Document of
The World Bank

Report No: ICR4053

IMPLEMENTATION COMPLETION AND RESULTS REPORT
(IDA-52340 IDA-45540 TF-94484, TF10096)

ON A CREDIT

IN THE AMOUNT OF XDR 57.6 MILLION (US$87 MILLION EQUIVALENT)

A GLOBAL ENVIRONMENT FACILITY TRUST FUND GRANT

IN THE AMOUNT OF US$9 MILLION

AND A GLOBAL PARTNERSHIP FOR OUTPUT BASED AID GRANT

IN THE AMOUNT OF US$5.5 MILLION

TO THE

REPUBLIC OF UGANDA

FOR AN

ENEGY FOR RURAL TRANSFORMATION PROJECT IN SUPPORT OF THE SECOND PHASE OF THE ENERGY FOR RURAL TRANSFORMATION PROGRAM

June 23, 2017

Energy and Extractives Global Practice
Country Department AFCE2
Africa Region

CURRENCY EQUIVALENTS
(Exchange Rate Effective June 1, 2017)

Currency Unit = Uganda Shillings
USh 1.00 = US$ 0.0003
US$ 1.00 = USh 3,600

FISCAL YEAR
July 1 – June 30

ABBREVIATIONS AND ACRONYMS

AF	Additional Financing
APL	Adaptable Program Loan
CIC	Community Information Center
CO_2	Carbon dioxide
ERT	Energy for Rural Transformation
ESIA	Environment and Social Impact Assessment
ESMF	Environment and Social Management Framework
FMR	Financial Monitoring Report
GEF	Global Environment Facility
GoU	Government of Uganda
GPOBA	Global Partnership for Output Based Aid
HC	Health Center
IA	Implementing Agency
ICT	Information Communication and Technology
IDA	International Development Association
KfW	German Development Bank
kW	Kilowatt
MEMD	Ministry of Energy and Mineral Development
MoES	Ministry of Education and Sports
MoFPED	Ministry of Finance Planning and Economic Development
MoH	Ministry of Health
MoLG	Ministry of Local Government
MoWE	Ministry of Water and Environment
MW	Megawatt
NDF	Nordic Development Fund
NDP	National Development Plan
OBA	Output-Based Aid
OIAG	Office of the Internal Auditor General
PCU	Project Coordination Unit
PDO	Project Development Objective
PSFU	Private Sector Foundation Uganda
PVTMA	Photo Voltaic Targeted Market Approach

RAP	Resettlement Action Plan
REA	Rural Electrification Agency
RPF	Resettlement Policy Framework
UCC	Uganda Communications Commission
UECCC	Uganda Energy Credit Capitalization Company

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Project Team Leader:	Raihan Elahi, Mbuso Gwafila, Mitsunori Motohashi
ICR Team Leader:	Federico Qüerio
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REPUBLIC OF UGANDA
Energy for Rural Transformation APL-2

DATA SHEET

A. Basic Information			
Country:	Uganda	Project Name:	Uganda: Energy for Rural Transformation APL-2
Project ID:	P112334, P112340, P120108	L/C/TF Number(s):	P112334 (IDA-45540, IDA-52340), P112340 (TF-94484), P120108 (TF-10096)
ICR Date:	06/30/2017	ICR Type:	Core ICR
Lending Instrument:	APL	Borrower:	Republic of Uganda
Original Total Commitment:	P112334 (XDR 49.50M, XDR 8.10M), P112340 (US$9.00M), P120108 (US$5.50M)	Disbursed Amount:	P112334 (IDA-45540, IDA-52340 XDR 54.51M), P112340 (TF-94484 US$ 7.26M), P120108 (TF-10096 US$ 5.49M)
Environmental Category: B		**Focal Area**: C	
Implementing Agencies: Ministry of Energy and Mineral Development (MEMD); Rural Electrification Agency (REA); Uganda Communications Commission (UCC); Private Sector Foundation of Uganda (PSFU); Uganda Energy Credit Capitalization Company (UECCC); Ministry of Finance, Planning and Economic Development (MoFPED), Ministry of Health (MoH), Ministry of Education and Sports (MoES), Ministry of Water and Environment (MOWE), Ministry of Local Government (MOLG), Ministry of Agriculture, Animal Industry and Fisheries (MAAIF)			
Co-financiers and Other External Partners: Global Environment Facility (GEF), Global Partnership for Output Based Aid (GPOBA)			

B. Key Dates				
Uganda: Energy for Rural Transformation APL-2 - P112334				
Process	**Date**	**Process**	**Original Date**	**Revised / Actual Date(s)**
Concept Review:	07/03/2008	Effectiveness:	11/25/2009	11/25/2009
Appraisal:	01/26/2009	Restructuring(s):		05/23/2014 02/13/2015
Approval:	04/06/2009	Mid-term Review:	11/27/2012	11/26/2012
		Closing:	06/30/2013	06/30/2016

UG: Energy for Rural Transformation APL-2 (GEF) - P112340				
Process	**Date**	**Process**	**Original Date**	**Revised / Actual Date(s)**
Concept Review:	07/03/2008	Effectiveness:	09/30/2009	11/25/2009
Appraisal:	01/26/2009	Restructuring(s):		05/23/2014 02/13/2015
Approval:	08/27/2009	Mid-term Review:	11/27/2012	11/26/2012
		Closing:	06/30/2013	06/30/2016

Uganda Energy for Rural Transformation (GPOBA) - P120108				
Process	**Date**	**Process**	**Original Date**	**Revised / Actual Date(s)**
Concept Review:	09/17/2010	Effectiveness:	12/20/2012	12/20/2012
Appraisal:		Restructuring(s):		
Approval:	06/21/2012	Mid-term Review:		
		Closing:	06/30/2017	06/30/2017

C. Ratings Summary

C.1 Performance Rating by ICR

Outcomes	Moderately Satisfactory
GEO Outcomes	Satisfactory
Risk to Development Outcome	Moderate
Risk to GEO Outcome	Moderate
Bank Performance	Moderately Unsatisfactory
Borrower Performance	Moderately Unsatisfactory

C.2 Detailed Ratings of Bank and Borrower Performance (by ICR)

Bank	Ratings	Borrower	Ratings
Quality at Entry	Moderately Unsatisfactory	Government:	Moderately Unsatisfactory
Quality of Supervision:	Moderately Unsatisfactory	Implementing Agency/Agencies:	Moderately Unsatisfactory
Overall Bank Performance	Moderately Unsatisfactory	Overall Borrower Performance	Moderately Unsatisfactory

C.3 Quality at Entry and Implementation Performance Indicators

Uganda: Energy for Rural Transformation APL-2 - P112334

Implementation Performance	Indicators	QAG Assessments (if any)	Rating:
Potential Problem Project at any time (Yes/No):	No	Quality at Entry (QEA)	None

Problem Project at any time (Yes/No):	Yes	Quality of Supervision (QSA)	None
DO rating before Closing/Inactive status	Moderately Unsatisfactory		

UG: Energy for Rural Transformation APL-2 (GEF) - P112340			
Implementation Performance	**Indicators**	**QAG Assessments (if any)**	**Rating:**
Potential Problem Project at any time (Yes/No):	No	Quality at Entry (QEA)	None
Problem Project at any time (Yes/No):	No	Quality of Supervision (QSA)	None
GEO rating before Closing/Inactive Status	Moderately Unsatisfactory		

Uganda Energy for Rural Transformation (GPOBA) – P120108			
Implementation Performance	**Indicators**	**QAG Assessments (if any)**	**Rating:**
Potential Problem Project at any time (Yes/No):	No	Quality at Entry (QEA)	None
Problem Project at any time (Yes/No):	No	Quality of Supervision (QSA)	None
GEO rating before Closing/Inactive Status	None		

D. Sector and Theme Codes

Uganda: Energy for Rural Transformation APL-2 - P112334

	Original	**Actual**
Sector Code (as % of total Bank financing)		
Information and Communications Technologies		
ICT Infrastructure	6	6
Public Administration - Information and Communications Technologies	4	4
Energy and Extractives		
Renewable Energy Wind	17	17
Renewable Energy Solar	17	17
Energy Transmission and Distribution	11	11
Public Administration - Energy and Extractives	11	11
Renewable Energy Geothermal	17	17
Renewable Energy Biomass	17	17

Theme Code (as % of total Bank financing)		
Private Sector Development		
Business Enabling Environment	25	25
Investment and Business Climate	25	25
ICT	25	25
ICT Solutions	25	25
Urban and Rural Development		
Rural Development	50	50
Rural Infrastructure and service delivery	50	50

UG: Energy for Rural Transformation APL-2 (GEF) - P112340		
	Original	**Actual**
Sector Code (as % of total Bank financing)		
Information and Communications Technologies		
ICT Infrastructure	6	6
Public Administration - Information and Communications Technologies	4	4
Energy and Extractives		
Renewable Energy Wind	17	17
Renewable Energy Solar	17	17
Energy Transmission and Distribution	11	11
Public Administration - Energy and Extractives	11	11
Renewable Energy Geothermal	17	17
Renewable Energy Biomass	17	17
Theme Code (as % of total Bank financing)		
Environment and Natural Resource Management		
Climate change	39	39
Mitigation	39	39
Private Sector Development		
Business Enabling Environment	25	25
Investment and Business Climate	25	25
ICT	25	25
ICT Solutions	25	25
Public Private Partnerships	10	10
Urban and Rural Development		
Rural Development	50	50
Rural Infrastructure and service delivery	50	50

E. Bank Staff		
Uganda: Energy for Rural Transformation APL-2 - P112334		
Positions	**At ICR**	**At Approval**
Vice President:	Makhtar Diop	Obiageli Ezekwesili
Country Director:	Diarietou Gaye	John McIntire
Practice Manager/Manager:	Sudeshna Ghosh Banerjee	Subramaniam V. Iyer
Project Team Leader:	Raihan Elahi, Mbuso Gwafila, Mitsunori Motohashi	Malcolm Cosgrove-Davies
ICR Team Leader:	Federico Qüerio	
ICR Primary Author:	Maria Alexandra Planas	

UG: Energy for Rural Transformation APL-2 (GEF) - P112340		
Positions	**At ICR**	**At Approval**
Vice President:	Makhtar Diop	Obiageli Ezekwesili
Country Director:	Diarietou Gaye	John McIntire
Practice Manager/Manager:	Sudeshna Ghosh Banerjee	Subramaniam V. Iyer
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Uganda Energy for Rural Transformation (GPOBA) – P120108		
Positions	**At ICR**	**At Approval**
Vice President:	Makhtar Diop	Obiageli Ezekwesili
Country Director:	Diarietou Gaye	John McIntire
Practice Manager/Manager:	Sudeshna Ghosh Banerjee	Subramaniam V. Iyer
Project Team Leader:	Raihan Elahi	Somin Mukherji
ICR Team Leader:	Federico Qüerio	
ICR Primary Author:	Maria Alexandra Planas	

F. Results Framework Analysis

Project Development Objectives (from Project Appraisal Document)

The objective of the project is to increase access to energy and information and communication technologies (ICTs) in rural Uganda.

Revised Project Development Objectives (as approved by original approving authority)

The PDO was not revised during implementation.

Global Environment Objectives (from Project Appraisal Document)

The project global environment objective is to increase energy efficiency and the use of renewable energy technologies in rural Uganda, in order to decrease present and future growth of greenhouse gas (GHG) emissions.

Revised Global Environment Objectives (as approved by original approving authority)

The GEO was not revised during implementation.

(a) PDO Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1:	Percentage of rural population with access to electricity in project areas.			
Value (quantitative or Qualitative)	4	6	7	7
Date achieved	04/06/2009	06/30/2009	05/22/2013	06/30/2016
Comments (incl. % achievement)	Achieved 100 percent, including on-grid and off-grid connections.			
Indicator 2:	Percentage of the geographical area with access to modern ICT services.			
Value (quantitative or Qualitative)	80	90	N/A	80
Date achieved	04/06/2009	04/06/2009		06/30/2016
Comments (incl. % achievement)	0 percent achieved as project interventions were not implemented.			
Indicator 3:	Project beneficiaries			
Value (quantitative or Qualitative)	0		843,600	709,674
Date achieved	05/22/2013	N/A	05/22/2013	06/30/2016
Comments (incl. % achievement)	Achieved 84 percent. This includes connections achieved through OBA, including GPOBA. Indicator introduced during the AF.			
Indicator 4:	Project beneficiaries, of which female.			
Value (quantitative or Qualitative)	0	N/A	421,800	354,837
Date achieved	05/22/2013		05/22/2013	06/30/2016
Comments (incl. % achievement)	Achieved 84 percent and calculated as half of total project beneficiaries. Indicator introduced during AF.			

Indicator 5:	MW of additional power generation from renewable resources.			
Value (quantitative or Qualitative)	46	73	Dropped	N/A
Date achieved	04/06/2009	06/30/2013	05/22/2013	06/30/2016
Comments (incl. % achievement)	Dropped as PDO indicator and reformulated as intermediate indicator during the AF.			
Indicator 6:	Tons of CO_2 emissions reduced/avoided as a result of the project.			
Value (quantitative or Qualitative)	0	800	Dropped	N/A
Date achieved	04/06/2009	06/30/2013	05/22/2013	06/30/2016
Comments (incl. % achievement)	Dropped as PDO indicator and became an intermediate indicator during AF.			

(b) GEO Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1:	Tons of CO_2 emissions reduced/avoided as a result of the project			
Value (quantitative or Qualitative)	0	860,484	356,700	540,692
Date achieved	04/06/2009	06/30/2013	05/22/2013	06/30/2016
Comments (incl. % achievement)	Target exceeded. Achieved 150 percent of revised target. Target was revised during the Additional Financing because the original target had considered CO2 emission reductions associated with 25MW of small hydro projects.			

(c) Intermediate Outcome Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1:	Number of people provided with access to electricity under the project by household connections.			
Value (quantitative or Qualitative)	0		720,000	643,674
Date achieved	05/22/2013		05/22/2013	06/30/2016
Comments (incl. % achievement)	Achieved 89 percent.			

Indicator 2:	Number of households connected through the extended grid.			
Value (quantitative or Qualitative)	151,000	260,000	271,000	248,753
Date achieved	04/06/2009	06/30/2013	05/22/2013	06/30/2016
Comments (incl. % achievement)	Achieved 91 percent, with vast majority of household connections being supported by the Uganda grid-based OBA Facility that is associated with the project. Target revised during the AF.			
Indicator 3:	Number of households connected through independent grids.			
Value (quantitative or Qualitative)	4,700	5,300	N/A	0
Date achieved	04/06/2009	06/30/2013		06/30/2016
Comments (incl. % achievement)	Not achieved. No connections were made during the project period due to delays with reaching financial closure of supported independent grids.			
Indicator 4:	Number of households using Solar PV systems.			
Value (quantitative or Qualitative)	12,000	32,000		23,000
Date achieved	04/06/2009	06/30/2013		06/30/2016
Comments (incl. % achievement)	Achieved 72 percent. There were reported and confirmed cases of fraud and corruption on the use of the PVTMA facility which resulted in numerous ineligible connections.			
Indicator 5:	Capacity of solar PV systems sold by private companies (kW)			
Value (quantitative or Qualitative)	1,400	2,400		2,400
Date achieved	04/06/2009	04/07/2009		06/30/2016
Comments (incl. % achievement)	100 percent target achieved. 1,012 kW solar PV installed from over 11,000 off-grid connections (eligible) under PVTMA Facility.			
Indicator 6:	Percent reduction in large industrial/commercial loads in target locations (energy savings through energy efficiency measures).			
Value (quantitative or Qualitative)	0	30		31
Date achieved	04/06/2009	06/30/2013		06/30/2016
Comments (incl. % achievement)	Target exceeded. Achieved 103 percent. Installed power factor correction equipment in 28 industries with 8.8 MW verified savings.			
Indicator 7:	Number of Community Information Centers established in undeserved and undeserved areas.			
Value (quantitative or Qualitative)	1,533	2,083		1,533
Date achieved	04/06/2009	06/30/2013		06/30/2016

Comments (incl. % achievement)	Not achieved due to unsuccessful tenders arising from limited market response to the tender design. IDA funding reallocated to another component during second project restructuring.			
Indicator 8:	Number of sub-counties with public broadband internet access points.			
Value (quantitative or Qualitative)	0	16		0
Date achieved	04/06/2009	06/30/2013		06/30/2016
Comments (incl. % achievement)	IDA funding reallocated to another component during second project restructuring.			
Indicator 9:	Percent of health centers (HC-II through HC-IV) with access to electricity in 24 districts (including 11 districts in Northern Uganda).			
Value (quantitative or Qualitative)	HC-II 6% HC-III 18% HC-IV 16%	HC-II 54% HC-III 87% HC-IV 98%		HC-II 64% HC-III 97% HC-IV 98%
Date achieved	04/06/2009	06/30/2013		06/30/2016
Comments (incl. % achievement)	Target exceeded. Original target included electrification of 464 health centers; the project electrified 522 health centers.			
Indicator 10:	Number of level four health centers (HC-IV) with computers and internet access.			
Value (quantitative or Qualitative)	5	30		30
Date achieved	04/06/2009	06/30/2013		06/30/2016
Comments (incl. % achievement)	Achieved 100 percent.			
Indicator 11:	Number of rural schools with access to electricity.			
Value (quantitative or Qualitative)	0	560	N/A	546
Date achieved	04/06/2009	06/30/2013		06/30/2016
Comments (incl. % achievement)	Achieved 97 percent.			
Indicator 12:	Number of rural schools with access to computer labs.			
Value (quantitative or Qualitative)	0	60		60
Date achieved	04/06/2009	06/30/2013		06/30/2016
Comments (incl. % achievement)	Achieved 100 percent.			
Indicator 13:	Number of water supply schemes with access to electricity			
Value (quantitative or	15	35	44	44

Qualitative)				
Date achieved	04/06/2009	06/30/2013	05/22/2013	06/30/2016
Comments (incl. % achievement)	Achieved 100 percent. Target revised during Additional Financing.			
Indicator 14:	Percent of local governments actively engaged in renewable energy or energy efficiency investments			
Value (quantitative or Qualitative)	0.4 percent	5 percent		5 percent
Date achieved	04/06/2009	06/30/2013		06/30/2016
Comments (incl. % achievement)	Achieved 100% with completed installations at six district headquarters of Kamuli, Kiruhura, Kasese, Kamwenge, Arua and Mubende. Installations completed in 30 primary schools in the same districts.			
Indicator 15:	Number of large agri-business/farms with access to electricity			
Value (quantitative or Qualitative)	133	142		142
Date achieved	04/06/2009	06/30/2013		10/15/2015
Comments (incl. % achievement)	Achieved 100 percent. Grid connection extended to nine agri-business/farms.			
Indicator 15:	Feasibility studies leading to additional power generation from renewable sources			
Value (quantitative or Qualitative)	0		3	5
Date achieved	05/22/2013		05/22/2013	06/30/2016
Comments (incl. % achievement)	Target exceeded. Achieved 166 percent. Feasibility reports completed for five mini-hydro projects. Indicator introduced during the Additional Financing (formerly PDO indicator MW of additional power generation from renewable resources).			

