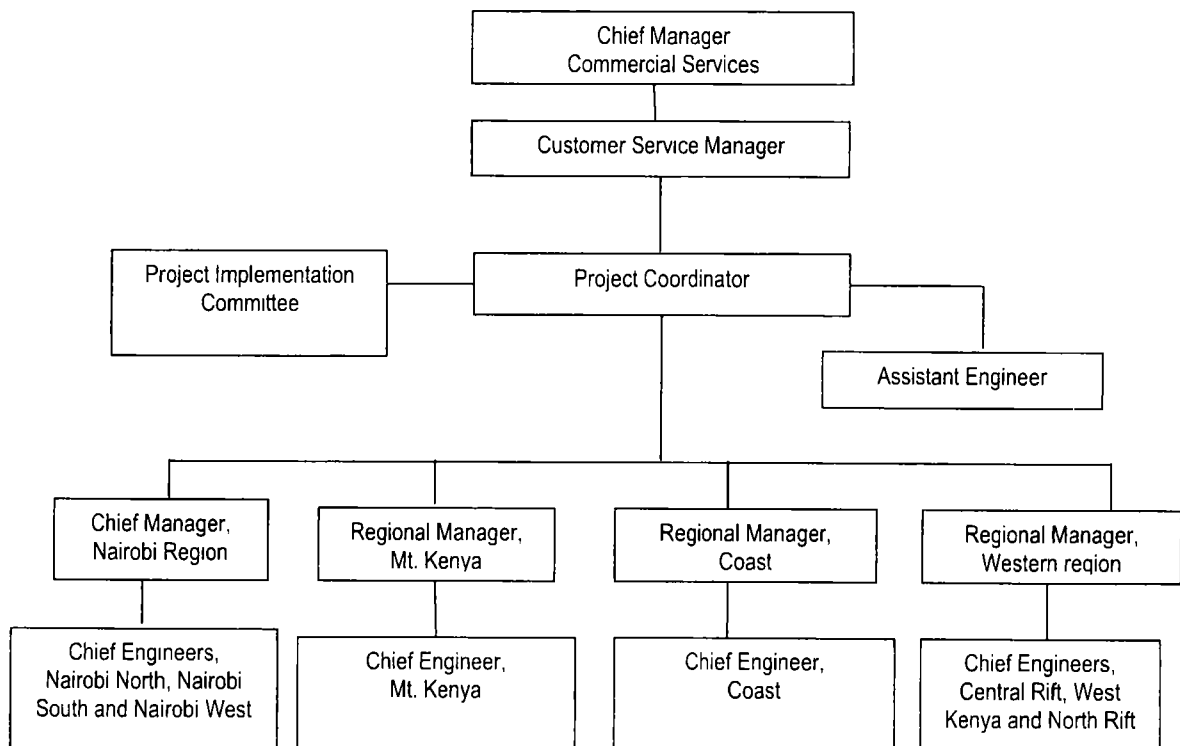
b) Documents Reviewed

Document reviewed	Information Obtained
Energy Act, 2006	Legal provisions for energy efficiency and conservation.
EMCA, 1999	Environmental requirements for implementation of efficient lighting project
Public Procurement and Disposal Act, 2015	Recommended procedures for procurement of goods in the public sector
PPOA Market Price Index, December, 2014	Recommended price for procuring CFLs in public offices
EMCA, (Waste Management) Regulations, 2006	Environmental requirement for disposal of ICLs and CFLs
Draft EMCA, (E-Waste Management) Regulations	Environmental requirement for disposal of light bulbs
KPLC strategic plan (2013-2017)	-KPLC's mandate -Energy conservation strategies
KPLC's 2014/15 annual report & financial statements	-Trend in customer connectivity
MoEP strategic plan (2013-2017)	-Ministry's role in promoting efficient lighting
ELP Phase II Project Document	-Background information on ELP, including its goal, objectives, activities, output, financing plan and implementation structure
Phase II EIA report	-Identified project's environmental impacts and proposed mitigations
GoK-AFD financial agreement	- Funding for the project - Implementation requirements
World Bank's large scale CFL deployment programs' guiding document, 2009	Recommended best practices for implementation of large scale CFL exchange programmes
UNEP's Achieving Global transition to energy efficient lighting toolkit, 2012	Recommended best practices for implementation of large scale CFL exchange programmes
Phase II distribution plan	-Planned distribution strategy
Phase II awareness and marketing plan	-Planned awareness and promotion strategy
CFL and storage containers procurement documents	-Set quality standards, cost of the bulbs and delivery of the bulbs
ELP phase I evaluation report	-Phase I implementation status
Consolidated ELP beneficiary data	-Deviations in the distribution of bulbs during phase I
ELP phase I disposal contract document	-Disposal terms of reference
ELP phase II disposal tender document	-Set disposal terms of reference
Draft national waste management strategy	-Strategy for the management of CFLs after end of life