G. Ratings of Project Performance in ISRs

No.	Date ISR Archived	DO	GEO	IP	Actual Disbursements (US$ millions)		
					Project 1 (IDA)	Project 2 (GEF)	Project 3 (GPOBA)
1	06/20/2009	S	S	S	0.00	0.00	0
2	12/11/2009	S	S	S	0.00	0.00	0
3	06/07/2010	MS	MS	MS	1.72	0.00	0
4	03/24/2011	MS	MS	MS	10.75	1.11	0
5	12/10/2011	MS	MS	MS	13.24	1.73	0
6	07/09/2012	MS	MS	MS	28.29	2.73	0
7	03/13/2013	MS	S	MS	45.87	4.56	0
8	10/19/2013	MU	MU	MU	57.11	4.85	0
9	05/30/2014	MU	S	MU	59.40	5.47	0
10	03/10/2015	MU	S	MS	78.97	6.66	0
11	10/26/2015	MU	N/A[1]	MS	79.81	7.23	0
12	06/30/2016	MU	N/A[2]	MS	80.07	7.23	4.22

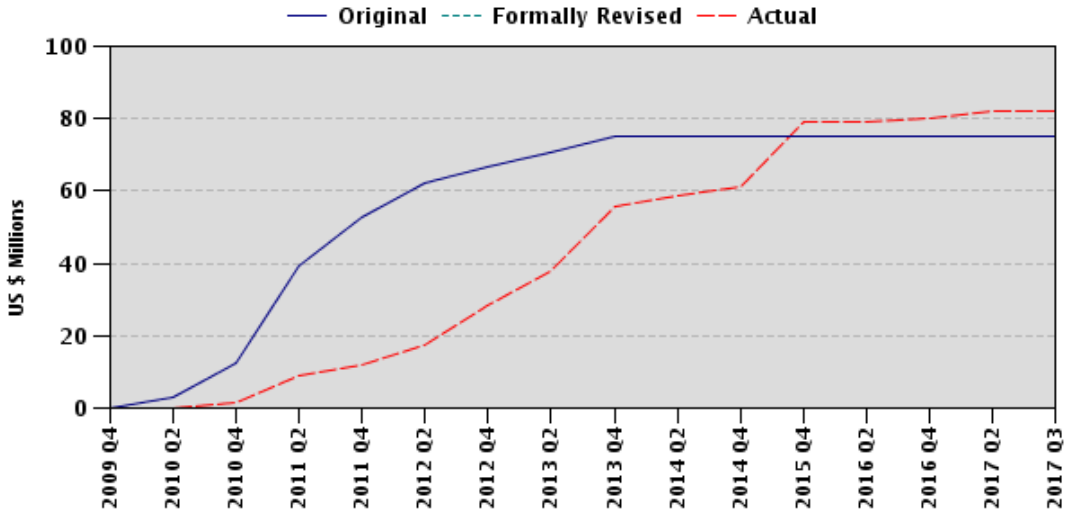
[1] Not rated in ISR No. 11
[2] Not rated in ISR No. 12

H. Restructuring (if any)

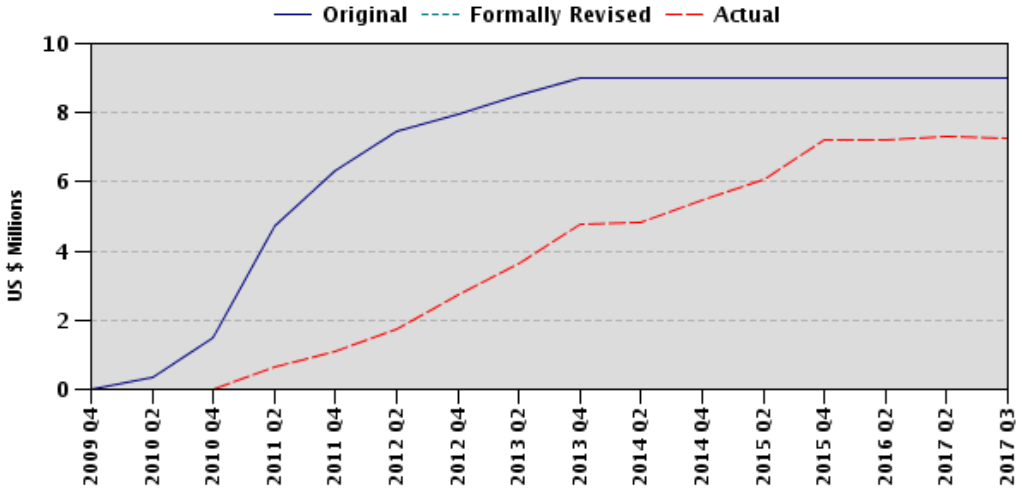
Restructuring Date(s)	Board Approved		ISR Ratings at Restructuring			Amount Disbursed at Restructuring in US$ millions			Reason for Restructuring & Key Changes Made
	PDO Change	GEO Change	DO	GEO	IP	Project1	Project 2	Project 3	
05/23/2014	No	No	MU	MU	MU	59.40	5.06	0	Level II restructuring. Harmonized project description of the GEF Grant Agreement with that of the IDA Credit Agreement as amended via the AF for ERT-2. Reallocated Credit and Grant proceeds. Reflected new eligible expenditures to existing categories in the disbursement table.
02/13/2015	No	No	MU	S	MU	78.67	6.05	0	Level II restructuring. Reallocation of Credit and Grant proceeds among categories of eligible expenditures. Made minor amendments to the project Agreements for the original credit and GEF grant. Specifically, these amendments brought the project monitoring, reporting and evaluation of the project Agreements into full conformity with the amendments made to the Financing Agreement and GEF Grant Agreement through the project restructuring of May 2014

I. Disbursement Profile

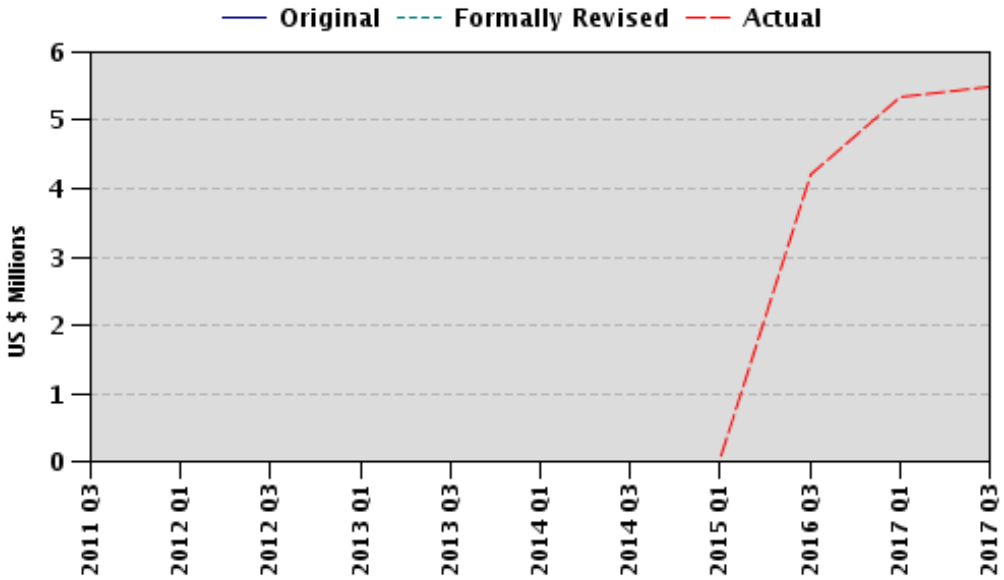
P112334 (IDA Credit)



P112340 (GEF Grant)



P120108 (GPOBA Grant)



1. Project Context, Development Objectives and Design

1.1 Context at Appraisal

1. Rural transformation was a priority in the Government of Uganda's (GoU) Poverty Eradication Action Plan (PEAP) launched in 1997 and updated in 2000, as well as in the National Development Plan (NDP), which was under preparation at the time of appraisal in 2009. The PEAP earmarked improvements in infrastructure and social services delivery as catalysts for socio-economic growth and poverty reduction. For rural areas, the GoU prioritized new investments to address low access to modern energy services and information communication technologies (ICTs).

2. In November 2001, the Bank approved the Energy for Rural Transformation (ERT) program as a three-phase Adaptable Program Loan (APL). The purpose of the ERT program was to develop Uganda's energy and ICT sectors, so that they could make a significant contribution to the productivity of enterprises and the quality of life of households. The objectives of Phase I were to put in place an environment and related capacities conducive to a sustainable service delivery of rural renewable energy and ICTs. The Implementation Completion Report for ERT Phase I (ERT-1) rated the achievement of project outcomes as *Moderately Satisfactory*.

3. According to the Project Appraisal Document (PAD) for Phase II (ERT-2), the ERT implementing agencies had fully adopted their role during implementation of the ERT-1 project and were ready to move to Phase II (ERT-2). In general, these agencies had demonstrated a strong sense of ownership, commitment and newly created capacity for scaling up activities. The GoU had also demonstrated its commitment to the project by forming an inter-agency coordinating committee, led by the Ministry of Energy and Minerals Development (MEMD), to address all key conceptual and operational issues in the design and implementation of the ERT-2 project.

Rationale for Bank Assistance

4. The Bank had been a major strategic partner in Uganda's development, and the ERT Program, with its focus on rural transformation, was an important element of this partnership. The Bank had supported power sector reforms, the Uganda Electricity Board restructuring, and major power investments, which benefited mainly the urban areas. It was important that the Bank also supported GoU's efforts in rural electrification and renewable energy development, to ensure that the support extended beyond the population who was served by the main grid. In addition to its direct support, the use of the Bank's convening power, to 'crowd in' other donors to the sector, was also an important contribution, especially in view of the significant additional resources needed to reach GoU's access expansion goals.

5. The Global Environment Facility (GEF) financing for this project [3] was part of the GEF Strategic Partnership. By supporting renewable energy sources, the ERT program was

[3] Approved on August 28, 2009.

intended to contribute to global environment protection through reducing greenhouse gas emissions.

6. The Global Partnership for Output-Based Aid (GPOBA) financing for this project [4] was designed to pilot and mainstream the Output-Based Aid (OBA) approach in grid-based electrification in Uganda. By targeting poor customers who were unable to afford connection fees, the GPOBA intended to provide improved access to electricity to poor households throughout Uganda, in rural, peri-urban, and urban areas.

1.2 Original Project Development Objectives (PDO) and Key Indicators (as approved)

APL Program Objective

7. The objective of the APL for the ERT program was to develop Uganda's energy and ICT sectors to facilitate a significant improvement in the productivity of enterprises and the quality of life of households.

8. The ERT program, originally planned for ten years and to be implemented in three phases, was, at the time of ERT-2 project preparation, expected to last 15 years.[5] The objective of the ERT-1 project, which was implemented from July 2002 to February 2009 was to put in place an environment and capacity conducive to implement a commercially oriented, sustainable service delivery of rural renewable energy and ICTs. ERT-2 project would accelerate investments and increase regional coverage by shifting from the case-by-case approach under Phase I to processing sub-projects through the institutional framework. Phase III (ERT-3) would shift the focus to a rapid growth in investments to achieve GoU's targets for rural electrification and renewable energy development.

9. The key performance indicators for the ERT program are listed below, with indicators related to GEF-supported activities shown in italics:

a. Number of homes, enterprises, public institutions (health clinics, schools, water supply facilities), trading centers, and communities with increased access to modern energy/ICTs;
b. Number of people benefiting from improved delivery of health, education, and water services;
c. Employment/economic gain due to small and medium enterprises (SME) participation in the project;
d. Sales of *solar photovoltaic (PV) household and institutional systems;*
e. *Price* reduction in solar PV product market, improvement in product, and increase in the range of product availability;
f. Increase in the power generated from renewable energy sources (excluding large scale hydroelectricity); and

[4] Approved on June 21, 2012.
[5] Phase I required seven years, and Phases II and III are each expected to take four years.

g. Increase *in local capacity for renewable energy development.*

ERT-2 Project Objectives and Indicators

10. The project development objective was to increase access to energy and ICTs in rural Uganda.

11. The key performance indicators for the ERT-2 project are listed below, with indicators related to GEF-supported activities shown in italics:

a. Increased access to energy, as measured by the percentage of rural population with access to electricity in project areas (rural electrification rate);
b. Increased access to ICT services, as measured by the percentage of the geographical area with access to modern ICT services;
c. Megawatts (MW) of additional power generation from renewable sources; and
d. Tons of Carbon Dioxide (CO_2) emissions reduced/avoided as a result of the project.

1.3 Revised PDO (as approved by original approving authority) and Key Indicators, and reasons/justification

12. The PDO remained unchanged throughout the project. However, some indicators in the results framework changed following an additional financing (AF) in 2013. No further changes were made to the results framework in the project restructurings of 2014 and 2015.

13. In May 2013, an AF was processed to accelerate the uptake of on-grid connections under the project. The AF would facilitate an increase in electricity access under the new institutional and legal framework proposed by the Rural Electrification Strategy and Plan (RESP) (2013-2022). The AF would address key shortcomings of the ERT program design which anticipated that private sector financing would materialize for on-grid connections. Specifically, the AF provided funds for REA to acquire connection materials, launch a consumer mobilization program, and carry out intensification of existing networks constructed under the ERT-1 and ERT-2 projects.

14. As part of the AF, changes were made to the results framework, including: (a) revised indicator targets to reflect the incremental benefits expected from the AF and amended optimistic assumptions made at appraisal; (b) moved *'Tons of CO_2 emissions reduced/avoided as a result of the project'* from outcome to intermediate indicator as it was considered that the indicator was not directly related to the PDO (but mandatory for GEF Grant); (c) moved *'MW of additional power generation from renewable resources'* from outcome to intermediate indicator as it did not directly address access and was not an appropriate measurement for project development outcome; the indicator was also rephrased to *'Feasibility studies leading to additional power generation from renewable resources'*; (d) created a new core intermediate indicator for *'Number of people provided with access to electricity under the project by household connections'*.

15. Amendments to PDO and intermediate indicators are summarized below.

Table 1. Project Development Objective (PDO) Indicators

Indicator	Baseline	Original Target	2013 AF Target	2014, 2015 Restructuring Targets
Indicator 1: Percentage of rural population with access to electricity in project areas	4	6	7	Not amended
Indicator 3: Project beneficiaries	0	N/A	843,600 New PDO Indicator	Not amended
Indicator 4: Project beneficiaries, of which female (50 percent)	0	N/A	421,800 New PDO Indicator	Not amended
Indicator 5: MW of additional power generation from renewable sources	0	25	Dropped as PDO Indicator; moved to Intermediate Indicator	Not amended
Indicator 6: Tons of CO_2 emissions reduced/avoided as a result of the project	0	800,000	Dropped as PDO Indicator; moved to Intermediate Indicator	Not amended

Table 2. Intermediate Outcome Indicators

Indicator	Baseline	Original Target	2013 AF Target	2014, 2015 Restructuring Target
Indicator 1.0: Number of people provided with access to electricity under the project by household connections	0	N/A	720,000 New Intermediate Indicator	Not amended
Indicator 1.1: Number of households connected through the extended grid	151,000	260,000	271,000 Target revised to account for AF	Not amended
Indicator 3.5: Number of water supply schemes with access to electricity	15	35	44	Not amended
Indicator 3.8: Feasibility studies leading to additional power generation from renewable sources	0	N/A	3 Replaced formerly PDO Indicator (‘*MW of additional power generation from renewable sources’)*	Not amended
Indicator 3.9: Tons of CO2 emissions reduced/avoided as a result of the project	0	800,000	356,700 Formerly PDO Indicator; target revised to amend original assumptions	Not amended

1.4 Main Beneficiaries

16. Project beneficiaries were not stated in the Project Appraisal Document (PAD), but can be inferred from the PDO and indicators as rural households and enterprises (for example, agribusiness farms), and public institutions (for example, schools, health centers, county offices) provided with access to electricity by on-grid and off-grid services. Rural enterprises benefited from increased productivity and income arising from electricity access, as well as from the ability to communicate with upstream suppliers and improve linkages with downstream markets. The project also contributed to global benefits in terms of reduced greenhouse gas (GHG) emissions.

1.5 Original Components (as approved)

17. Following implementation experience under the ERT-1 project, which had six components, the design of the ERT-2 project was consolidated into three components at the design stage.

18. **Component 1 - Rural Energy Infrastructure:** (Total US$53.4 million, of which US$41.0 million IDA; US$5.7 million GEF; US$6.7 million GoU).

19. *Sub-component 1.1 - Publicly Funded Grid-related Power Supply.* This component supported REA-sponsored main grid distribution extension to rural areas. These included investments that were initiated under ERT-1 project, but were not completed by project closure. This component expected to extend 109,000 new connections through extension of the main grid.

20. *Sub-Component 1.2 - Off-grid Renewable Energy Investments.* This component comprised the implementation of the Photovoltaic Targeted Market Approach (PVTMA), where consumer subsidies were provided to support solar PV installations in households and non-government institutions. About 20,000 households and 1,000 non-governmental institutions were expected to receive solar PV service. This component would achieve 600 household connections through independent grids.

21. *Sub-Component 1.3 - Technical Assistance and Training.* This component assisted REA with the preparation of main grid and independent grid bid packages, primarily through the provision of engineering, safeguards, and procurement support. Consultancy services were provided to support PVTMA Facility activities, as well as facilitate participation of financial institutions in the project.

22. *Sub-Component 1.4 - Credit Support Facility.* This component included capitalization and technical assistance for the Uganda Energy Credit Capitalization Company (UECCC), which was set up under the ERT-1 project, but had not yet started functioning. Specifically, this component capitalized the UECCC and provided technical assistance for its operationalization. The UECCC would provide credit enhancement products aimed at encouraging the participation of local financial institutions, including standby liquidity option, a partial risk guarantee, and refinance facilities for solar PV

transactions. Technical assistance was provided to potential project sponsors and participating financial institutions for appraisal of investment projects.

23. *Sub-Component 1.5 - Private Sector Foundation Uganda (PSFU).* This component supported the PSFU to assist private sector investors in reaching financial closure or meeting other specific market enhancement targets through the provision of targeted technical assistance. PSFU's targets were more focused than under the ERT-1 project. Specifically, PSFU would bring to financial closure renewable energy projects worth 10 MW and establish about 20 new rural solar PV sales outlets. PSFU would receive operational support and provide capacity building and training for institutions supporting rural electrification business.

24. **Component 2 – Information Communications Technologies (ICT)** (Total US$9.2 million, of which US$8.0 million IDA; US$1.2 million GoU)

25. *Sub-Component 2.1 - Investments:* This component comprised financing (a) last mile internet broadband access extension to rural areas in at least 16 sub-counties, with a focus on the Northern region; (b) at least 550 new Community Information Centers (CICs) for underserved rural areas; (c) cell-phone charging facilities for CICs installed under the ERT-1 project; and (d) equipment for computer labs to schools, health facilities, and subsidized internet access centers.

26. *Sub-Component 2.2 - Technical Assistance and Training:* This component included support for development and dissemination of tailor-made electronic information packages in local languages for traders, teachers, health workers, and farmers. Technical assistance in different areas (for example, program design, monitoring and evaluation) was included for the Uganda Communication Commission (UCC).

27. **Component 3 - Energy Development, Cross Sectoral Links, Impact Monitoring** (Total US$30.4 million, of which US$26.0 million IDA; US$3.3 million GEF; US$l.1 million GoU)

28. *Sub-Component 3.1 - Energy Packages for Health, Water, and Education.* This component financed solar PV energy packages for remote health, education, and water pumping facilities, building on the experience of the ERT-1 project. This component would provide electricity to 464 health centers, 560 rural schools, and 20 water supply facilities.

29. *Sub-Component 3.2 - Technical Assistance, Training, and Operating Costs.* This component included technical assistance, training, and operating cost support for the ministries implementing the solar PV energy packages, namely the Ministry of Health (MoH), Ministry of Education and Sports (MoES), and Ministry of Water and Environment (MoWE). This component also supported the Ministry of Energy and Mineral Development (MEMD), Ministry of Finance, Planning, and Economic Development (MoFPED), Ministry of Local Government (MoLG), and Ministry of Agriculture, Animal Industries and Fisheries (MAAIF). The Project Coordination Unit (PCU) received training, capacity building, and operating cost support.

1.6 Revised Components

30. Project components were not revised during project implementation.

1.7 Other Significant Changes

31. An Additional financing (AF) and two Level II restructurings were processed during project implementation. The AF (XDR8.1 million – US$12 million equivalent) was approved in May 2013. Two Level II restructurings were approved in May 2014 and February 2015, respectively. Moreover, the Uganda grid-based Output Based Aid (OBA) facility committed about US$19.00 million co-financing toward subsidizing the full cost of household connections in 2012.[6] Co-financiers included the GPOBA (US$5.50 million), GoU (US$4.30 million), and the Federal Republic of Germany (EUR4.05 million – US$4.6 million) and the European Union (EUR3.95 million – US$4.5 million) through the German Financial Cooperation (KfW). The Bank implemented the US$5.50 million GPOBA grant, which closed in June 2017.

32. ***Additional Financing of May 2013.*** The AF was processed to scale-up on-grid connections under the project by addressing key shortcomings of project design, which had anticipated that private sector financing would materialize for connections. The AF covered the financing gap by providing funds for REA to acquire connection materials and carry out intensification of existing networks constructed under the ERT-1 and ERT-2 projects. The project closing date was extended to June 30, 2016. The impact of the AF is illustrated below.

Table 3. Impact of AF (May 2013) by Project Component (US$ million)

Component	Original Cost (April 2009)	Changes with AF (May 2013)	Revised Cost after AF (May 2013)
1. Rural Energy Infrastructure	53.8	12.0	65.8
2. Information and Communications Technologies (ICT)	9.2	0.0	9.2
3. Energy, cross-sectoral links, impacts	30.0	0.0	30.0
Total	**93.0**	**12.0**	**105.0**

6 Original contributions to the OBA Facility were US$19.75 million. The anticipated funding from IDA (ERT-2) did not materialize, and so GPOBA increased funding from the original US$4.75 million to US$5.5 million. Government of Germany's contribution was reduced from the original EUR5 million to EUR4.05 million. EU contribution remained unchanged at EUR3.95 million. GoU's funding was adjusted from US$4 million to US$4.3 million. Out of the US$19.00 million OBA committed funding was applied for consultancy, supervision, and contingency; the remaining funds were applied for connection subsidies.

33. ***Level II Restructuring of June 2014.*** This Level II restructuring included: (a) harmonizing the ERT-2 project description of the GEF Grant Agreement with that of the IDA Credit Financing Agreement as amended via the AF for the ERT-2 project; (b) reallocating some Credit and Grant proceeds; and (c) reflecting new eligible expenditures to existing categories in the disbursement table: 'non-consulting services' as an eligible expenditure under the disbursement Category 1 and 'operating costs' as an eligible expenditure under the disbursement Category 2.

34. Regarding the reallocation of Credit and Grant proceeds, the following changes were made. For the IDA Credit, Category 1 funds available under Category 1-b were transferred to Category 1-c to finance construction variation orders under Part 1 of the project. Category 4 was increased by US$3.3 million to finance additional solar PV systems to rural schools, studies for small hydropower projects and supply and installation of test benches for CFLs. Category 5 was increased by US$400,000 to finance procurement of additional solar water heaters and power factor correction equipment. For the GEF Grant, Category 1 was increased by US$400,000 to finance the preparation of a consumer mobilization study for Part 1 of the project. Category 3 was increased by US$100,000 to finance PSFU's operating costs.

35. ***Level II restructuring of February 2015.*** Under the second project restructuring, IDA and GEF funds were reallocated from Category 3 (ICT component, IDA-funded) and Category 2A (CSF component, IDA- and GEF-funded) to Categories 1A (REA distribution lines), 4 (Cross-sectoral activities), 5 (PSFU activities), and 6 (unallocated). The activities financed with the reallocated funds were expected to contribute to expanding access to electricity in rural areas under the project and/or help prepare the proposed ERT-3 project. The activities included (a) additional lines and regional storage facilities for connection materials to increase rural access; (b) preparatory studies for the proposed ERT-3 project; (c) energy needs assessment for solar packages implemented by line ministries (that is, MoH, MoES, MoWE); (d) information dissemination by the MoFPED; and (e) energy efficiency and micro-hydro studies implemented by the PSFU.

2. Key Factors Affecting Implementation and Outcomes

2.1 Project Preparation, Design and Quality at Entry

Soundness of Background Analysis

36. An independent evaluation of the achievements from the ERT-1 project was carried out and served as a background for the preparation of the ERT-2 project, but the analysis was concentrated on the institutional strengthening of sector institutions which was carried out throughout ERT-1 project implementation.

37. According to the independent analysis *'most of the implementing agencies had now fully internalized their role and activities under the ERT program, and are ready to move to Phase II'*. Furthermore, the independent review recommended the following two main priority areas for enhancing the ERT-2 project, including (a) the reformulation of the role

of the private sector in the roll-out of the rural electrification program;[7] and (b) a streamlining of approval procedures, in particular that of the 'no-objection' approval. The first recommendation was considered for the design of Component 1, where REA was given a more prominent role in rural electrification by building the required network extensions and handling them over to the SPs for O&M.

38. ERT-2 project design was developed in the midst of strategic changes in the energy sector, including the shift in the power sector towards a sector-wide approach (SWAp). The MEMD, through the Energy and Mineral Development Sector Working Group (EMDSWG) was in the process of preparing a Sector Investment Plan that would form the basis of a SWAp, with a strong emphasis on rural electrification by utilizing the Rural Electrification Framework (REF). Moreover, the GoU placed as strategic priority the development of Northern Uganda, especially given the significant improvements in peace and security since mid-2006. The focus on Northern Uganda was incorporated into the ERT-2 project design, as activities targeting that region were interwoven into each of the three project components.

39. While the background analysis for the ERT-2 project considered strategic changes being adopted and implemented by the GoU at the time, a better understanding of the energy access barriers and mechanisms to address them could have strengthened the design of the project. The design of the ERT-2 project relied on energy sector studies conducted under the ERT-1 project regarding rural electrification, but a more thorough analysis of those studies could have been carried out and lessons learned from other access projects in Africa could have been better incorporated, especially regarding household affordability constraints affecting the uptake of connections.

40. Regarding the design of the ICT component, the ERT-2 project relied on the encouraging performance of the sector activities under the ERT-1 project, which extended the telephone network to under-served areas and installed Internet points in 32 districts. However, additional background analysis (for example, ICT demand needs assessment in Northern Uganda, analysis and discussions with ICT private sector) could have resulted in a better design of the ICT component. For example, consultations with the private sector could have indicated the low interest of the sector in participating in the expansion of ICTs in Northern Uganda, which was the focus of the ERT-2 project.

41. ***Lessons learned incorporated into ERT-2 project design.*** Project preparation was informed by recommendations from the above mentioned independent evaluation of the ERT-1 project, as well as key lessons learned from ERT-1 project implementation. Some

[7] In the original design of ERT program, the private sector was expected to contribute equity for grid extension. However, private sector participation did not materialize as expected during the implementation of the ERT-1 project. As a result, private sector participation shifted from providing equity contribution for the grid extension (original assumption under the ERT-1 project) to bidding for O&M of the grid extensions, with GoU financing the capital investments needed for grid extensions (proposed approach under the ERT-2 project).

of the key lessons learned that were incorporated in the design of the ERT-2 project included:

a. ***Need for public financing for rural electrification.*** ERT original design assumed that as long as GoU provided the enabling environment, the private sector would invest in rural electrification and small-scale renewable energy projects. While there was adequate private sector interest in renewable energy-based power generation, that was not the case for power distribution infrastructure. In response, the ERT-2 project would provide public financing for grid extensions, while seeking to expand the role of the private sector in renewable energy-based power generation.

b. ***Need for stronger coordination between agencies.*** ERT original design did not contemplate extensive coordination or regular meetings between implementing agencies. This was intended to allow each implementing agency (IA) to play its natural role. While the flexibility of that design encouraged many agencies to take ownership and successfully implement their programs, it also made it difficult for MEMD to stimulate implementation in lagging agencies. This deficiency was addressed through the creation of the PCU at MEMD during ERT-1 implementation. The ERT-2 project would strengthen the PCU even further to improve efficiency and effectiveness of project management.

c. ***Need for Credit Support Facility (CSF).*** Credit enhancement instruments were required to attract the participation of local financial institutions into the energy sector. Liquidity risks posed an obstacle for local financial institutions to extend loan tenors to more closely match the needs of private investors; perceived credit risk also discouraged local lending to the sector. The CSF that would help address these risks was established under the ERT-1 project, but unfortunately was not operationalized within the project period. Under the ERT-2 project, the CSF would become operational and offer (a) a refinance product to facilitate long-term finance to the sector; and (b) a partial credit or risk guarantee to increase the ability of local financial institutions to lend to energy projects.

42. Finally, the ERT-2 project incorporated elements that were fully consistent with the *Bujagali Inspection Panel Management Response*, as well as addressed some of the concerns raised by the *Inspection Panel* investigation, including (a) the provision of electricity to rural populations; (b) support for small and medium scale renewable energy investments; and (c) support for solar PV investments to provide power for remote rural households and institutions.

Assessment of Project Design

43. Project design had important shortcomings. The project PDO addressed simultaneously two complementary sectors and was aligned with long-term ERT program goals *'to develop Uganda's rural energy and Information and Communication*

Technologies (ICT) sectors, so that they would make a significant contribution to bringing about rural transformation'. However, ERT-2 project implementation showed that incorporating two sectors in the same project may lead to biases towards one of the sectors if there is not a strong and committed multi-sectoral team both at the Bank and GoU sides with strong ownership of their respective sector activities. Moreover, the PDO gave the same weight to the Energy and ICT sectors, whereas project design and funds were mostly directed towards the energy sector (with 91 percent of the overall funds and most of the project activities under the two largest components). During preparation and implementation, the energy sector received most of the attention from both the Bank and the GoU resulting in design and implementation oversights on the ICT sector.

44. ERT-2 project simplified the design by reducing the number of components under the ERT-1 project from six to three. However, the extensive scope – which included nine sub-components covering on-grid and off-grid works, independent grids, credit enhancement support, ICT investments, technical assistance and capacity building – increased the complexity of the project. Additionally, project design relied on complex implementation arrangements involving 11 implementing agencies and an overly ambitious project implementation timeframe (four years), especially considering ERT-1 project experience of two extensions that led to a total implementation timeframe of seven years.

45. Component 1 had important design shortcomings. Project design did not clearly identify and address the need to have adequate measures to overcome demand-side affordability constraints. Experience in sub-Saharan Africa had shown that connection charges and internal wiring costs were among the key impediments for rural households to access electricity. Still, the original project design did not make any specific allocations for connections, in part due to parallel support for connections which was expected at the time of appraisal. In hindsight, project design should have addressed the affordability barrier, particularly considering the ambitious connection targets of the project. In the end, affordability constraints of poor households were addressed by the grid-based OBA Facility for Uganda, which was associated to the ERT-2 project and became effective in December in 2012. The OBA Facility was considered instrumental to achieving ERT-2 project targets. The OBA Facility subsidized two types of connections: (a) standard household connection for consumers who could afford house wiring; and (b) load-limited connection with a ready-board internal wiring scheme for poorer households. The OBA targeted poor households who were able to pay for energy consumed, but remained unconnected for more than 18 months after the area had been electrified. The OBA also subsidized eligible poor households who had been identified through poverty mapping study undertaken by an independent consultant financed by KfW.

46. Other project design shortcomings included the inadequate selection of Service Providers (SPs) without due regard to their financial and technical capacity, coupled with complex procedures for processing requests for household connections. Project design could have included a capacity needs assessment of potential SPs to ascertain their ability to deliver the required connections through the project, as well as develop simplified processes for connection requests by households. The AF (May 2013) attempted to address

these two shortcomings by establishing a mechanism (revolving fund) to allow REA to procure connection materials in bulk and deliver them directly to the different SPs, as well as carrying out mobilization campaigns to facilitate the process for obtaining service connections. Unfortunately, the revolving fund mechanism was not designed and implemented properly, primarily due to inadequate storage and inventory management capabilities of REA and SPs, together with coordination problems between REA and the Electricity Regulatory Authority (ERA) which led to substantial delays in determining the standardized costing and specifications of connection materials. The mobilization campaign helped accelerate connections uptake, but failed to fully address concerns related to complex application procedures for connections.

47. Component 2 targeted the ICT sector, building on positive results achieved under the ERT-1 project. In retrospect, project design would have benefited significantly from further preparatory analysis of the ICT sector particularly focusing on rural Northern Uganda. Perhaps a demand driven approach based on a needs assessment of ICTs in Northern Uganda could have been more successful than the supply driven approach adopted by the project.

Adequacy of Government Commitment

48. Project preparation was done in close coordination with GoU stakeholders, including MoFPED, MEMD, REA, MoWE, MoESTS, MoLG, MoH, UCC, UECCC, and local private sector. Counterpart funding was considered adequate at appraisal. GoU had allocated US$7 million for transition arrangements between the closing of the ERT-1 project and the startup of the ERT-2 project, and committed US$9 million to the ERT-2 project.

Assessment of Risks

49. The overall risk of the ERT-2 project was considered *Moderate* at appraisal, as it was assumed that the ERT approach had been internalized by GoU agencies during implementation of the ERT-1 project and the project did not entail major critical risks.

50. In retrospect, the risk assessment at appraisal was overly optimistic as it did not reflect the complexity of project implementation arrangements involving several implementing agencies with varied degrees of technical and procurement capacity, technical challenges related to on-grid electrification spearheaded by a relatively new agency (that is, REA) and Service Providers (SPs) [8] with low technical and financial capacity, and uncertainties regarding private sector involvement in both rural electrification and ICT sectors. Some of these risks, which materialized and affected project implementation, had been rated *Moderate* or *Low* at appraisal after mitigation measures were put into place. The only risk rated *Substantial* at appraisal was related to private sector participation.

[8] Service Providers (SPs) were introduced as part of the RESP-2 (2013-2022).

Table 4. Risk assessment

Risks that were considered low or moderate at appraisal but materialized	
Technical design risk was rated *Low* after mitigation measures.	This risk materialized with important design deficiencies especially regarding Component 1 and Component 2. The residual risk could have been rated *Substantial* considering the ambitious and novelty design, and reliance on a nascent private sector.
Implementation capacity risk was rated *Moderate* after mitigation measures, including technical assistance support to increase capacity in sector institutions.	This risk materialized and resulted in important delays in project implementation. The project had eleven implementing agencies with varied capacities. Some of them performed well, but others, especially the recently created REA had low implementation capacity which affected project implementation.
Procurement capacity risk was rated *Moderate* after mitigation measures including training and capacity building throughout project implementation.	Risk was understated. The project had important procurement delays causing implementation delays of key sub-components, especially those related to the extension of the distribution lines. The main problem was that mitigation measures were not implemented timely; when mitigation measures were implemented (almost 2.5 years into implementation), REA changed its structure, things started moving.
Social and environmental safeguards risk was rated *Low* after mitigation measures, including the preparation of Resettlement Policy Framework (RFP) and hiring of safeguards specialist for overseeing the project.	This risk materialized during project implementation when contractors started construction of grid extension lines before compensation payments for Project Affected Persons (PAPs) had been completed, which made the ERT-2 project non-compliant with World Bank's operational policy on Involuntary Resettlement (OP/BP 4.12).
Risks identified as substantial that materialized	
Private sector participation risk was rated *Substantial* after mitigation measures, which included partial grants and other concessional arrangements for off-grid connections. The risk identified at appraisal was only related to off-grid connections but the risk was materialized had a broader spectrum including on-grid connections and the ICT sector.	For on-grid connections, project design anticipated that private sector financing would materialize, though private interest did not develop. The OBA Facility and the AF were processed to subsidize high connections fees for eligible households and facilitate connections by SPs. Even after the AF had facilitated the bulk procurement of materials, these materials were not used to make any connection. The only connections that materialized were those subsidized by the OBA Facility. On the ICT component, there was no interest from the private sector and activities planned under Component 2 did not materialize.
Risks not identified at appraisal	
Fraud and Corruption	Fraudulent practices and abuse of subsidies were identified involving the independent verification agencies, REA employees and some solar PV companies under the PVTMA Facility. The risk of fraud and corruption was not identified at appraisal.