c) List of Places Visited

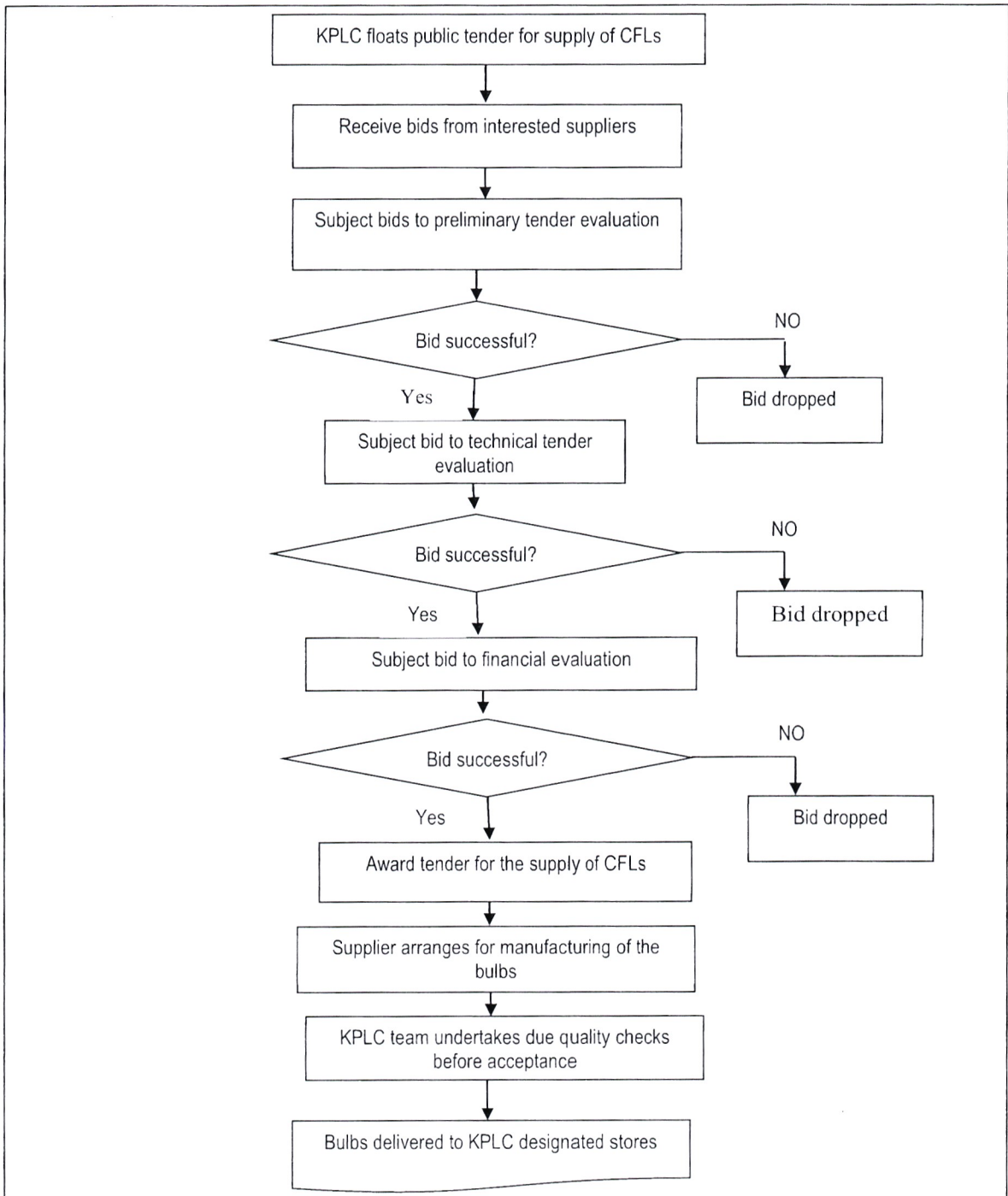
Region	Branch	Places Visited
Nairobi North	Zimmerman/Githurai/Mwiki	- Ruaraka store -Mathare Mental Hospital -Buruburu Girls High School -Buruburu Secondary -Baraka Primary School -Mathare Estate -Zimmerman Estate -Githurai Estate
Nairobi South	Machakos	-Machakos store -Mlolongo store -Mutindi Estate -Kenya Israel Estate -Muthini Estate
Nairobi West	Dagoretti	-KPLC Dagoretti store -Dagoretti Boys High School -Moy Girls High School -Dagoretti Estate -Kawangware 46 Estate -Kawangware 56 Estate
North Rift	Eldoret	-Eldoret Store -Langas Estate -Pioneer Estate -Munyaka Estate -Moi University Annex
Central Rift	Nakuru	-Lanet Store -Free Area Estate -Mwariki Estate -Langalanga Estate
Mount Kenya	Nyeri	-Nyeri store -Blue Valley Estate -Ruring'u Estate -Atlas Estate
Coast	Mombasa	-Mbaraki store -Likoni Estate -Kiembeni (Kosovo) Estate -Sossion Estate

## Appendix 2: ELP Phase I Implementation Structure



Source: ELP phase I project working document

### Appendix 3: KPLC's CFL Procurement Process



OAG, 2015

**Appendix 4: ELP Phase I expenditure**

Item	Actual Expenditure (Ksh.)	Financier	
		GoK (Kshs.)	KPLC (Ksh.)
Compact Fluorescent Lamps	327,970,800.00	327,970,800.00	-
20x40 ft. Containers	5,742,000.00	5,742,000.00	-
Procurement Costs (tendering, FAT)	615,543.00	615,543.00	-
Installation costs (Labour & Transport)	62,198,286.90	62,198,286.90	-
Disposal of ICLs	27,103,086.80	-	27,103,086.80
Awareness Campaigns	15,313,405.01		15,313,405.01
<b>Total</b>	<b>438,943,121.71</b>	<b>396,526,629.90</b>	<b>42,416,491.81</b>

Source: ELP Phase I Financial documents

## Appendix 5: KPLC Management Response to audit findings

SN	OBSERVATIONS BY PERFORMANCE AUDIT	KPLC RESPONSE ON THE OBSERVATIONS	OAG COMMENTS
5,6,7, 8, 9, 10,11, 12,13	<p><b>Inadequate Utilisation of lessons learned from Phase I to improve on Phase II of the project:</b></p> <p>Phase I of the ELP was designed as a pilot phase meant to provide useful lessons for future implementation of the project. Phase II is therefore expected to utilize these lessons to improve its performance.</p> <p>KPLC used some of the experiences from Phase I to improve on the performance of the project such as:</p> <ul style="list-style-type: none"> <li>- Improvements on the specifications for more light output</li> <li>- Use of contractors instead of KPLC staff for the distribution and more supervision by KPLC</li> <li>- Use of vernacular radio stations for media campaigns</li> <li>- Development of end of life management for CFLs</li> </ul> <p>Most critical shortcomings that led to the inadequate performance of phase I have not been addressed and there is a risk they might still occur in Phase II jeopardizing the projects ability to encourage sustainable wides-pread use of energy saving bulbs in Kenya's residential lighting. Some of the most critical shortcomings that have not been addressed are as below:</p>	<p><b>Lessons learned from Phase I were adequately applied in Phase II:</b></p> <p>It is acknowledged that KPLC has used some of the vital lessons learned in Phase I in the design of the current Phase II project.</p> <p>The lessons learned from Phase I include:</p> <ul style="list-style-type: none"> <li>- Improved specs in terms of wattage and light output (lumens),</li> <li>- Contracting the installation services and improvement on supervision,</li> <li>- Campaigns for awareness through local radio stations and</li> <li>- Development of a waste management strategy for CFLs is in progress</li> </ul> <p>The issues identified in the audit as short comings were carefully considered in the Phase II project design and are explained as follows:</p>	<p>KPLC agrees it used some of the lessons learned in Phase I</p> <p>Commitment to use contractors in phase II under close supervision of KPLC is noted. However, the Pre-identification of the customers in phase II has been done by mapping out the low income areas just like in phase I, despite the challenges faced in implementation of phase I</p>