2.2 Implementation

51. The ERT-2 project was approved on April 6, 2009, became effective on November 25, 2009 and had an initial closing date of June 30, 2013. An AF that was processed in May 2013 and became effective in April 2014 extended the overall project closing date to

June 30, 2016 for a total implementation period of seven years. The project also had two Level II restructurings, the first one in May 2014 and the second one in February 2015. By project closing, 95 percent of the funds of the original IDA project, 81 percent of the GEF funds and 89 percent of the AF funds were disbursed.

52. Overall project implementation started slowly with key activities not ready for implementation at the time of Board approval in April 2009, especially those related to the extension of the distribution grid (for example, feasibility studies, ESMPs and RAPs). The implementation capacity of the different agencies, even if it had been strengthened under the ERT-1 project, was still relatively weak, especially at REA, and resulted in delays in internal procurement processes such as tender evaluation, contracts committee approval and clearance of the contracts by the Solicitor General. Various measures were taken to solve this problem, including recruiting additional procurement staff or consultants to support the procurement department in REA in addition to recruiting engineers in the projects planning and implementation departments.

53. ***Mid-term Review.*** By the time of the mid-term review (MTR) in November 2012, implementation and disbursement performance had improved from the unsatisfactory progress achieved during the first two years (with disbursement increasing from US$12.5 million or 16 percent as of the end of November 2011 to about US$40.55 million or 54 percent as of the end of November 2012). But despite the progress achieved during the third year of implementation, by the time of the MTR it was clear that various key activities, especially those related to components 1 and 2 such as the grid extensions for distribution lines, the number of household connections, the PVTMA target connections and the projects to be supported under the PSFU and UECCC related to renewable energy, the Internet broadband services, and the new CICs and battery charging facilities under UCC could not be implemented by the original project closing date and a project extension would be required. The MTR recommended to: (a) process an AF of US$12.0 million to help address some of the key challenges faced by Component 1 regarding the procurement of materials and the difficulties by households in requesting connections and to meet the financial gap identified for on-grid connections; and (b) extend the closing date of the project to June 30, 2016 (in line with the AF closing date) to allow for the implementation of all project components. These measures were expected to accelerate implementation and facilitate reaching the project objectives.

54. Key implementation issues faced by the project and how they were addressed are summarized below. The on-grid activities implemented under Component 1, *which* was the driving force of the project both in terms of access outcomes and budget, was successful in constructing 12 distribution lines (almost 1,300 km of lines) that will allow the connection of a large number of households and businesses under ERT-3 and other programs. Moreover, activities under this component facilitated the connection of 97,753 households primarily through the OBA Facility, including GPOBA. Despite these important achievements, implementation faced many challenges both for the on-grid and the off-grid sub-components. The main implementation challenges included:

a. ***Slow Pace of on-grid connections.*** Under the original program design, it was anticipated that almost half of the connections would be supported by programs associated with the ERT-2 project, but financed outside the project. The collaboration between the ERT-2 project and other programs was reinforced at AF stage, when the ERT-2 project connections target was increased to 120,000 new connections, of which 60,000 connections were expected from the project[9] and 60,000 from the Uganda grid-based OBA Facility. The project would also carry out consumer mobilization campaigns and procure independent verification agents. The Uganda grid-based OBA Facility included a US$5.5 million contribution from the GPOBA, which was implemented by the Bank. This GPOBA support, which piloted and mainstreamed the OBA approach in grid-electrification in Uganda, was instrumental to crowd in additional donor funding and involvement, which contributed substantially to the achievement of ERT-2 project targets.[10] By project closing, most of the new connections achieved under the ERT-2 project were due to OBA support (including GPOBA). The revolving fund supported under the AF did not perform as anticipated, among others due to the high connection fees still charged by the SPs and the complex process for the households in requesting connections.

b. ***High Connection Fees.*** A related obstacle for increasing connections was the high fees for service connections that were charged by SPs almost during the entire project implementation timeframe (about US$200 for the minimum service rating). Investigations made during preparation of the AF indicated that design specifications were provided for larger cables than required, given the average electricity consumption of rural households. During the preparation of the AF, REA and ERA revised the design standards and reduced the size of the conductors. With this revision, the connection fees were expected to be reduced significantly, thus making it more affordable for rural households to obtain electricity services. However, it took ERA long time to determine the new fees the SPs could charge the customers for the connections. That figure was only notified to the SPs in December 2016, six months after project closing. In the meantime, the SPs were charging the customers a much higher price (4-7 times higher), which did not encourage rural households to request connections. Post December 2016, the new much lower connection fee for no-pole connections of USh98,000 (in addition to USh41,000 inspection fee) is expected to increase the pace of connections but could affect the financial viability of the SPs.

[9] The Bank's AF would establish a revolving fund to facilitate and reduce the costs of the connection materials to the Service Providers (SPs).

[10] For example, GPOBA had worked with KfW in the Uganda's health sector, but KfW's involvement in the power sector in Africa through the Uganda grid-based OBA Facility was new.

c. ***High cost of connection materials and slow pace of intensification.*** Under the AF, a revolving fund managed by REA was established to purchase connection materials in bulk for the SPs and carry out an intensification of existing networks built under the ERT-1 and ERT-2 projects. The intensification exercise would provide an opportunity to enhance the number of connections at lower costs than the overall average cost per connection of the original project. By project closing, it was evident that materials procured in bulk were unlikely to be fully utilized for years at that pace of annual connections by the participating SPs. REA was requested to set-up a system to record, monitor, and report all Revolving Fund transactions; reconcile all materials delivered to the Service Providers. Participating SPs were requested to submit a realistic roadmap to fully utilize the materials within the ERT-3 project implementation period.

d. ***Internal Wiring Problems.*** One barrier faced by the households was the internal wiring. At present, the wiremen are free to charge whatever they want to the households, which makes it too expensive for some rural customers. The wiring charges could be somehow standardized even though the standardization of wiring costs may not be easy since the houses are not of the same size or require the same materials and effort to wire. Furthermore, the quality of the connections and materials provided by the wiremen is not consistent. ERA needs to provide minimum standards and ensure that licensed wiremen are properly trained.

e. ***Need for joint planning and quality control of grid-extensions.*** REA is in charge of extending the grid to rural areas. Under the ERT-2 project, REA was responsible for nine line extensions from original IDA allocation and three additional lines financed from the second project restructuring. According to the SPs, the network design was not robust enough and the quality of the materials and workmanship of those extended lines was sub-standard. Joint planning between REA and the SPs would be needed to ensure that the capacity of the lines is adequate, the new line extensions are made to priority areas, and there are standards for their construction. Moreover, according to the SP´s, grid intensification in charge of REA is moving slowly, affecting the pace of electrification.

f. ***Cumbersome procedures for connecting households.*** Connection procedures were cumbersome and presented a considerable burden for new customers to be connected. To address these demand-side issues, a consumer mobilization campaign was initiated after the MTR to help inform future and existing consumers on the benefits of electricity use and to help them overcome some of the transaction barriers. This was expected to allow the SPs to proactively reach out to potential customers and to connect new consumers in larger batches rather than individually. Unfortunately, the mobilization campaign failed to achieve the expected results (that is, attract

a large number of new customers). REA could improve outreach efforts to adequately market and accelerate the electrification process.

g. ***Clear delimitation of Service Territories (STs) Coverage.*** The GoU adopted in 2013 a new Rural Electrification Strategy and Plan-RESP (2013-2022) that envisaged a new business model where the country was divided into 13 Service Territories (STs), each being served by an SP. Under the new model, SPs would manage and operate specific areas and would be responsible to increase access and area coverage. By project closing, of the 13 proposed STs, only eight were served by six SPs – leaving five STs being served in the interim by UEDCL. Umeme, which has a market share of almost 90 percent, is not one of the ST´s established by RESP-2, but Umeme's footprint overlaps with some of them. A clear delimitation of the STs could help avoid consumer confusion and ensure the sustainability of the SPs.

h. ***SPs cannot cover their Operation and Maintenance (O&M) costs.*** Another problem faced by the SPs is that they are not covering their O&M costs, which puts at risk their sustainability. In theory, those costs are covered by the tariffs but not enough to recuperate all costs. An increase in tariffs could solve this issue but will further reduce the electricity consumption of the rural customers.

55. The off-grid activities implemented under Component 1 also faced important implementation issues, including:

a. ***Low sales of Solar Home Systems using PVTMA subsidy compounded by cases involving fraud and corruption.*** The pace of implementation of this activity was constrained by major problems related to the verification process of the PVTMA (ineffective targeting of lower-income households, fraudulent practices in the verification, and slow pace of verification), coupled with general constraints within the nascent sub-sector. By project closing, 11,000 solar PV systems were installed against a target of 20,000 on a subsidized basis. According to an independent *'Analysis of suitable Options for scale-up/introduction of Solar Home Systems/Solar Lanterns in Uganda'*,[11] the key issues encountered during the implementation of the PVTMA Facility included (a) a slow verification process that impacted negatively on the timely payment of subsidies to solar companies, which were financing in the subsidies and hence had to carry extra financing costs; (b) auditing was critically needed to enable a more efficient and accountable verification process; (c) technical standards had to be effectively publicized and enforced to avoid sub-standard products impact negatively on market perceptions; (d) targeting of subsidies was not favoring those beneficiaries

[11] Analysis of suitable option(s) for scale-up/introduction of Solar Home Systems/Solar Lanterns in Uganda. Draft April 2013. Robert Aitken, Wikus Kruger and Nelson Tashonya.

who needed them the most; [12] (e) lending terms from SACCOs/MFIs/banks were found to be relatively expensive, which in turn increased affordability barrier for most households; (f) MFIs/banks had limited knowledge of the new solar market and products, hence preferred to seek better returns in other and more 'traditional' sectors; (g) pay-as-you-go plans or equivalent instalment sales models are crucial to address affordability barriers and hence scale-up solar deployment in rural areas; (h) there needs to be a balance between innovation and responsibility, ensuring that solar companies have adequate presence and infrastructure in the field to provide after sales services without restricting innovation (for example, mobile money lowers customer engagement costs).

b. ***The implementation of the Credit Support Facility (CSF) by the UECCC had mixed results.*** The UECCC was responsible for setting-up a functional CSF and designing the market mechanisms that would promote and facilitate the participation of the private sector in the development of renewable energy and rural electrification projects. Towards that end, the UECCC designed three mechanisms that included a Solar Refinance Facility for Participating Financial Institutions (PFIs) to onlend to households and commercial enterprises for the acquisition of solar systems; a Connection Loan Facility also extended to PFIs for onlending to households and commercial enterprises for on-grid electricity connections; and a Standby Liquidity/Refinance option to enable the PFIs to extend the tenors of the loans to Renewable Energy generation projects. According to the final report from UECCC, the demand and absorption capacity for those products was overestimated and less than half of the original budget of US$6.8 million was utilized. The remaining funds were reallocated to other components.

56. The implementation of Component 2 was unsuccessful. The activities planned under this component were not implemented and funds were reallocated to the other two components. The main reasons for lack of implementation include:

a. ***Design flaws.*** The design of the component was not responsive to the situation on the ground. The component targeted Northern Uganda, a very poor region that was in a period of post-conflict and the existing demand was for basic voice services and not for data services, as anticipated by the

[12] According to the study, the subsidy covered a much higher percentage of larger systems' costs compared to smaller ones. In fact, systems in the 75Wp – 120Wp DC size range received twice as much subsidy than 14Wp systems. As a result, the ERT-2 project subsidy improved the affordability of larger, more expensive systems targeted at middle to higher income households, and incentivized solar companies to promote these larger systems into the market.

project. Moreover, the incentives provided by the project were not adequate to attract the private sector at that time. In retrospect, the component could have targeted the demand side instead of the supply side, for example by providing data services to schools that in turn will drive up the demand for data. This could have created a multiplier effect.

b. ***Timing challenges.*** When the project was designed, the private ICT operators were still interested in many geographical areas in the country which they could reach without the support of the GoU. This contributed to the lack of private sector interest in the ICT sector activities proposed under the project.

c. ***Priorities.*** The UCC had other priorities at the time of project implementation which ended up diverting the attention of the UCC from the implementation of this component.

57. Implementation of the Energy Development, Cross Sectoral Links, and Impact Monitoring Component was the most successful of the three components, as it led to the installation of energy packages for remote health, education, and water pumping facilities through the respective ministries. This component faced some implementation delays due to institutional capacities of the various implementing agencies, as well as the prioritization of electrification activities under respective ministries. The main concern under this component related to ensuring the sustainability of the off-grid solar PV institutional systems, which was stressed by (a) inadequate duration of maintenance contracts that only run until the fifth year of operation; (b) technical faults and damages arising from adverse weather incidents and vandalism; and (c) insufficient budgetary allocations to cater for the replacement of batteries to ensure full life usage of the systems installed. To address these issues, the MEMD, in coordination with the other line ministries (MoWE, MoESTS, and MoH), agreed to allocate budget to cover the cost of maintenance, repair, and replacement of system parts and/or collection of resultant waste materials for disposal or recycling beyond the first five years of operation.

2.3 Monitoring and Evaluation (M&E) Design, Implementation and Utilization

58. ***M&E Design***. The monitoring and evaluation system was the same as for the ERT-1 project, where the PCU had the primary responsibility for tracking the project's key performance indicators, using data provided by the relevant ministries, agencies and project stakeholders. According to the initial design, the Poverty Monitoring Unit of the Ministry of Finance had a role in assessing the overall poverty impact of the rural electrification schemes during the ERT-2 project, but this never materialized.

59. Two of the four outcome indicators were aligned with the objectives of the PDO and were designed to measure the increase in energy access and ICTs. The two other outcome indicators were related to the GEO (for example, reduction in tons of CO_2 emissions and MW of additional renewable capacity) and were dropped as outcome indicators and captured as intermediate indicators during the AF as it was considered that

they were not directly related to the achievement of the ERT-2 PDO. The indicator related to the MW of additional renewable generation was also reformulated as feasibility studies leading to additional power generation from renewable resources to ensure consistency with project activities.

60. Although the ERT-2 project Results Framework had specific, measurable, attributable, and relevant outcome and intermediate indicators, it could have been strengthened by including intermediate indicators related to the activities implemented by the Private Sector Foundation and UECCC, as well as targets regarding the extension of the distribution lines where the majority of project financing was directed. The AF addressed some shortcomings of the results framework.

61. ***M&E Implementation***. PCU coordinated data collection for key performance indicators from implementing agencies. PCU prepared quarterly reports in collaboration with implementing agencies. The monitoring function to be fulfilled by the MoFPED did not occur as anticipated at appraisal, as during implementation, it was considered that there was an overlap of monitoring functions and it was decided that the PCU would be the only unit responsible for it.

62. Data collection was adequate for most of the indicators, although it should be noted that for the indicators related to on-grid access (that is, the number of households connected to the grid, the percentage of rural population with access to electricity in project areas, and the number of project beneficiaries) the numbers reported on the results framework included connections supported by the ERT-2 project and Uganda grid-based OBA Facility, including the Bank-managed GPOBA grant. The reported numbers did not differentiate between the connections achieved by the overall OBA Facility and the GPOBA grant. While differentiating connections by source of funding would have enhanced transparency, the overall approach was aligned with the project design, which expected that connections would be achieved not only from project funding but also from other activities financed outside the project. Some of the connections reported under the ERT-2 project may also be reported by other donor-funded programs (for example, by donors supporting the Uganda grid-based OBA Facility), owing to the strong collaboration and interchangeable activities that were financed under one program but contributed to the implementation of the entire OBA Facility in Uganda. For example, the ERT-2 project financed the consumer mobilization campaign, as well as Independent Verification Agents (IVAs) responsible for the verification of OBA-supported connections.

63. For the OBA Facility, the long competitive process for the selection of IVAs delayed project start-up. Two firms were selected to certify the connections for the disbursement of the OBA subsidy. One IVA verified large batches of connections completed by Umeme, while the other experienced difficulties to timely respond to verification requests for connections installed by SPs other than Umeme. The verification allowed identification of critical implementation issues, including limited customer awareness on the OBA subsidy scheme, internal wiring challenges (that is, cost and technical quality), technical quality of connections, and identification of households by service providers (SPs) through Global Position Systems (GPS).

64. For the PVTMA Facility, independent verification agents were competitively selected to conduct inspections and verify installation of solar PV systems. The agents submitted verification reports to REA. Payments to the solar PV companies were made only upon successful verification of installation. The verification process was not adequately handled and important delays on the verification process occurred. Moreover, cases of fraud and corruption related to the PVTMA Facility involved the verification agents and staff from REA.

65. ***M&E Utilization***. The M&E framework was used to inform project progress and aided project refinement during the course of implementation, including reallocation of funds from non-performing to well-performing activities through two project restructurings as well as the processing of an AF intended to improve performance of the on-grid activities under Component 1. The framework was also useful in determining the beneficiaries of the various project components and in distinguishing between on-grid and off-grid connections. However, the M&E Framework should have been restructured together with the PDO in order to formally drop the indicators related to the ICT component that were not implemented.

2.4 Safeguard and Fiduciary Compliance

66. ***Safeguards***. The project was classified as environmental category B and triggered seven safeguard policies. Environmental Assessment (OP/BP 4.01) was triggered because the project would support investments with potential adverse environmental impacts. Natural Habitats (OP/BP 4.04) was applicable because some sub-projects may adversely impact on natural habitats. Physical Cultural Resources (OP/BP 4.11) was triggered because project investments would affect physical cultural resources. Involuntary Resettlement (OP/BP 4.12) was applicable because project interventions would entail land taking or limiting access to land and other resources. Forests (OP/BP 4.36) was triggered because project investments would have adverse impacts on forests. Safety of Dams (OP/BP 4.37) and projects on International Waterways (OP/BP 7.50) were applicable because mini-hydro projects would involve small dams and international waterways. As part of project preparation, an Environmental and Social Management Framework (ESMF) and Resettlement Policy Framework (RFP) were prepared.