SN	OBSERVATIONS BY PERFORMANCE AUDIT	KPLC RESPONSE ON THE OBSERVATIONS	OAG COMMENTS
	<p><b>a) Lack of pre-identification of project beneficiaries:</b></p> <p>Beneficiaries of Phase 1 were not pre-identified and KPLC installers were expected to randomly select beneficiaries so long as they fall within the target group. The draft marketing and awareness plan proposed pre-identification of beneficiaries where KPLC customers who fall within the target group were to register through a Short Messaging System (SMS). The project team would then vet the registrations and identify those who deserve to benefit from the project.</p> <p>However, this was reviewed and beneficiaries are to be selected randomly just like in the pilot phase and the reason given was that customers would view this as discrimination.</p> <p>This led to the following issues:</p> <p>Random selection of beneficiaries provided a loophole that encouraged diversion of bulbs to non-eligible customers.</p> <p>A review of phase I beneficiaries reviewed several instances of more than 3 bulbs issued to individual names which for some it was established that the several instances was for several households sharing a single meter. However, some 21 out of 64 beneficiaries' interviews reported receiving more than 3 bulbs.</p>	<p><b>a) Pre-identification of project beneficiaries:</b></p> <p>Phase I of the project had initially considered pre-identification of beneficiaries, but the practicality of implementing the same was not possible due to the following:</p> <p>After pre-identifying the beneficiaries, locating the pre-identified customers' premises for retrofitting can be done by use any of the following methods:</p> <ul style="list-style-type: none"> <li>- Physical address</li> <li>- GPS coordinates</li> <li>- Staff familiar with the particular locations</li> </ul> <p>i) Physical address system in the entire country such as street names and house numbers is not properly done. This is more so in the low income settlements and rural areas which are the target of this project. This makes it impossible to locate beneficiaries by this method.</p> <p>ii) GPS coordinates for all the beneficiaries need to be available to locate the beneficiaries by this method.</p> <p>iii) The only option was to use meter readers as they are the only staff familiar with the customer locations.</p> <p>Due to the need to meet the timelines, Phase I of the project was implemented by KPLC employees from all the departments as the meter</p>	

SN	OBSERVATIONS BY PERFORMANCE AUDIT	KPLC RESPONSE ON THE OBSERVATIONS	OAG COMMENTS
		<p>readers were inadequate to implement the project.</p> <p>At the time of implementing the project, completion of the project was very critical as the country was facing a supply – demand crisis and the major goal was to reduce peak demand and avoid reduce rationing of power.</p> <p>Any delays would have meant the immediate project goal would not be realized as the country continued experiencing power shortages. Hence due to the urgency to implement the project, all the employee categories in KPLC were deployed and the only practical method was to select the customers according to the area where they live.</p> <p>Phase II of the project is being implemented using contractors.</p> <p>To avoid the loopholes identified in the audit, KPLC has made improvements on the distribution criteria as follows:</p> <ul style="list-style-type: none"> <li>- Pre-identification of the customers has been done by mapping out the low income areas and allocating each of the areas a particular quantity of CFLs.</li> <li>- Likewise, in all the regions, a similar exercise has been done, mapped out and given to the contractors and implementation is being</li> </ul>	