67. Overall safeguards rating remained *Satisfactory* until May 2014 when the rating was downgraded to *Moderately Unsatisfactory* due to delayed payment of compensations to Project Affected Persons (PAPs) even after most of the grid extension lines and expansion projects had been completed. This was non-compliant with World Bank OP 4.12, which required complete compensations to PAPs prior to the commencement of any civil works. Delays were attributed to new directives from MoFPED which required all such compensations be made only through formal bank accounts to ensure transparency and accountability.

68. Non-compliance to World Bank OP 4.12 were also observed in relation to the three additional grid extension lines financed under the second restructuring (February 2015), when construction works had finalized well before compensation to PAPs was completed.

The Resettlement Action Plan (RAP) closure report noted that cash payments were finalized in December 2016, which was six months after project closing and with nearly 90 percent of PAPs compensated. The RAP closure report included an action plan to continue compensations until June 30, 2017. The action plan consisted in carrying out rounds of compensations for the remaining PAPs in all three distribution lines, as well as opening an escrow account to deposit unpaid compensation payments for PAPs who had not been paid yet. The official closure of the RAP process, including compensation payments to PAPs, will end on June 30, 2017. Over 96 percent of PAPs have been compensated as of June 1, 2017.

69. ***Procurement.*** The procurement performance rating for the project overall was *Moderately Satisfactory*. Procurement was carried out by REA, MEMD, and the different line ministries and agencies with a varied performance. Some agencies completed all or almost all the anticipated contracts while others had a much weaker performance. A final procurement evaluation of REA rated its procurement performance as *Moderately Satisfactory*, noting the progress achieved under the project.

70. ***Fraud and Corruption.*** An allegation of fraud and corruption in connection with the project was received by the Bank, but not substantiated. The Office of the Internal Auditor General (IAG) undertook a joint (REA, OIAG and PCU of MoEMD) verification exercise of 7,073 PVTMA-supported systems implemented by REA (77 percent of the verification target of 9,142). The OIAG concluded that ineligible subsidy expenditures totaled US$851,740 (US$564,942 from subsidies paid irregularly for 1,419 solar PV systems and US$286,998 from subsidies paid irregularly for 343 solar PV systems that could not be located). REA completed the refund of ineligible expenses to IDA/GEF in November 2016. The OIAG recommended, among others, that efforts should be made to trace all of the systems that could not be located and that REA should investigate an unexplained variance of UGX78,813,423 between the database for 9,142 systems and the payment vouchers. The Bank will follow this case closely.

71. ***Financial Management.*** Overall, financial management performance of the project was *Satisfactory* or *Moderately Satisfactory* throughout project implementation. Financial management and disbursement arrangements of the ERT-2 project were adequate. The project's financial management systems complied with generally accepted accounting principles and provided reasonable assurance that the project funds were used for the intended purpose. PCU and REA staffing remained adequate and proper books of accounts and supporting documents were kept in respect of all expenditures. The auditors' opinions on the annual financial statements were submitted mostly on time and were unqualified.

2.5 Post-completion Operation/Next Phase

72. In line with the ERT program, along with adjustments to reflect country and sector circumstances and building on relevant lessons from the ERT-1 and ERT-2 projects, GoU prepared the ERT-3 project as a stand-alone Investment Project Financing (IPF) with a total IDA amount of US$135 million and GEF grant of US$8.2 million. The ERT-3 project was approved by the Bank on June 5, 2015 and reached effectiveness on March 31, 2016.

The ERT-3 project development objective is to increase access to electricity in rural areas of Uganda. The ERT-3 project continues to support the implementation of the RESP-2 by providing support for on-grid and off-grid electrification, as well as institutional strengthening and impacts monitoring. A number of key issues arising during ERT-2 project implementation are acknowledged and reflected in ERT-3 project design, including: (a) allocation of IDA funding for connections and GoU agreement to establish a public financing mechanism to accelerate scaling-up of connections; (b) simplified implementation arrangements and project design with fewer implementing agencies and components; and (c) front-loading of project preparatory activities. Furthermore, ERT-3 project design addresses some of the sustainability issues that surfaced during ERT-2 project implementation, including: (a) need to provide incentives for private concessionaires to expand electricity access; (b) sustainability of tariffs and financial viability of SPs; and (c) long-term maintenance on the institutional off-grid institutional systems. As mentioned before, line ministries have assigned budget for maintenance of the systems to ensure their sustainability.

3. Assessment of Outcomes

3.1 Relevance of Objectives, Design and Implementation

Overall Rating: Modest

Relevance of Objectives (PDO)

Rating: High

73. The PDO was *'to increase access to energy and information and communication technologies (ICTs) in rural Uganda'*. This objective continues to be of high relevance in relation to GoU′s national priorities. Electricity remains a critical element for the country to achieve significant growth and socioeconomic transformation. Limited access and high cost of electricity services have constrained the development of industrial and commercial enterprises and affected delivery of social services. As articulated in Uganda's Vision 2040, the GoU aims at transforming Uganda from an agrarian society to a modern and prosperous country within 30 years, and expects to increase electricity access to 80 percent of the population by 2040. Ambitious infrastructure investments are planned in transport, energy, ICT, oil and gas, and water for production and consumption under the second National Development Plan (NDPII) covering the period 2015/16 to 2019/20 to support the country′s transformation.

74. Project objectives are also aligned with the priorities set under the Country Partnership Framework (CPF) for Uganda for the period FY16-FY21, which will assist Uganda in addressing its national priorities with a focus on ending extreme poverty and promoting shared prosperity in a sustainable manner. The World Bank Group (WBG) will support the GoU to sustain high rates of growth, socio-economic transformation, and inclusion, and reduce poverty and vulnerability to shocks. Under the sixth CPF objective, the WBG will focus on improving access to urban services, including improvements in electricity access and ICT services, as well as water and sewerage provision.

Relevance of Objectives (GEO)

Rating: High

75. The GEO was *'to increase energy efficiency and the use of renewable energy technologies in rural Uganda, in order to decrease present and future growth of greenhouse gas (GHG) emissions'*. The GEO is in line with GoU's commitment with the Sustainable Energy for All (SE4ALL) initiative of attaining universal access to modern energy services, improving energy efficiency, and increasing the share of renewable energy. Uganda's SE4ALL Action Agenda (2015) sets priorities to accelerate the achievement of the aforementioned goals in Uganda.

Relevance of Design (PDO, GEO)

Rating: Modest

76. As discussed in previous sections, the design of the project had important deficiencies, especially related to Component 1 and Component 2. For Component 1, the GPOBA Facility and the AF attempted to resolve key design shortcomings affecting the uptake of on-grid connections. While efforts from the GPOBA Facility were instrumental to accelerate connections, design problems materialized with the activities proposed under the AF, where connection materials procured in bulk were finally not utilized by the SPs. Component 2 was not implemented, mainly owing to important flaws in the component´s design and scope.

Relevance of Implementation (PDO, GEO)

Rating: Modest

77. Delays with project implementation prompted an extension of the original closing date by three years, extending the total implementation period to seven years. Delays were mainly attributed to inadequate procurement capacity particularly during early stages of project implementation, readiness of key sub-components (for example, grid extensions), and RAP implementation. For Component 2, the interest of the private sector had not been adequately assessed at appraisal, which resulted in the non-execution of major activities under this component due to lack of private sector interest.

3.2 Achievement of Project Development Objectives and Global Environment Objectives

Achievement of PDO

Rating: Substantial

78. The PDO was to *'to increase access to energy and information and communication technologies (ICTs) in rural Uganda'*. For the purposes of assessing the achievement of this objective, it can be viewed as being comprised of two parts: (a) increasing access to

energy in rural Uganda; and (b) increasing access to information and communication technologies (ICTs) in rural Uganda.[13]

a. Increasing access to energy in rural Uganda (*Rating: Substantial*)

79. According to the PDO targets reported in the ISRs and the GoU's Completion Report, the project achieved the target for percentage of rural population with access to electricity, but fell a little bit short to achieve the target on the number of project beneficiaries (of which 50 percent women). The total number of project beneficiaries included those connected to the grid, as well as those benefiting from off-grid connections through the PVTMA or institutional solar packages.

80. For on-grid, the project achieved 97,753 connections, representing almost 82 percent of the target.[14] It should be noted that 92,552 of these connections were achieved through the Uganda grid-based OBA Facility, including the Bank-managed GPOBA grant.[15] At AF, it was expected that the newly funded activities (that is, bulk procurement of connection materials and grid intensification of existing lines) would contribute 60,000 connections, whereas the remaining 60,000 connections would be made through the associated OBA Facility, including the Bank-managed GPOBA grant. However, by project closing, most of the connections can be attributed to the OBA Facility (including GPOBA) and none to the AF. Because the ERT-2 project connections targets were established based on connections financed from the ERT-2 project and other programs (for example, GPOBA and the overall Uganda grid-based OBA Facility), and considering that the targeted connections were largely achieved, this part of the PDO was rated *Substantial.*

81. For independent grids, connections did not materialize as expected due to delays with reaching financial closure of the investments. However, the project extended access to electricity to nine agricultural farms.

82. For off-grid, the project achieved 11,000 new connections under the PVTMA Facility, representing over 50 percent of the target consisting of 20,000 solar PV systems for households and 1,000 solar PV systems for non-Governmental institutions. As mentioned in other sections, this program suffered from various problems including mismanagement of funds, ineffective targeting of subsidies, and verification delays. Targets were largely achieved for the installation of solar PV energy packages for remote

[13] A split assessment for the analysis of the PDO achievement was considered considering that an AF was processed during Project implementation. The ICR team decided that the split analysis would not be relevant for the analysis for the following reasons: (a) the PDO and components were not changed; (b) the indicators were not significantly changed even though two PDO indicators were moved from outcome to intermediate indicators; and (c) the AF amount represented only 12 percent of the overall Project cost.

[14] The target for on-grid connections was revised at AF (May 2013), increasing target connections from 109,000 to 120,000.

[15] The 92,552 HH connections supported under the OBA facility were financed from various sources, including WB/GPOBA (36,864 HH connections), KfW (40,874 HH connections), and GoU (14,773 HH connections).

health, education, and water supply facilities with an important emphasis in Northern Uganda.

Table 5. PDO indicators for increased access to energy in rural Uganda

Indicators	Baseline	Target [16]	Achieved	Achievement rate
Percentage of rural population with access to electricity in project areas	4 percent	7 percent	7 percent	100 percent
Project beneficiaries	0	843,600	709,674	84 percent
Project beneficiaries, of which women	0	421,800	354,837	84 percent

b. Increasing access to information and communication technologies (ICTs) in rural Uganda (*Rating: Negligible*)

83. The PDO objective related to the increase in access to modern ICT services was not achieved, because core activities under Component 2 were largely not implemented. Component 2 comprised activities aimed at providing last mile Internet broadband access extension to rural areas with a focus on the Northern region and to establish new community information centers (CICs) for underserved rural areas. Funds were reallocated to Component 1 under the second restructuring (February 2015). The achievement of this objective is therefore considered *Unsatisfactory*.

Table 6. PDO indicators for increasing access to ICT in rural Uganda

Indicators	Baseline	Target	Achieved	Achievement rate
Percentage of the geographical area with access to modern ICT	80 percent	90 percent	80 percent	0 percent

Achievement of GEO

Rating: High

84. The GEO was *'to increase energy efficiency and the use of renewable energy technologies in rural Uganda, in order to decrease present and future growth of greenhouse gas (GHG) emissions'*. The target measuring tons of CO_2 emissions reduced/avoided as a result of the project was exceeded by 150 percent at project closing (356,700 tons CO_2 target, 540,692 tons CO_2 actuals). The second indicator related to the PDO was the number of feasibility studies completed under the project. The target of five

[16] Revised target after AF (May 2013).

studies was also achieved. The achievement of this objective is therefore considered satisfactory.

3.3 Efficiency

Rating: Substantial

85. Since the economic and financial analysis prepared at appraisal did not include calculations of net present value (NPV), economic internal rate of return (EIRR), and financial internal rate of return (FIRR), it was therefore difficult to evaluate potential improvements in project efficiency compared to that expected at appraisal. However, an ex-post economic and financial analysis of the project was conducted to verify its economic and financial viability based on information available at project closing. It should be noted that the analysis covered Component 1[17] and Component 3[18], but excluded Component 2 because activities were largely not completed and funds reallocated to other components.

86. The economic analysis considered costs and benefits accruing to the main beneficiaries of the project, including rural households and enterprises (for example, agribusiness farms), and public institutions (for example, schools, health centers, county offices) which gained access to electricity by on-grid and off-grid services. Benefits accrued from increased access to electricity were based on avoided costs (for example, diesel costs for power generation, kerosene for lighting), avoided peak load demand, and energy savings. On the cost side, the main economic costs included the investment costs and the costs for operations and maintenance, electricity connection fees, battery replacement for solar equipment, and the costs of additional electricity required to supply new connections.

87. Overall, the project had an estimated EIRR of 12 percent and an NPV of US$47.0 million (at a six percent discount rate). For Component 1, the EIRR was estimated at 15 percent (NPV of US$50.7 million). The high NPV for Component 1 could be attributed to benefits derived from avoided cost for households for spending on kerosene, candles, dry batteries, and phone charging, as well as from energy savings from power factor correction equipment. For Component 3, the negative value of the NPV (US$3.8 million) could be attributed to relatively high investments in institutional solar PV energy packages vis-à-vis fairly low accrued benefits within the lifetime of the solar PV equipment. It should be noted that there are positive externalities and spillover effects derived from increasing access to electricity to health and education centers, and water supply schemes, which are difficult to estimate and were not included in the calculations (for example, improvements in education and health).

[17] The economic analysis that was carried out for Component 1 included activities related to (a) grid extension and household connections; (b) off-grid solar PV for households, commercial buildings, and non-governmental institution; (c) solar water heaters; and (d) power factor correction equipment.
[18] The economic analysis that was carried out for Component 2 included activities related to (a) institutional solar PV for education and health centers, and water supply schemes; and (b) grid extension to agricultural farms.

88. The project was also financially viable on account of increased revenues from electricity sales to newly connected customers (that is, households and agricultural farms) and revenues from electricity connection charges. The estimated financial internal rate of return (FIRR) was 7.7 percent (NPV of US$48.2 million).

3.4 Justification of Overall Outcome Rating

Rating: Moderately Satisfactory

89. Overall outcome rating is *Moderately Satisfactory* considering the *Modest* relevance of objective, design and implementation, *Substantial* achievement of the PDO, and *Substantial* efficiency. Increasing access to electricity services continues to have high relevance for Uganda. The project facilitated increased energy access in rural areas by financing grid distribution extensions that, in collaboration with the Uganda grid-based OBA Facility, allowed the provision of electricity to 97,753 households. The project was also successful in supporting institutional off-grid connections to schools, health centers, agricultural farms and water supply schemes. Despite shortcomings in the design and implementation arrangements, the project largely achieved the targets related to the energy sector that comprised the vast majority of financing and activities. The achievement of some energy targets was even exceeded. The ICT objectives were not achieved.

3.5 Overarching Themes, Other Outcomes and Impacts

(a) Poverty Impacts, Gender Aspects, and Social Development

90. The ERT-3 project will support the development of an impact evaluation of the ERT-2 project to track the impact of the electrification investments in order to establish contributions to changes in income at household and enterprise levels, employment at household, enterprise and community levels and changes in access to social services in project areas - mainly health, post-primary education and safe water. While the impact evaluation has not yet started, feedback from consumers has emphasized the benefits of electrification: lighting has replaced kerosene and allowed children to study at night and adults to use TVs, radio and phones; increased ease of women's household chores with electric appliances; and improved community safety. Service providers have emphasized the project's role in reducing illegal connections and growing the customer base.

91. ***Poverty Impact.*** Households have reported higher income because of an improvement in business and employment opportunities resulting from the project. Some households have reported that they could get their family members employed as welders, could operate businesses of charging mobile phones and other businesses, such as selling cold drinks, all because of the availability of electricity. Furthermore, people have now regular power supply which is enabling them to use power for productive means, including agro processing, fish processing and small industrial activities.

92. ***Gender Aspects.*** Anecdotal evidence indicates that because of easier access to potable water as a result of electrification of the water supply schemes, women in some project target areas now spend less time collecting water. This makes it easier for them to use the time they save from collecting water for other productive activities. In addition,

availability of clean water is helping to lower incidences of malaria and water borne diseases. Many women have also been taking up business enterprises and/or extending their business hours after dark. In addition, more women are reported attending pre-natal clinics and coming to have deliveries at the health centers due to the availability of improved quality of lighting.

93. ***Social Development.*** The project has resulted in both direct and indirect benefits for individual households and for communities. These include improved health services in some rural areas resulting from a more secure environment in hospitals because of lighting. The availability of modern energy services in rural communities is allowing children to do their homework at night, women to be able to deliver babies in better conditions, and a whole range of income generating activities are emerging from ice making, food processing, bakery, tailoring, rural telephony, and commercial (mobile) banking.

(b) Institutional Change/Strengthening

94. The project strengthened the institutional capacity of line ministries and agencies, especially the Project Coordination Unit (PCU) at MEMD and REA. Through formal training and implementation experience, the project management, procurement, financial management, and safeguards capabilities of these institutions were enhanced. REA was assisted with additional staff (for example, engineers), increasing field presence and quality control. The project also supported the operationalization of the UECCC responsible for managing the Credit Support facility (CSF), and strengthening the capacity of the Participating Financial Institutions (PFIs) and Independent Power Producers (IPPs) to finance renewable energy and rural electrification projects.

(c) Other Unintended Outcomes and Impacts (positive or negative)

95. Unintended outcomes and impacts that arose during the implementation of the project include:

a. *Illegal connections.* The OBA Facility addressed the issue of illegal connections through customer awareness on fully subsidized connection charges for poor households;
b. *Retention.* The electrification of schools and health centers has improved retention of teachers and health professionals;
c. *Vandalism.* Some solar PV systems installed in schools were dysfunctional due to vandalism (for example, switching points and lighting bulbs were removed/stolen). This experience informed the design of anti-vandalism measures under the ERT-3 project (for example, signing MoUs with participating schools and burglar proof cages for control equipment in MoES designs);
d. *Fraud and corruption.* Fraudulent practices and abuse of subsidies were identified under the PVTMA involving independent verification agencies, REA employees, and some solar PV companies. This issue was addressed by, among others, dismissing REA staff involved in the fraud scheme, reporting the firms to the relevant authorities for further investigation, and

sanctioning and auditing all the subsidies paid by the PVTMA. REA refunded ineligible subsidy expenditures to IDA/GEF.

e. *Long delays for repairs in the electrified water schemes.* Repairs related to the water supply schemes took extensive time especially in isolated areas, as technicians were based in Kampala. Securing a framework contractor who could be readily available or conduct training for local technicians could help reduce delays.