SN	OBSERVATIONS BY PERFORMANCE AUDIT	KPLC RESPONSE ON THE OBSERVATIONS	OAG COMMENTS
		<p>done under close supervision of KPLC staff to ensure there is no diversion to undeserving areas.</p> <ul style="list-style-type: none"> <li>- Beneficiary data collected is checked for quality which was not the case in Phase I.</li> <li>- Monitoring surveys by KPLC supervisors are continuously being done to ensure the correct quality is adhered to.</li> </ul>	
14,15, 16	<p><b>b) Disposal of ICLs still focusses on the destruction of the bulbs and not safe disposal of the same</b></p> <p>The disposal of ICLs is focused on the destruction of the bulbs to avoid their reintroduction to the market and not the safe disposal of the same just as was the case during Phase I.</p> <p>Safe disposal of ICLs would mean that the bulbs are crushed using a special machine capable of separating the various components like glass, metal components which can be recycled and the lead oxides which should either be recycled or buried safely under NEMA's supervision.</p>	<ul style="list-style-type: none"> <li>- KPLC has focused on both the destruction and safe disposal of the bulbs in this project. KPLC has taken steps to ensure this is accomplished:-</li> <li>- While the main reason for destruction is to ensure the bulbs are not re-used as this will negate the project gains, the project also focuses on safe disposal as per the following:-</li> <li>- Regarding destruction and disposal of the recovered Incandescent bulbs, KPLC sought guidance from the NEMA which advised on use of the only licensed facility in the country for the destruction of the bulbs and disposal the associated waste. The engagement of the contractor is underway.</li> <li>- The contractor is responsible for the disposal of the waste for this project</li> </ul>	<p>No follow-up was done to ensure safe disposal of incandescent bulbs in phase I. The contracted firm had at the time of the audit only crushed and separated the various components of incandescent bulbs like glass and lead oxide stored in bags. It was not clear on the method of disposal/ recycling they were to adopt.</p> <p>KPLC commitment to do follow-up on disposal methods adopted in phase II is noted.</p>

SN	OBSERVATIONS BY PERFORMANCE AUDIT	KPLC RESPONSE ON THE OBSERVATIONS	OAG COMMENTS
		<p>under the supervision of NEMA.</p> <p>- KPLC will also do follow ups to ensure disposal of the waste is done.</p>	
17,18, 19,20, 21, 22, 23	<p><b>Although KPLC procured High Quality CFLs at the prevailing market price, the delivery of these bulbs was not done in a timely manner</b></p> <p>KPLC complied with the Public Procurement and Disposal Act, 2015 in that the prices were within the Public procurement and Oversight Authority's price Index for the third quarter of 2014/15. However, the delivery of the bulbs was not done within the completion schedule specified in the Schedule of requirements in the contract. The deliveries were completed in 237days instead of the 210 days allowed in the contract</p> <p>The implementation of the project is behind schedule as the distribution was scheduled to begin in November 2015.</p>	<p><b>There were unforeseen delays in the deliveries of the bulbs attributable to the following:-</b></p> <p>The CFL distribution program is financed by the French Development Agency (AFD). The procurement processes of the program are governed by the procurement guidelines of the financier. For every stage of procurement, internal approvals are done, after which the financing agency's approval (No Objection) is sought before the next move is undertaken.</p> <p>While the internal approvals are done fairly fast, the approval by the donor agency is quite slow, sometimes taking as long as 4 months. For this project, the steps which required internal approvals as well as the AFD No objection are: approval of tender document before tendering, tender evaluation report and approval of the contract document with the winning bidder. The delays in each of the processes cumulatively lead to a long delay overall.</p> <p>In this regard, the procurement of the CFLs and storage containers underwent the</p>	<p>Agreed; though the implementation of the project is behind schedule and customers continue to use incandescent bulbs. The inordinate delays have resulted in KPLC not being able to achieve one of their core objective of reducing peak demand.</p>

SN	OBSERVATIONS BY PERFORMANCE AUDIT	KPLC RESPONSE ON THE OBSERVATIONS	OAG COMMENTS
		<p>following steps leading to the delays:</p> <ul style="list-style-type: none"> <li>- The tendering process for the CFLs was concluded in July 2015 when the contract was signed as AFD No Objection to the supply contract was received on 9<sup>th</sup> July 2015 after which the contract was signed on 17<sup>th</sup> July 2015).</li> <li>- At the same time, the tender document for the procurement of storage containers had been prepared and was submitted to AFD for No Objection in June 2015 which was finally granted on 27<sup>th</sup> July 2015.</li> <li>- It was envisaged that by the time the manufacturing of the CFLs was completed and delivery, the containers would have been procured and delivered.</li> <li>- Procurement of containers thus inadvertently went beyond the expected period due to delays in getting the AFD No objections (both at the bidding, evaluation and award).</li> </ul> <p>Though the bidding and evaluation were successfully completed by September 2015, the tender was eventually cancelled in December 2015. The tender committee cancelled the tender based on the following:</p>	