3.6 Summary of Findings of Beneficiary Survey and/or Stakeholder Workshops

96. No beneficiary surveys or stakeholder workshops were carried out.

4. Assessment of Risk to Development Outcome and Global Environment Outcome

Risk to Development Outcome

Rating: Moderate

97. The main risks to the development outcome are considered to be *moderate*. GoU's commitment to increasing access to electricity in rural areas is demonstrated by the ERT-3 project, which building on the ERT-2 project, will continue facilitating the implementation of RESP-2 and establish a long-term platform for access enhancement. Under the ERT-3 project, GoU remains fully committed to infrastructure development as a key element of its rural development strategy. Moreover, the ERT-3 project design addresses some risks associated with the rural electrification model proposed under RESP-2, including (i) *Demand-side sustainability of on-grid connections and financing mechanism.* GoU has been designing an electricity connection policy to ensure that connection fees are subsidized for eligible households, therefore addressing affordability constraints that materialized during ERT-2 project implementation. The ERT-3 project has also allocated funding for on-grid connections; and (ii) *Weak institutional and implementation capacity.* Despite extensive training and capacity building over the past 12 years, the capacity of REA and SPs requires further strengthening in order to achieve RESP-2 targets. The ERT-3 project will further strengthen REA's capacity through additional training and recruitments. In turn, REA will continue strengthening SPs' implementation capacity through appropriate support mechanism (for example, technical assistance).

Risk to Global Environment Outcome

Rating: Moderate

98. The main risks to the global environment outcome are considered to be *moderate*. GoU remains committed to achieving the goals under Uganda's National Development Plan (NDP) and Uganda's Vision 2040 to 'meet the energy needs of the Ugandan population for social and economic development in an environmentally sustainable manner'. After becoming one of the 'early movers' for Africa to opt-in the SE4ALL

initiative, GoU endorsed the Uganda's SE4ALL Action Agenda in 2015, setting priorities to accelerate the achievements of the three goals of SE4ALL in the country.

5. Assessment of Bank and Borrower Performance

5.1 Bank Performance

(a) Bank Performance in Ensuring Quality at Entry

Rating: Moderately Unsatisfactory

99. The Bank performance in ensuring Quality at Entry is rated as *Moderately Unsatisfactory*. The ERT-2 project design incorporated important lessons from ERT-1 project implementation, and addressed some shortcomings of the First Ugandan Rural Electrification Strategy and Plan (RESP-1) (2001-2010). However, design deficiencies prevailed and affected the achievement of project objectives. The original 4-year project implementation timeline was overly ambitious, and did not properly identify and/or address key barriers to rural electrification. The AF attempted to address some of those deficiencies, but once again suffered from important shortcoming in the design of the mechanism for bulk procurement of connection materials; implementation was also affected by the poor performance of the consumer mobilization consultant. Leveraging GPOBA's and other donors' funding under the grid-based OBA Facility was aimed at addressing a key design shortcoming related to customer payment constrains of electricity connection charges.

100. The project assumed that implementation of the ERT-1 project had built enough capacity in relevant sector institutions, but implementation of the ERT-2 project exposed capacity constraints of key institutions (for example, REA) to successfully deliver under the project. Also, some key activities (for example, grid extensions) were not ready for implementation at entry and resulted in slow disbursements during the first two years of implementation.

101. Finally, the design of Component 2 (ICT) lacked a more thorough analysis of the ICT sector in rural Uganda, especially in regards to private sector interest and degree of incentive requirements that would have attracted private sector participation in the proposed activities.

(b) Quality of Supervision

Rating: Moderately Unsatisfactory

102. The project was supervised on regular basis throughout the entire seven-year implementation period with 12 Implementation Status and Results Reports (ISRs) prepared by regular missions from headquarters to the field. Sufficient budget and staff resources were allocated for supervision activities. The Bank team comprised experienced staff members with good knowledge of Uganda's rural electricity sector. The Bank team

responded to GoU´s concerns on implementation challenges by processing an AF and two Level II restructurings, which allowed the completion of most project activities regarding energy access. The Bank team played a critical role to engage Umeme under the grid-based OBA Facility, which helped accelerate uptake of connections starting from 2015.

103. Bank supervision also exhibited several deficiencies, including numerous changes in Task Team Leaders (TTLs) throughout project implementation, which resulted in significant delays during transitions, especially related to approvals of work programs and procurement plans. Moreover, the changes in TTLs required an adaptation period to the new management style of the new TTL affecting the pace of implementation. One important deficiency was the supervision of the ICT component. A more proactive supervision of this component could have resulted in a restructuring of this component that would have allowed its successful implementation or to formally drop the related ICT activities. Another important supervision oversight was related to compliance with Bank's safeguards policies, especially with World Bank OP 4.12. The Bank team had important deficiencies on reviewing, approving, and following-up on safeguard issues regarding compensation payments to PAPs under grid extensions works. In some cases, compensation payments to PAPs were completed when lines had already been constructed.

104. Even though the Bank processed two restructuring, those could have been done more comprehensively by not only reallocating funds but also by processing a more thorough project restructuring to review the PDO, project components and results framework once acknowledging that core activities under Component 2 (ICT) would not be implemented. Moreover, ISR ratings during the first three years for 'Overall implementation progress' and 'Progress toward achievement of PDO' did not adequately reflect the slow pace of project implementation. These ratings were considered *Moderately Satisfactory* up to March 2013 and were only downgraded to *Moderately Unsatisfactory* starting in October 2013.

(c) Justification of Rating for Overall Bank Performance

Rating: Moderately Unsatisfactory

105. Based on the two *Moderately Unsatisfactory* ratings for ensuring quality at entry and supervision, overall Bank performance is rated *Moderately Unsatisfactory*. Although the Bank provided proactive supervision, which attempted to address effectively the deficiencies and challenges identified in the project design and implementation by processing an Additional Finance and two Level II restructurings, the aforementioned shortcoming warrants the *Moderately Unsatisfactory* rating.

5.2 Borrower Performance

(a) Government Performance

Rating: Moderately Unsatisfactory

106. GoU strongly supported the ERT-2 project development objectives of increasing access to energy and ICT in rural Uganda. However, this was not adequately reflected in initial project implementation. The project only became effective eight months after project approval and implementation progress and disbursements were very low in the first two years (that is, 16 percent of project funds disbursed by November 2011).

107. Although GoU responsively and proactively developed RESP-2, there were no clear guidelines for monitoring and tracking the implementation of the RESPs. Also, delays with the preparation and adoption of RESP-2 left the country without a clear rural electrification strategy for almost two years. Ongoing issues with cost recovery tariffs for SPs need to be addressed to meet rural electrification targets.

108. Ownership and commitment of sector ministries to ensure the sustainability of solar systems was identified and addressed promptly towards the end of project implementation, when MEMD, in coordination with MoWE, MoESTS, and MoH agreed to allocate budget to cover the cost of maintenance, repair, and replacement of system parts and/or collection of resultant waste materials for disposal or recycling beyond the first five years of operation.

109. Finally, the GoU violated the World Bank OP 4.12 when commenced and even finalized construction of grid extension lines before completing compensation payments to PAPs. Funds required to make compensation payments were not transferred to REA in a timely manner.

(b) Implementing Agency or Agencies Performance

Rating: Moderately Unsatisfactory

110. This rating reflects mostly the performance of the PCU at MEMD and REA, as the key institutions responsible for overall project coordination and implementation of a significant amount of project funds. The performance ratings for other line ministries and agencies are provided below.

111. ***PCU.*** The performance of the PCU at MEMD was *Moderately Satisfactory*. PCU proactively coordinated the different line ministries and agencies involved in project implementation, and provide cross-sectoral support on implementation issues, contract management, and procurement. PCU organized periodic meetings with all stakeholders and closely monitored project implementation, and submitted quarterly and annual reports in a timely manner. These reports provided valuable information on project activities. The status of performance indicators was incorporated in all progress reports and served as valuable input to Bank supervision mission reports. The financial management system, including accounting, controls, auditing and reporting, was adequate and satisfied the Bank's financial management requirements.

112. Implementation deficiencies of the PCU included: (i) delays with contract payments and transfer of funds under Component 3 – PCU handled the designated account

serving the line ministries (that is, finance, health, education, water, agriculture, and local government); and (ii) amending work plans without prior consultation with line ministries.

113. ***REA.*** The performance of REA was *Unsatisfactory*. REA exhibited several deficiencies during project implementation, including (a) technical, procurement, and safeguards capacity constraints, which severely affected project implementation; (b) serious governance issue with proven fraud and corruption involving REA staff under the PVTMA Facility; (c) completing compensation payments to PAPs with significant delays, and even allowing construction works to proceed even when compensation to PAPs had not been completed, which violated World Bank OP 4.12. Moreover, compensation payments to PAPs related to the three lines under the second restructuring (February 2015) was completed in December 2016, six months after project closing.

114. ***Sector Ministries and agencies.*** Overall performance of the other sector ministries and agencies varied from *Satisfactory* (MoH, MoWE, MoLG, and PSFU) to *Moderately Unsatisfactory* (MoES, UECCC) or *Unsatisfactory* (UCC).

(c) Justification of Rating for Overall Borrower Performance

Rating: Moderately Unsatisfactory

115. Overall Borrower performance is rated *Moderately Unsatisfactory*. This was a complex project with multiple line ministries and agencies involved. Although GoU's strong commitment to the project, key policy and budget issues (that is, related to timely completion of compensation payments to PAPs) affected project implementation. Moreover, the performance of the key IAs, REA was unsatisfactory with significant procurement delays, issues with safeguards non-compliance, and cases of fraud and corruption. The other implementing agencies had mixed implementation performance.

6. Lessons Learned

116. The main lessons learned from the ERT-2 project are the following:

a. ***The public sector should take a leading role in building the enabling infrastructure and establishing a conducive environment for private sector participation in rural electrification.*** The experience with ERT-1 and ERT-2 projects demonstrates that the role of the public sector is essential for achieving ambitious rural electrification targets, for example by building the enabling infrastructure (that is, transmission and distribution lines) and providing connection subsidies for low income households in peri-urban and rural areas. Moreover, the GoU needs to put in place a clear and stable legal and regulatory environment that sets clear and balanced laws and regulations for private sector participation in rural electrification.

b. ***Ensure effective sector-wide coordination, planning, and monitoring, relying on continuous improvement of institutional capacity of relevant***

stakeholders. Achieving the scaled-up access targets under RESP-2 requires effective coordination among multiple stakeholders (that is, MEMD, ERA, REA, SPs, Umeme, UETCL) in fostering investment and operations across the electricity supply chain, but also resolve problems in a timely manner. For example, it took over three years to estimate the new connection charge and notify SPs about the reduced technical design standards to make connections more affordable to consumers. A clearer geographical demarcation of service territories, especially when there is overlap between SPs and Umeme, could help avoid confusion for potential customers as to where the households should apply for connections, and avoid social issues due to different tariffs within nearby locations. Furthermore, building appropriate institutional capacity for implementation is key for achieving rural electrification targets. Although the ERT-2 project improved the capacities of line ministries, agencies, and SPs, these efforts should be viewed as work in progress and more needs to be done. The ERT-2 project design assumed that the ERT-1 project had already built capacity in relevant sector institutions, but implementation of ERT-2 project exposed serious institutional capacity constraints of key institutions (for example, REA). Also, while most of the SPs had weak capacities, the ERT-2 project demonstrated that the engagement of SPs with strong technical and financially strong capacities (for example, Umeme) could be critical for scaling-up electrification efforts. Umeme's engagement in the project was fundamental to accelerate the uptake of connections during the last two years of project implementation.

c. ***Project design and implementation arrangements should be simple and realistic.*** Although ERT-2 project design was simplified compared to the ERT-1 project, the design was still broad and complex, covering an extensive scope of activities through nine sub-components and spread across two sectors (that is, energy and ICT). Project design may avoid multi-sectorial projects, where possible, as project implementation support tends to focus on the sector with the largest allocation of funds. If multi-sectorial project design is inevitable, implementation responsibilities could be shared between co-TTLs from either sector. ERT-2 project implementation arrangements were also complex, involving seven line ministries and four agencies with differing institutional capacities. [19] The PCU at MEMD helped with the overall coordination of the project, though relying on simpler implementation arrangements with fewer implementing agencies would allow for more focused and effective support for weaker institutions, and efficient implementation of the project. A more realistic implementation timeline, especially for complex projects, should be considered at project appraisal instead of extending the timeframe throughout restructurings. Complex projects should also consider proactive

[19] Under initial implementation arrangement the Ministry of Finance (MoFPED) and the Ministry of Agriculture (MoAAIF) were also implementing agencies but their activities were implemented by MEMD.

implementation support arrangements, including raising the profile of project supervision to bring up issues to the highest levels of management attention and carrying out thorough reviews (that is, equivalent to 'mid-term' reviews) more frequently (for example, every 18-24 months).

d. ***Be conservative in identifying and assessing project risks and incorporate effective risk mitigation measures.*** The initial project design did not adequately identify and address important barriers, particularly related to consumer affordability for connections (that is, connection fees and internal wiring), technical and financial capabilities of SPs, and procedures for processing connection requests, which resulted in hardly any on-grid connections under the project four years into implementation. The AF attempted to resolve some of these barriers, but still failed to address them effectively. For example, the implementation of the revolving fund relied primarily on SPs that did not have adequate capacity for managing inventory and making connections. Noteworthy, most of the connections supported by the grid-based OBA Facility were made by the private entity with the strongest capacity, Umeme. ERT-2 project design could have earmarked funds for on-grid connections and implementation arrangements could have considered the capacities of SPs, including the provision of technical assistance for SPs to effectively perform their responsibilities during and beyond the project period. The assessment of consumer affordability should also look at the cost of internal wiring, which remained an important barrier hindering the uptake of connections under the ERT-2 project. The internal wiring constraint could be resolved through technical solutions (for example, ready boards) or applying partial subsidies based on willingness to pay of the household.[20] Implementation of the ERT-2 project also showed the value to carry out targeted and well-designed information and mobilization programs for increasing demand for new connections, especially to deal with logistical difficulties and simplify procedures for obtaining service connections. Finally, ERT-2 project implementation demonstrated the importance to overestimate rather than underestimate project risks, and incorporate effective risk mitigation measures accordingly.

e. ***Programs supporting off-grid solar systems programs should be designed considering an adequate allocation of subsidies, access to financing complemented by capacity and knowledge building, efficient monitoring and verification measures, quality standards, and after sales services in rural areas.*** The implementation of the PVTMA program under the ERT-2 project provides important lessons for future programs. Subsidies should be designed carefully to improve the affordability of the targeted consumers

[20] Although ready boards were eligible for OBA subsidy, the implementation of ready boards did not materialize during ERT-2 project implementation due to regulatory constraints in regards to acceptable technical specifications for ready boards.

taking into account the type of system that will likely be demanded by these consumers. A deficient design of subsidies could incentivize the promotion of larger and more expensive systems that are unaffordable to the targeted consumers. Pay-as-you-go plans or equivalent installment sales models can improve affordability and facilitate the deployment of solar systems in poorer rural areas. Increasing access to finance is essential for expanding the availability of solar systems in rural areas (through business expansion of solar companies), but this support should be accompanied by necessary capacity and knowledge building of participating financial intermediaries and/or banks, especially when they are encouraged to work in a new sector. The necessary sectoral and technology knowledge should be acquired by financial intermediaries and/or banks to enhance their risk assessment capabilities and avoid unwarranted risk perceptions translate into higher financing costs that affect directly the purchase price of the system by the final beneficiary. The monitoring and verification process should be efficient to ensure timely reimbursement of subsidies, therefore minimizing the cost of additional financing (for example, for solar companies). Auditing mechanisms should be in place to enable effective verification process. Technical standards also should be enforced as sub-standard products could have a negative impact on market perceptions. Finally, innovation and responsibility should be balanced, ensuring that solar companies have necessary presence in rural areas to provide acceptable after-sales services without restricting innovation.

f. ***Government should ensure the sustainability of off-grid solar systems installed in public institutions.*** The electrification of public rural institutions (for example, schools, health centers) with solar PV systems provides enormous benefits to local areas, but ownership is essential to ensure the sustainable operation of these systems beyond the project period. The sustainable operation and maintenance of solar PV systems installed in public institutions should become the responsibility of hosting local authorities and/or ministries. Budgetary commitments from the corresponding authority should be an integral part of project design to ensure the sustainable operation of the systems.

g. ***Efficient IVAs are key for achieving satisfactory progress on the implementation of result-based projects.*** Delays in the procurement of the Independent Verification Agents (IVAs) for the OBA subsidies and a varied performance among the selected IVA´s slowed down project implementation at certain stages. In addition to the essential function of the IVA´s on the certification of connections for subsidy disbursement function, they also play a critical in bringing key implementation issues to the attention of the project stakeholders.

h. ***Thorough assessment of the ICT sector to understand interest and barriers for private sector participation.*** The implementation of the ICT

component under the ERT-2 project was affected by unsuccessful tenders arising from limited market response to the tender design. Lesson learned from the ERT-2 project revealed the importance to carefully assess the potential and readiness for private sector investment in rural ICTs, which included identification of barriers and incentive requirements, as well as corresponding risk mitigation measures to fully exploit this potential. The assessment should also identify demand side needs and mechanisms to increase such demand. Also, the ICT needs of Northern Uganda were more basic than those anticipated by the project, therefore the project could have identified and included mechanisms to increase demand for data (for example, through free internet data access at schools).

7. Comments on Issues Raised by Borrower/Implementing Agencies/Partners

(a) Borrower/implementing agencies

117. Draft copies of this ICR were discussed and comments from the Borrower/Implementing Agency were received and included in this Report.

(b) Co-financiers

N/A

(c) Other partners and stakeholders

118. The GPOBA Grant, which was approved in June 2012 and became effective in December 2012, supported on-grid connections for poor households in rural and peri-urban areas of Uganda. The US$5.5 million GPOBA grant closed in June 2017.

119. The GPOBA project faced initial implementation challenges, including low payment capacity of households for internal wiring, shortage of connection materials (particularly for small SPs), and delays in poverty mapping and in verification/subsidy disbursement. These challenges were addressed by offering partial wiring and ready board options to address barriers related to internal wiring; accelerating and finalizing poverty mapping; and streamlining disbursement procedures. Project restructuring amended the subsidy disbursement schedule to a one-time payment to accommodate pre-paid meter technology (the only technology used), which contributed significantly to connection uptake due to SPs being more strongly incentivized. REA pursued an active mobilization and public outreach campaign to inform residents of the benefits of the project and accelerate connection uptake.

Annex 1. Project Costs and Financing

(a) Project Cost by Component (in US$ Million equivalent)

Components	Appraisal Estimate (US$ millions)	Actual/Latest Estimate (US$ millions)	Percentage of Appraisal
C1. Rural Energy Infrastructure	46.70	72.2[21]	155
C2. ICT	8.00	0.00	0
C3. Energy Development	29.30	29.30	100
Total Baseline Cost	84.00	101.5	120
Physical Contingencies	0.00	0.00	
Price Contingencies	0.00	0.00	
Total Project Costs	84.00	101.5	120

(b) Financing

Source of Funds	Type of Co-financing	Appraisal Estimate (US$ millions)	Actual/Latest Estimate (US$ millions)	Percentage of Appraisal
IDA	Loan	75.0	87.0 [22]	116.0
GEF	Grant	9.0	9.0	100.0
GPOBA	Grant	0.0	5.5	

[21] Includes US$5.5 million from GPOBA.
[22] Includes US$12 million from the AF (May 2013).

Annex 2. Outputs by Component

Component 1: Rural Energy Infrastructure

1. ***Sub-component 1.1 – Publicly funded grid related power supply.*** This sub-component was implemented by REA and financed grid extensions and intensification in various concession footprints.

Table 2.1. Grid extensions completed under Component 1

No	Project Name	Location (District)	MV (Km)	LV (Km)
1	Ibanda-Kazo	Ibanda and Kiruhura	123	86
2	Soroti-Katakwi	Soroti and Katakwi	92	41
3	Ayer-Kamdin	Oyam and Gulu	100	67
4	Ruhiira Millenium Village	Ntungamo	106	83
5	Ntenjeru	Wakiso	75	53
6	Nkonge-Kashozi	Ibanda, Kiruhura and Sembabule	178	64
7	Masindi-Waki	Masindi, Buliisa and Hoima	177	69
8	Opeta-Ochokora	Oyam and Kole	51	40
9	Gulu-Acholibur	Gulu and Pader	117	40
10	Amuru-Nwoya District Headquarters	Amuru and Nwoya	44	14
11	Kizirafumbi-Kabaale, Kisaaru & Hoima schemes	Hoima	110	89
12	Rubaare, Kyempene, Kitwe-Isingiro	Ntungamo	37	14
13	Agricultural farms[23]	Various	26	28
14	Intensification schemes	Various (13 districts)	57	168
		Total	**1,293**	**855**

2. The project had a target of 120,000 on-grid household connections (including OBA connections). By project closing, 97,753 households were connected to the grid, of which 92,552 connections were supported by the OBA Facility (including the Bank-managed GPOBA grant) that was associated with ERT-2 and 5,201 connections were reported under others. Connections expected from the independent grids did not materialize due to delays with financial closure of the investments by project closing.

3. ***Sub-component 1.2 – Off-grid renewable energy investments.*** The off-grid sub-component was implemented by REA under the PVTMA Facility, where consumer subsidies were provided to support solar PV installations in households, commercial buildings and non-government institutions. By project closing, 11,000 new connections

[23] Grid extension to agricultural farms was implemented under Component 3.

were achieved under the PVTMA Facility. It should be noted that the implementation of the PVTMA Facility was affected by cases of fraud and corruption, which undermined the results finally achieved by the project.

4. ***Sub-component 1.3 – Technical assistance and training.*** This sub-component supported implementation of on-grid and off-grid energy access activities, including planning, coordination, and implementation support for the REA, construction supervision, consumer sensitization and mobilization, independent verification of connections, and capacity development for the REA to strengthen its oversight roles in rural electrification.

5. ***Sub-component 1.4 – Credit Support Facility (CSF).*** The CSF was implemented by UECCC and provided credit enhancement products aimed at encouraging the participation of local financial institutions. They included a standby liquidity/refinance option, a connection loan facility and solar refinance facility. Under the standby liquidity/refinance facility only one private financial institution made use of the facility to extend a long term-loan to the West Nile Rural Electrification Company (WENRECO) for the development of a 3.5 MW mini-hydro. Under the connection loan facility, UECCC piloted the scheme in the West Nile region in partnership with a commercial Bank and WENRECO. Under the solar loan refinancing facility, the UECCC worked with four commercial Banks to provide on-lending credits to households and commercial enterprises for acquisition of solar products. This facility was aimed at reducing the affordability barrier to poor households. The financing options were not used as expected due to various reasons. Among others, the interest rates charged by the banks to the households were still high, the products were competing with other bank products that were easier to sell, and by project closing, solar companies were using a new end-user financing, the 'pay-as-you-go' model where the companies were also providing the credits for the solar systems.

6. ***Sub-component 1.5 – Private Sector Foundation Uganda (PSFU).*** This sub-component supported solar PV market development and private sector involvement in renewable energy power generation and energy efficiency improvements. PSFU supported the scaling-up of investments in solar water heaters (SWH) by way of cost share grants towards the cost of the SWH and its installation. The grants were extended to the hospitality sector, private industries, private hospitals, private schools and homes. In total, 911 installations were completed in hotels (187), guest houses (41), lodges (75), homes (362), and private institutions (246). The installations would avoid over 4 MW of peak load demand. This sub-component also financed power factor correction equipment in 28 industries, leading to 8.8 MW verified savings.

Table 2.2. Indicators related to Component 1

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1:	Percentage of rural population with access to electricity in project areas.			
Value (quantitative or qualitative)	4	6	7	7
Date achieved	Household survey data (2005/2006)	06/30/2013	05/22/2013	06/30/2016
Comments (incl. % achieved)	Achieved 100 percent, including on-grid and off-grid connections financed through GPOBA and OBA facilities.			
Indicator 1.1:	Number of households connected through the extended grid.			
Value (quantitative or qualitative)	151,000	260,000	271,000	248,753
Date achieved	04/06/2009	06/30/2013	05/22/2013	06/30/2016
Comments (incl. % achieved)	Achieved 91 percent, with vast majority of household connections being supported by the Uganda grid-based OBA Facility that is associated with the project. Target revised during the AF.			
Indicator 1.2:	Number of households connected through independent grids.			
Value (quantitative or qualitative)	4,700	5,300	N/A	0
Date achieved	04/06/2009	06/30/2013		06/30/2016
Comments (incl. % achieved)	Not achieved. No connections were made during the project period due to delays with reaching financial closure of supported independent grids.			
Indicator 1.3:	Number of households using Solar PV systems.			
Value (quantitative or qualitative)	12,000	32,000	N/A	23,000
Date achieved	04/06/2009	06/30/2013		06/30/2016
Comments (incl. % achieved)	Achieved 72 percent achieved. There were reported and confirmed cases of fraud and corruption on the use of the PVTMA Facility which resulted in numerous ineligible connections.			
Indicator 1.4:	Capacity of solar PV systems sold by private companies (kW).			
Value (quantitative or qualitative)	1,400	2,400	N/A	2,400
Date achieved	04/06/2009	04/06/2009		06/30/2016
Comments (incl. % achieved)	100 target achieved. 1,012 kW solar PV installed from over 11,000 off-grid connections (eligible) under PVTMA Facility.			
Indicator 1.5:	Percent reduction in large industrial/commercial loads in target locations (energy savings through energy efficiency measures).			
Value (quantitative or qualitative)	0	30	N/A	31
Date achieved	04/06/2009	06/30/2013		06/30/2016
Comments (incl. % achieved)	Target exceeded, achieved 103 percent. Installed power factor correction equipment in 28 industries with 8.8 MW verified savings.			

Component 2: ICT

7. ***Sub-component 2.1 – Investments.*** This sub-component was expected to implement: (a) last mile internet broadband access extension to rural areas with a focus on the Northern region; (b) new community information centers (CICs); (c) cell-phone charging facilities for CICs installed in ERT I; and (d) computer equipment with subsidized internet access for schools and health facilities. The computer labs for schools and ICT facilities for health centers were the only activities successfully completed. The

procurement processes for (a) and (b) were carried out, but were declared unresponsive. The unused funds from this component were reallocated to other components after the second project restructuring (February 2015).

8. ***Sub-component 2.2 – Technical assistance and training.*** This sub-component was funded to develop and disseminate information packages to beneficiaries of investments in sub-component 2-1, including traders, teachers, health workers, farmers and communities. Only limited technical assistance was delivered under the project.

Table 2.3. Indicators related to Component 2

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 2.1:	Number of Community Information Centers established in unserved and underserved areas.			
Value (quantitative or qualitative)	1,533	2,083		1,533
Date achieved	04/06/2009	06/30/2013		06/30/2016
Comments (incl. % achieved)	Not achieved due to unsuccessful tenders arising from limited market response to the tender design. IDA funding reallocated to another component during second project restructuring.			
Indicator 2.2:	Number of sub-counties with public broadband Internet access points.			
Value (quantitative or qualitative)	0	16		0
Date achieved	04/06/2009	06/30/2013		06/30/2016
Comments (incl. % achieved)	IDA funding reallocated to another component during second project restructuring.			

Component 3: Energy Development, Cross-sectoral links and Impact Monitoring

9. The component was implemented by the MEMD, MoH, MoWE, MoES, MoLG, and REA.

10. ***Sub-component 3.1 – Energy packages for health, water and education.*** This sub-component supported the installation of solar PV energy packages in rural health centers, water pumping stations, primary schools, sub-county headquarters and Post Primary Education Institutions (PPEIs), and grid extensions to agricultural farms.

11. The target of 464 health centers with access to electricity was exceeded, as the project finally electrified 522 health centers. Also, 30 level four health centers (HC-IV) were provided with computers and internet access. The target for electrifying water supply schemes was achieved, with 29 water-pumping stations electrified under the project. The target for number of rural schools with access to electricity was mostly achieved, with 546 out of 560 schools gaining access to electricity services (97 percent of the target).

12. The target for local governments actively engaged in renewable energy or energy efficiency investments was achieved with installations completed at the six district

headquarters of Kamuli, Kiruhura, Kasese, Kamwenge, Arua and Mubende. The target for connecting nine agribusiness famrs to the grid was completed.

13. The target for the feasibility studies leading to additional power generation from renewable sources was exceeded with the completion of five studies (the target was 3 studies). Feasiblity studies were completed for small-hydro projects at Kakaka (5.5MW) and Lubilia (5MW) implemented by PSFU; Muyembe (6.9MW), Latoro (5.4MW), and Okuluchere (6.3MW) implemented by MEMD.

14. Finally, 540,692 tons of CO_2 emissions were reduced/avoided as a result of project activities, exceeding the target by 150 percent.

15. ***Sub-component 3.2 – Technical assistance, training and operating costs.*** This sub-component supported the implementation of on-grid and off-grid energy access activities including planning, coordination, and implementation support, supervision of works and capacity development within the implementing institutions. This sub-component also supported operational costs and training for the PCU.

Table 2.4. Indicators related to Component 3

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 3.1:	Percent of health centers (HC-II through HC-IV) with access to electricity in 24 districts (including 11 districts in Northern Uganda).			
Value (quantitative or qualitative)	HC-II 6% HC-III 18% HC-IV 16%	HC-II 54% HC-III 87% HC-IV 98%		HC-II 64% HC-III 97% HC-IV 98%
Date achieved	04/06/2009	06/30/2013		06/30/2016
Comments (incl. % achieved)	Target exceeded. Original target included electrification of 464 health centers; the project electrified 522 health centers.			
Indicator 3.2:	Number of level four health centers (HC-IV) with computers and internet access.			
Value (quantitative or qualitative)	5	30		30
Date achieved	04/06/2009	06/30/2013		06/30/2016
Comments (incl. % achieved)	Achieved 100 percent.			
Indicator 3.3:	Number of rural schools with access to electricity.			
Value (quantitative or qualitative)	0	560		546
Date achieved	04/06/2009	06/30/2013		06/30/2016
Comments (incl. % achieved)	Achieved 97 percent.			
Indicator 3.4:	Number of rural schools with access to computer labs.			
Value (quantitative or qualitative)	0	60		60
Date achieved	04/06/2009	06/30/2013		06/30/2016
Comments (incl. % achieved)	Achieved 100 percent.			

Indicator 3.5:	Number of water supply schemes with access to electricity.			
Value (quantitative or qualitative)	15	35	44	44
Date achieved	04/06/2009	06/30/2013	05/22/2013	06/30/2016
Comments (incl. % achieved)	Achieved 100 percent. Target revised during the AF.			
Indicator 3.6:	Percent of local governments actively engaged in renewable energy or energy efficiency investments.			
Value (quantitative or qualitative)	0.4%	5%		5%
Date achieved	04/06/2009	06/30/2013		06/30/2016
Comments (incl. % achieved)	Achieved 100 percent with completed installations at six district headquarters of Kamuli, Kiruhura, Kasese, Kamwenge, Arua and Mubende. Installations completed in 30 Primary Schools in the same districts.			
Indicator 3.7:	Number of large agri-business/farms with access to electricity			
Value (quantitative or qualitative)	133	142		142
Date achieved	04/06/2009	06/30/2013		10/15/2015
Comments (incl. % achieved)	Achieved 100 percent. Grid connection extended to nine agri-business/farms.			
Indicator 3.8:	Feasibility studies leading to additional power generation from renewable sources.			
Value (quantitative or qualitative)	0		3	5
Date achieved	05/22/2013		05/22/2013	06/30/2016
Comments (incl. % achieved)	Target exceeded, achieved 166 percent. Feasibility reports completed for five mini-hydro projects. Indicator introduced during the AF (formerly PDO indicator 'MW of additional power generation from renewable resources').			
Indicator 3.9:	Tons of CO_2 emissions reduced/avoided as a result of the project			
Value (quantitative or qualitative)	0	860,484	356,700	540,692
Date achieved	04/06/2009	06/30/2013	05/22/2013	06/30/2016
Comments (incl. % achieved)	Target exceeded, achieved 150 percent of revised target. Target was revised during the AF, because original target had considered CO_2 emission reductions associated with 25MW of small-hydro projects (original attribution for avoided emissions was not clear as the project only covered feasibility studies, not construction).			

Annex 3. Economic and Financial Analysis

1. This Annex describes the methodology and underlying assumptions considered to estimate and assess the project's net present value (NPV), economic internal rate of return (EIRR), and financial internal rate of return (FIRR).

2. Since the economic and financial analysis prepared at appraisal did not include calculations of NPV, EIRR, and FIRR, it was therefore difficult to evaluate potential improvements in project efficiency compared to that expected at appraisal. However, an ex-post economic and financial analysis of the project was conducted to verify its economic and financial viability based on information available at project closing. It should be noted that the analysis covered Component 1 and Component 3, but excluded Component 2 because activities were largely not completed and funds reallocated to other components.

3. ***Economic analysis.*** The economic analysis covers activities supported under Component 1 and Component 3. It does not cover Component 2, because activities were largely not completed and funds reallocated to other components. For Component 1, the analysis focuses on (a) grid extension and household connections; (b) off-grid solar PV systems for households, commercial buildings, and non-government institutions; (c) solar water heaters for the hospitality sector, private industries, private hospitals, private schools, and households; and (d) power factor correction equipment for industries. For Component 3, the analysis concentrates on (e) institutional solar PV energy packages for rural health centers, water pumping stations, and primary schools; and (f) grid extension to agricultural farms.

a. ***Cost***: the cost consisted of investment costs, operations and maintenance (O&M), connection fees, battery replacement, and cost of additional electricity required to supply new connections; and
b. ***Benefit***: benefits from increased access to electricity were based on avoided costs, avoided peak load demand, avoided CO_2, and energy savings.

4. Key assumptions included the following:

a. Grid extension and household connections: (a) Estimated benefit (kerosene, candles, dry cells, cell phone charging): 9 US$/household per month, which is based on average household spending that could be assumed be spent on grid supplied electricity. This includes spending on kerosene, candles, dry cells, and cell phone charging; (b) Average electricity consumption: 52 kWh/household per month, assuming power for two lights, radio, TV, and mobile charging; (c) Average cost of electricity generation: 0.12 US$/month; (d) Connection fees: 142 US$/household connection. Based on the connection fee for Umeme, which made most of the connections under the project; and (e) CO_2 benefits: 0.8 tCO_2/household per year;

b. Off-grid solar PV systems for households, commercial buildings, and non-governmental institutions: (a) Average household system size: 92 Wp (30% load factor); (b) Average household system cost: 12 US$/Wp; (c) Battery

replacement cost: 3.6 US$/Wp every 5 year; (d) O&M cost: 0.6 US$/Wp per year; and (e) CO_2 benefits: 0.62 tCO_2/household per year;

c. Solar water heaters, where avoided electricity consumption was assumed 2.5 hour/day;

d. Power factor correction equipment: (a) Plant availability factor: 0.66 (2015 Bujagali factor); (b) Losses: 19% (2016 Umeme); and (c) Annual working days: 300 days/year;

e. Institutional solar PV for education and health centers, and water supply schemes: (a) Average system size - health centers: 997 Wp (15% load factor); (b) Average system size - water pumping scheme: 10,910 Wp (15% load factor); (c) Average system size - primary schools: 497 Wp (15% load factor); (d) Battery replacement: 5 US$/Wp every 5 year; and (e) O&M cost: 0.18 US$/Wp per year; and

f. Grid extension to agricultural farms: (a) Average electricity consumption: 351,000 kWh per agricultural farm per year; (b) CO_2 benefits: 486.7 tCO_2/GWh, derived from converting source of electricity for farms from diesel (793.7 tCO_2/GWh) to national grid mix dominated by hydro (307 tCO_2/GWh).

Table 3.1. Summary of Economic Analysis

Component	EIRR (%)	NPV (@6% DR)
Component 1 - Grid extension and household connections - Off-grid solar PV for households, commercial buildings, and non-governmental institutions - Solar water heaters - Power factor correction equipment	15 %	US$50.7 million
Component 3 - Institutional solar PV for education and health centers, and water supply schemes - Grid extension to agricultural farms	4 %	- US$3.8 million
Overall Project	**12 %**	**US$47.0 million**

5. When considering CO_2 benefits, the overall project NPV is US$54.8 million (at 6 percent discount rate). The overall project EIRR is 13 percent.