SN	OBSERVATIONS BY PERFORMANCE AUDIT	KPLC RESPONSE ON THE OBSERVATIONS	OAG COMMENTS
		<ul style="list-style-type: none"> <li>- The lowest evaluated bidder had offered the containers at high prices</li> <li>- By the time of the decision, the CFLs had already arrived in the country and the winning bidder still required to import the containers from China which would have taken a minimum of 1 month to deliver.</li> <li>- It was therefore decided that the supplier of the CFLs supplies the same containers having the bulbs. The price was cheaper and it was more convenient.</li> </ul> <p>The whole process was therefore restarted with the approvals for the CFL tender to include the containers in the same contract. AFD finally gave their No objection on 27<sup>th</sup> January to amend the CFL contract and include the supply of containers as well.</p> <p>The whole process took about seven months instead of the envisaged about four months which would have been adequate to finalize the process.</p>	
24,25, 26,27, 28, 29,30, 31,32	<p><b>Lack of long-term sustainability plan for the project outcomes</b></p> <p>In addition to reducing the electricity system peak demand, ELP sets its goal to encourage widespread use of energy efficient bulbs among electricity consumers in Kenya. Both KPLC and the</p>	<p><b>Long term sustainability plan of the project outcomes</b></p> <p>One of the project goals besides reduction of peak demand was promotion of energy saving bulbs amongst our customers. In this project, this was achieved by the</p>	<p>We note the efforts of KPLC to sensitize the users on the long time advantages of use of energy saving bulbs</p>

SN	OBSERVATIONS BY PERFORMANCE AUDIT	KPLC RESPONSE ON THE OBSERVATIONS	OAG COMMENTS
	<p>MOEP is expected to have a strategy in place for ensuring that the non-beneficiaries are encouraged to use energy saving bulbs and the beneficiaries of the project do not revert back to ICLs.</p> <p>Some beneficiaries reported having reverted back to ICLs due to the following:</p> <ul style="list-style-type: none"> <li>- High cost of energy saving bulbs in the market</li> <li>- Low quality of energy saving bulbs in the market</li> <li>- The dim light produced by energy saving bulbs</li> </ul> <p>There is no evidence of a plan for project sustainability. The sustainability of the project outcomes was overlooked during the design stages of the project with the assumption that the savings provided by the bulbs would be enough to encourage electricity consumers to use these bulbs.</p> <p>This poses a risk to the achievement of the ELP goal of encouraging widespread use of energy saving bulbs, even with the implementation of Phase II of this project.</p>	<p>awareness and communication campaigns that targeted the beneficiaries as well as the non-beneficiaries to ensure that beneficiaries do not revert back to using ICLs.</p> <p>The awareness creation in KPLC is a continuous process which is carried out through the media, barazas, trade-fairs and other customer engagement forums. Through the awareness campaigns, many customers in Kenya are now aware and continue to use energy saving bulbs.</p> <p>One of the most effective ways to ensure long term sustainability of the project outcomes would be the phase out of importation of Incandescent Light bulbs. Many Governments around the world have implemented measures to ban incandescent light bulbs in their country. In Africa, only South Africa has implemented this measure where the ban was effected in 2016.</p> <p>KPLC will lobby the Ministry of Energy and Petroleum to ban the importation of the Incandescent Light Bulbs in Kenya.</p> <p>On overcoming the barriers of using energy saving lamps like the high cost, low quality and the dim lights, the following has been done:-</p>	

SN	OBSERVATIONS BY PERFORMANCE AUDIT	KPLC RESPONSE ON THE OBSERVATIONS	OAG COMMENTS
		<ul style="list-style-type: none"> <li>- In 2014/15, KPLC participated in the Standards and Labelling (S&amp;L) program that was spearheaded by the Ministry of Industrialization. The program involved development of Minimum Energy Performance Standards (MEPS) for Compact Fluorescent Lamps and other appliances as well as a Labeling Scheme for the same. The MEPS will ensure only quality and energy efficient appliances get into the Kenyan market. Labelling gives energy consumption information on the appliances and gives purchasers the choice to purchase appliances based on their energy consumption.</li> <li>- The dim lights have also been addressed by the new Standards as quality light bulbs will now be imported.</li> <li>- On the high prices of energy saving bulbs, the Government has zero rated energy saving bulbs to ensure affordability.</li> </ul> <p>These measures, together with a possible future ban of the importation of ICLs in the country are some of the strategies that will ensure sustainable energy saving culture in our country.</p>	

SN	OBSERVATIONS BY PERFORMANCE AUDIT	KPLC RESPONSE ON THE OBSERVATIONS	OAG COMMENTS
33,34, 35,36, 37,38	<p><b>Inadequate management of project's negative environmental impacts</b></p> <p>Both ICLs and CFLs contain hazardous and toxic substances. CFLs contain mercury and ICLs contain lead Oxides. These need to be disposed as per EMCA regulations 2006. The Financing Agreement between AFD and GOK requires KPLC to establish a procedure for proper management of end of life of CFLs.</p> <p>KPLC did not have an end of life management plan for CFLs distributed during phase I or phase II of the project. The audit team was however informed that a national end of life management strategy for all light bulbs by a KPLC contracted consultant as part of the technical assistance for Phase II.</p> <p>It is expected that NEMA given its mandate would spearhead the development of this strategy, interviews revealed that NEMA was only involved during the stakeholder consultation. The same case went for the MoE&amp;P. There is therefore a risk that strategy might not be implemented while environmental pollution due to unsafe disposal of CFLs continues.</p> <p>KPLC intends to use the same waste handler used in Phase I. The glass and lead oxides are still lying in their premises as the contractor gets a way of disposing them.</p>	<p>KPLC is alive to the fact that CFLs and ICLs contain toxic substances and the following has been done to mitigate this:-</p> <p>i) The specifications developed for the project CFLs called for low mercury content &lt;2.5mg. The actual mercury content of the CFLs supplied is 1.4mg and in amalgam form to reduce the environmental impact in the event of breakages.</p> <p>ii) The current project is registered to the UNFCCC for CDM and one of the requirements for registration is for approval of Environmental Impact Assessment (EIA) approved by the National Environmental Authority in the country of project implementation.</p> <p>An EIA for the project was done and approved by NEMA on 17<sup>th</sup> July 2012 vide Ref. NEMA/PR/5/2/9746, and a renewal was done on 20<sup>th</sup> August 2015, ref. NEMA/21/II/VOL.II for a further 24 months up to July 2017. The EIA was submitted to NEMA through the MoE&amp;P and gave details on the environmental management plan regarding disposal of ICLs as well as CFLs.</p> <p>iii) KPLC, in the current project is developing an end of life</p>	<p>Agreed with the management comments</p> <p>However, KPLC being the main stakeholder should have been more proactive in ensuring safe disposal of the crushed bulbs and or assessing the capacity of the firm contracted to dispose the incandescent bulbs</p>

SN	OBSERVATIONS BY PERFORMANCE AUDIT	KPLC RESPONSE ON THE OBSERVATIONS	OAG COMMENTS
	<p>The inadequate management of the project's environmental impacts was attributed to:</p> <p>i) KPLC's focus was more on avoiding reintroduction of the ICLs back to the market and not safe disposal. There is therefore a risk that that ICLs recovered from Phase II might not be safely disposed just like in Phase I.</p> <p>ii) A review of the EMCA (waste management) regulations, 2006 and Occupational Safety and health Act, 2007 revealed that the law is not clear on safe disposal of wastes containing mercury and lead oxides but both recommend safe disposal. The disposal of bulbs is covered in the draft EMCA (E-Waste Management) Regulations.</p> <p>iii) KPLC officials interviewed informed the audit team that the CFLs used in the project have a life span of up to 15 years hence less emphasis on the end of life management of the same.</p>	<p>management strategy for the CFLs which is part of the implementation of the EIA. The strategy is at the draft stage and has been submitted to NEMA for comments. The strategy has borrowed both from international best practices as well as our local environmental policies.</p> <p>- NEMA has therefore been involved since the EIA stage, stakeholder consultations as well as the workshops held to discuss the strategy and is now in possession of the draft strategy for their input. This is to ensure the strategy meets all the requirements and is implementable.</p> <p>iv) KPLC adequately considered the environmental impacts of the project in both phase I and the current project and met the requirements within what is within her mandate.</p> <p>- Apart from destruction to avoid reintroduction of the ICLs back to the users which could have been achieved by other means like painting the bulbs, KPLC followed due process and hired the only NEMA licensed firm to carry the destruction and eventual disposal of the same.</p> <p>- The Terms of Reference for disposal of Phase II</p>	

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		<p>includes destruction and disposal of ICLs through a NEMA licensed firm. The process is to be witnessed by NEMA and provide a disposal certificate on completion of the process.</p> <p>v) In addition, KPLC will work with NEMA to ensure safe destruction and disposal of the waste from the project within the available regulations. It has also established that the waste from Phase I project is still lying within the contractor's premises. KPLC will write to NEMA about the disposal of the same and make follow up to ensure the process is concluded.</p> <p>vi) KPLC placed great emphasis on the end of life management for CFLs, lifetime of 15 years notwithstanding. In the project plan, this component has been ongoing since the project inception with an EIA done in 2012 and stakeholder consultation in 2014. The draft strategy is now with NEMA for their input. As rightfully acknowledged, there has not been clear guidelines on the disposal of mercury and lead oxides and in it just recently that these have been covered under the draft EMCA (E-Waste Regulations).</p>	

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		<p>Due to the gaps in policy, the process has been ongoing and has taken longer than anticipated. KPLC is working to ensure that a good strategy is developed for the disposal of CFLs in the entire country.</p>	
39	<p><b>Conclusions</b> Based on the issues presented in the findings, a conclusion can be drawn that the implementation of ELP has been faced with several shortcomings limiting the projects ability to encourage sustainable widespread use of energy saving bulbs among electricity Consumers.</p> <ul style="list-style-type: none"> <li>- While KPLC incorporated some of the experiences of Phase I in to phase II, the risk of diversion of bulbs to non –eligible beneficiaries still remain. This is due to the fact that pre-identification of beneficiaries is not considered important in phase II just like it was in Phase I. Further the planning phase of phase II has not managed to adequately address the safe disposal of ICLs thus increasing the risk of environmental pollution from the project.</li> <li>- While KPLC procured high quality CFLs at prevailing market price, it failed to adequately plan for storage of the bulbs leading to the lack of space that caused delays in the delivery of the bulbs to the stores</li> <li>- KPLC did not adequately plan for safe disposal of ICLs and</li> </ul>	<p><b>Conclusions</b> It is acknowledged that there were a few shortcomings in Phase I of the project, but given that challenges and lessons learned have been applied in the current phase of the project based on the current scenario in the country.</p> <ul style="list-style-type: none"> <li>- Pre-identification of beneficiaries has been considered through use of pre-identified itineraries within particular zones. For example, in Nairobi West region, a total 125,100 CFLs have been allocated to several villages within Likewise, in all the regions, a similar exercise has been done, mapped out and given to the contractors and implementation is being done under close supervision of KPLC staff to ensure there is no diversion to undeserving areas.</li> <li>- Planning for the disposal of the ICL waste has been factored in the project and the process is still ongoing to ensure disposal is done</li> </ul>	<p>Noted. The success or otherwise of the program will be determined by the full implementation of the ELP, sensitization of the users and in the long run, the banning of the importation/ distribution of incandescent bulbs.</p> <p>The greatest risk rests with the safe disposal of end of use bulbs.</p>

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	<p>end of life management of CFLs posing environmental pollution and human health risk</p> <ul style="list-style-type: none"> <li>- Sustainability of ELP outcomes lies in a continuous supply of cost effective energy saving bulbs, but the project has not given this any serious consideration. The outcomes of ELP may thus be unsustainable in future.</li> </ul>	<p>in a safe manner approved by NEMA.</p> <ul style="list-style-type: none"> <li>- KPLC planned procurement of the containers for storage of the bulbs in good time to ensure they were available before delivery of the bulbs, but faced challenges of delays in approval, high prices and eventual cancellation of tender. Internal approvals by the financier for the supply of containers took about seven months.</li> <li>- Sustainability of the project outcome is not only ensured by continuous supply of the energy saving bulbs, but by many other factors including awareness campaigns and development of policies that will remove barriers to energy efficiency in the country. The ultimate will be to ban the importation of Incandescent light bulbs in the country which KPLC will work with the MoEP to spearhead the ban.</li> <li>- KPLC has also fully participated in development of various policies and continues to raise awareness in the country on efficient use of energy. Some of the activities already done are: <ul style="list-style-type: none"> <li>- Participation by KPLC and MOE&amp;P engineers</li> </ul> </li> </ul>	

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		<p>in the development of MEPS and Labels for energy efficient appliances in the country including CFLs</p> <ul style="list-style-type: none"> <li>- Continuous customer education on use of energy saving technologies including bulbs.</li> </ul>	

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