Table 3.2. ERT-2 Project Economic analysis (in US$ million)

Year	Cost				Benefits				Net benefits	CO_2 benefits	Net benefits incl. CO_2
	On-grid	Off-grid PVTMA	Institutional solar	EE / Agriculture	On-grid	Off-grid PVTMA	Institutional solar	EE / Agriculture			
2010	3.93	0.34	2.96	0.34	0.00	0.00	0.00	0.00	-7.57	0.00	-7.57
2011	1.35	2.55	0.66	0.09	0.22	0.24	0.06	0.00	-4.11	0.03	-4.08
2012	12.63	3.33	9.42	1.08	0.22	0.48	0.29	0.25	-25.21	0.05	-25.17
2013	5.79	7.69	3.84	0.43	0.55	1.24	0.58	0.36	-15.01	0.11	-14.90
2014	18.58	0.35	3.33	0.38	4.70	1.24	0.67	5.44	-10.60	0.38	-10.22
2015	17.08	0.32	0.00	0.03	12.00	1.24	0.69	7.83	4.34	0.85	5.19
2016	8.29	0.98	0.92	0.04	12.00	1.24	0.69	7.83	11.53	0.85	12.38
2017	8.51	1.31	1.89	0.00	12.00	1.24	0.69	7.83	10.06	0.85	10.90
2018	8.51	2.83	2.46	0.00	12.00	1.24	0.69	7.83	7.97	0.85	8.82
2019	8.51	0.61	0.84	0.00	12.00	1.24	0.69	7.83	11.81	0.85	12.66
2020	8.51	0.61	0.35	0.00	12.00	1.24	0.69	7.83	12.30	0.85	13.15
2021	8.51	0.61	0.73	0.00	12.00	1.24	0.69	7.83	11.92	0.85	12.77
2022	8.51	0.61	2.10	0.00	12.00	1.24	0.69	7.83	10.55	0.85	11.40
2023	8.51	0.61	2.65	0.00	12.00	1.24	0.69	7.83	10.00	0.85	10.85
2024	8.51	0.61	0.96	0.00	12.00	1.24	0.69	7.83	11.69	0.85	12.53
2025	8.51	0.61	0.38	0.00	12.00	1.24	0.69	7.20	11.63	0.85	12.48
2026	8.51	0.61	0.73	0.00	12.00	0.99	0.69	7.20	11.04	0.84	11.87
2027	8.51	0.61	0.21	0.00	12.00	0.75	0.69	7.20	11.31	0.82	12.14
2028	8.51	0.00	0.21	0.00	12.00	0.00	0.69	7.20	11.17	0.79	11.96
2029	8.51	0.00	0.21	0.00	12.00	0.00	0.69	7.20	11.17	0.79	11.96
2030	8.51	0.00	0.21	0.00	12.00	0.00	0.69	7.20	11.17	0.79	11.96
2031	8.51	0.00	0.21	0.00	12.00	0.00	0.53	7.20	11.00	0.78	11.79
2032	8.51	0.00	0.00	0.00	12.00	0.00	0.00	7.20	10.69	0.77	11.46
2033	8.51	0.00	0.00	0.00	12.00	0.00	0.00	7.20	10.69	0.77	11.46
2034	8.51	0.00	0.00	0.00	12.00	0.00	0.00	7.20	10.69	0.77	11.46
2035	8.51	0.00	0.00	0.00	12.00	0.00	0.00	7.20	10.69	0.77	11.46
2036	8.51	0.00	0.00	0.00	12.00	0.00	0.00	7.20	10.69	0.77	11.46
2037	8.51	0.00	0.00	0.00	12.00	0.00	0.00	7.20	10.69	0.77	11.46
2038	8.51	0.00	0.00	0.00	12.00	0.00	0.00	7.20	10.69	0.77	11.46
2039	8.51	0.00	0.00	0.00	12.00	0.00	0.00	7.20	10.69	0.77	11.46
2040	8.51	0.00	0.00	0.00	12.00	0.00	0.00	7.20	10.69	0.77	11.46

6. ***Financial analysis.*** The financial analysis covers revenue generating activities under Component 1 (for example, grid extensions and household connections) and Component 3 (for example, grid extension to agricultural farms). Other activities were not included because they were not revenue-generating activities.

a. ***Cost***: the cost consisted of investment costs, O&M, additional cost incurred by SPs on materials and labor, and the cost of purchasing bulk electricity from UETCL; and
b. ***Revenue***: revenues consisted of payments for household connections and additional electricity sales by newly connected customers, including households and agricultural farms.

7. Key assumptions were the following:

a. Retail tariff: between 0.07 US$/kWh (2010) and 0.17 US$/kWh (2017 and thereafter);
b. Commercial tariff: 0.15 US$/kWh (2015) (farms were interconnected in mid-2015);
c. UETCL bulk supply tariff: between 0.07 US$/kWh (2010) and 0.08 US$/kWh (2017 and thereafter);
d. Average electricity consumption: 52 kWh/household per month. The vast majority of connections achieved under ERT-2 were made by Umeme, whose customer base is primarily located in peri-urban areas, where electricity consumption rates are relatively higher than in rural areas;
e. Average electricity consumption: 351,000 kWh per agricultural farm per year;
f. Connection fees: 142 US$/household connection based on connection fees for Umeme customers; and
g. O&M cost: 2 percent.

Table 3.3. Connections and tariffs

Year	New Household Grid-connections	Retail Supply Tariff (US$/kWh)	New agricultural farms connections	Commercial Tariff (US$/kWh)	Bulk Supply Tariff (US$/kWh)
2010	-	0.07	-	-	0.07
2011	2,000	0.09	-	-	0.11
2012	-	0.10	-	-	0.09
2013	2,910	0.11	-	-	0.09
2014	36,854	0.20	-	-	0.09
2015	55,989	0.17	9	0.15	0.07
2016 - 2040	-	0.17	-	0.15	0.08

8. At 0.75 percent Weighted Average Cost of Capital (WACC), the overall project NPV is US$48.2 million. The overall project FIRR is 7.7 percent.

Annex 4. Bank Lending and Implementation Support/Supervision Processes

(a) Task Team members

Names	Title	Unit	Responsibility/ Specialty
Lending			
Malcolm Cosgrove-Davies	Lead Energy Specialist	GEEDR	Team Leader
Paul Baringanire	Power Engineer	GEE05	
Mary Bitekerezo	Sr. Social Development Specialist	GSU07	
Howard Bariira Centenary	Sr. Procurement Specialist	OPSPF	
Martin Fodor	Sr. Environmental Specialist	GEN2B	
Richard Hosier	Sr. Energy Specialist	GEE08	
Paul Kato Kamuchwezi	Sr. Financial Management Specialist	GGO31	
Agnes Kaye	Program Assistant	AFMUG	
Anta Loum Lo	Sr. Program Assistant	AFCSN	
Annette Byasansa	Program Assistant	AFMUG	
Subodh Mathur	Consultant	GEESO	
Marjorie Mpundu	Sr. Counsel	LEGAM	
Patrick Okecho	Counsel	LEGAM	
Bobak Rezaian	Consultant	GEEDR	
Robert Schlotterer	Lead Infrastructure Finance Specialist	GEEFS	
Luis Schwarz	Sr. Finance Officer	WFALN	
Peter Silarzsky	Senior Economist	GTI11	
Janine Speakman	Operations Analyst	AFTEG	
Kameel Virjee	Financial Specialist	ETWAF	
Raluca Golumbeanu	Infrastructure Specialist	GPOBA	
Supervision/ICR			
Somin Mukherji	Senior Energy Specialist	AFTEG	Team Leader
Mitsunori Motohashi	Senior Energy Specialist	GEE01	Team Leader
Mbuso Gwafila	Senior Energy Specialist	GEE01	Team Leader
Raihan Elahi	Lead Energy Specialist	GEE01	Team Leader
Barbara Katusabe	Program Assistant	AFMUG	
Federico Qüerio	Energy Specialist	GEE01	ICR Team Leader
Maria Alexandra Planas	ICR consultant	GEE01	ICR Primary Author
Chita Obinwa	Program Assistant	GEE01	
Herbert Oule	Sr. Environmental Specialist	GEN01	
Constance Nekessa-Ouma	Social Development Specialist	GSU07	
Grace Nakuya Munanura	Sr. Procurement Specialist	GGO01	
Paul Kato Kamuchwezi	Sr. Financial Management Specialist	GGO31	
Christine Makori	Sr. Counsel	LEGAM	
Raluca Golumbeanu	Infrastructure Specialist	GPOBA	
Kabir Malik	Economist	GEE01	
Olayinka Bisiriyu	Financial Analyst	GEE07	

(b) Staff Time and Cost

Stage of Project Cycle	Staff Time and Cost (Bank Budget Only)	
	No. of staff weeks	US$ Thousands (including travel and consultant costs)
Lending		
FY 09	44.05	275.90
FY 13	7.13	47.08
Total:	**51.18**	**322.98**
Supervision/ICR		
FY 09	2.53	11.40
FY 10	13.62	38.90
FY 11	15.28	62.57
FY 12	15.23	103.81
FY 13	15.04	114.30
FY 14	25.64	108.59
FY 15	27.38	146.88
FY 16	21.01	92.58
FY 17	9.83	42.87
Total:	**145.56**	**721.90**

Annex 5. Summary of Borrower's ICR

Introduction

1. GoU prioritized rural transformation under the Poverty Eradication Action Plan (PEAP) and the first National Development Plan (NDP). The PEAP earmarked improvements in infrastructure and social services delivery as catalysts for socio-economic growth and reduction in poverty levels. To advance on this agenda, the ERT program was approved as a three-phase Adaptable Program Loan (APL) in 2001. The purpose of the ERT program was to develop the energy and ICT sectors, so that they could make a significant contribution to the productivity and quality of life of households.

2. The ERT-2 project, which was approved in April 2009, represented the second phase of the ERT program. The project development objectives were to increase access to energy and ICTs in rural Uganda. ERT-2 was structured into three main components and nine sub-components, namely (i) Component 1: Rural Energy Infrastructure; (ii) Component 2: Information Communications Technology (ICT); and (iii) Component 3: Energy Development, Cross Sectoral Links, Impact Monitoring.

3. Implementation arrangements were complex with one Project Coordination Unit (PCU) at MEMD coordination project activities among six line ministries and four agencies. These were the MoES, MoH, MoWE, MoLG, MAAIF, MoFPED, REA, PSFU, UCC, and UECCC.

Bank and Borrower Performance

4. A six-point scale was used to assess performance ratings, including highly satisfactory, moderately satisfactory, satisfactory, moderately unsatisfactory, unsatisfactory, and highly unsatisfactory.

5. ***Bank Performance.*** Overall Bank performance was rated *Moderately Satisfactory*, which comprised of *Satisfactory* rating for ensuring quality at entry and *Moderately Satisfactory* rating for quality of supervision.

a. *Ensuring Quality at Entry*

Rating: Satisfactory

Table 5.1. Bank performance during project preparation and design

Criteria	Rating	Key Notes
Strategic relevance and approach	Satisfactory	The PDOs were in line with the GOU country strategy, NDP, Vision 2040 and SE4ALL
Technical, Financial and Economic Aspects	Moderately Unsatisfactory	The financial feasibility projected a high household connections rate; however, it is related projects that finally boosted connections
Poverty, Gender and Social Development Aspects	Moderately Satisfactory	Gender mainstreaming was not considered at project design. Gender considerations were made during project restructuring but only for beneficiaries
Environmental Aspects	Highly Satisfactory	ESMF and RPF prepared in line with Bank and GoU requirements. Capacity needs assessment was also conducted for IAs
Fiduciary Aspects	Highly Satisfactory	Tools for financial management, procurement and compliance were developed
Policy and Institutional Aspects	Satisfactory	IAs selected were informed by ERT-1 project implementation
Implementation Arrangements	Satisfactory	Modalities were defined for all IAs
Monitoring and Evaluation Arrangements	Satisfactory	Arrangements were available
Risk Assessment	Satisfactory	Assessments were done for country, sector and project
Bank Inputs and Processes	Satisfactory	Sufficient preparatory missions were conducted

b. *Quality of Supervision*

Rating: Moderately Satisfactory

Table 5.2: Bank performance during implementation

Criteria	Rating	Key Notes
Focus on Development Impact	Satisfactory	There were reallocation of funds and restructuring during the project life cycle
Supervision of Fiduciary and Safeguard Aspects	Moderately Satisfactory	Follow up was promptly done
Adequacy of Supervision Inputs and Processes	Moderately Unsatisfactory	Changes in TTLs created many delays during transitions
Quality of Performance Reporting	Satisfactory	Mission reports were informative and provided guidance on follow up actions
Role in Ensuring Adequate Transition Arrangements	Satisfactory	Support was provided for the development of sustainability plans and the ERT-3 project

6. ***Borrower Performance.*** Overall Borrower performance was rated *Moderately Satisfactory*. The performance of GoU was rated *Moderately Satisfactory*, whereas performance of Implementing Agencies (IAs) was rated *Satisfactory*.

a. *GOU Performance*

Rating: Moderately Satisfactory

Table 5.3. GoU Performance

Criteria	Rating	Key Notes
Government ownership and commitment to achieving development objectives	Moderately Satisfactory	Inadequate and delayed funding for implementation of RAPs
Enabling environment including supportive macro, sectoral, and institutional policies	Satisfactory	Supporting policies and statutory instruments are in place
Adequacy of beneficiary/stakeholder consultations and involvement	Satisfactory	Strategic level stakeholders were available for consultations
Readiness for implementation, implementation arrangements and capacity, and appointment of key staff	Moderately Satisfactory	IAs set up designated PMUs and provided capacity building plans for its staff
Timely resolution of implementation issues	Moderately Satisfactory	Support was provided by those responsible for oversight and steering of project implementation. Restructuring of the project delayed
Fiduciary role (financial management, governance, procurement, reimbursements, compliance with covenants)	Moderately Satisfactory	There were cases of delayed approvals
Adequacy of monitoring and evaluation arrangements, including the utilization of M&E data in decision-making and resource allocation	Moderately Satisfactory	The data sources and collection methods provided adequate information for progress reporting. Restructuring of the project was informed by slow progress and challenges reported in the ICT component
Relationships and coordination with donors/ partners/stakeholders	Satisfactory	Co-financiers and other stakeholders were provided with progress updates in line with financing agreements
Adequacy of transition arrangements for regular operation of supported activities after Loan / Credit closing	Satisfactory	Continuous M&E arrangements within the sustainability plans and ERT-3 project will ensure achievement of expected socio-economic impacts
Overall Rating	**Moderately Satisfactory**	

b. *Implementing Agencies' Performance*

Rating: Satisfactory

Table 5.4: Implementing Agencies' Performance

Criteria	Rating	Key Notes
Agency commitment to achieving development objectives	Satisfactory	IAs provided PMUs to support implementation
Adequacy of beneficiary/stakeholder consultations and involvement	Satisfactory	Regular consultations were conducted with the PCU and the Bank. Further, consultations/ promotions were held in project areas with communities and local government representatives
Readiness for implementation, implementation arrangements and capacity, and appointment of key staff	Moderately Satisfactory	IAs designated staff within a PMU to work closely with the PCU; however, certain employees were not dedicated to ERT-2 works and were from time-to-time assigned other parallel duties. Recruitment of a safeguards officer at the PCU also delayed
Timely resolution of implementation issues	Moderately Unsatisfactory	There were delays in approvals and implementation of RAPs
Fiduciary role (financial management, governance, procurement, reimbursements, compliance with covenants)	Moderately Satisfactory	There were delays in the approvals
Adequacy of monitoring and evaluation arrangements, including the utilization of M&E data in decision-making and resource allocation	Satisfactory	The data sources and collection methods provided adequate information for progress reporting
Relationships and coordination with donors/ partners/stakeholders	Satisfactory	Co-financiers and other stakeholders were provided with progress updates in line with financing agreements
Adequacy of transition arrangements for regular operation of supported activities after Loan / Credit closing	Satisfactory	Continuous M&E arrangements within the sustainability plans and ERT-3 project will ensure achievement of expected socio-economic impacts
Overall Rating	**Satisfactory**	

Lessons learned

a. ***Delayed effectiveness.*** Board approval was in April 2009 and effectiveness was seven months later in November 2009. Implementation-readiness tests (for example, personnel adequacy and competency, stakeholder consultations) could help ensure early achievement of effectiveness conditions and commencement of project implementation

b. ***Testing output assumptions.*** The original project target for on-grid household connections was 109,000, of which 83,000 would be supported under OBA Facility and 26,000 from other initiatives. In the course of project implementation, over 90% OBA connections were achieved. After the second project restructuring, the revised target of 120,000 was expected from OBA subsidies and AF for connection materials. By project end, the vast majority of connections were attributed to the OBA Facility. Output assumptions made during feasibility studies should be tested for sensitivity to critical factors and to ensure that projected targets are realistic and achievable.

c. ***Inadequate subsidy to implement broadband services in under-served sub-counties.*** Licensed telecommunication companies rejected project offers of cost-sharing in the supply and installation of broadband equipment owing to inadequate financial returns. Negotiations on additional subsidies between GoU and the companies failed and funds for ICT activities were reallocated to other components during second project restructuring. For similar interventions in specialized areas (for example, ICT), it would be critical to conduct thorough due diligence upfront prior to appraisal. This could help determine incentive requirements more accurately and ensure successful implementation of project activities.

d. ***Replacement and location of Bank Task Team Leaders (TTLs).*** Multiple and time consuming transitions between successive TTLs affected timely decision-making and implementation. It should be noted that resident TTLs were more accessible to IAs than TTLs at headquarters. Planned changes in TTLs placements should include considerations for minimal disruptions to project implementation.

e. ***Compliance and monitoring of subsidy payments.*** There were substantial differences between eligible and reported beneficiaries under the PVTMA Facility. As a result, compliance with periodic reporting obligations could not be met until installations were verified and reconciled. GoU had to return funds for ineligible subsidy expenditures. Future projects should consider verification methods for monitoring using remote and web-based technologies. Such tools can be used to cross-check numbers of reported investments by solar system vendors and by independent verification agents, thereby minimizing discrepancies in the records of project investments and reports.

f. ***Managing the funds-absorption risk.*** Under the ICT component of the project, contract negotiations with telecommunications companies were lengthy and inconclusive. Unused funds under the ICT component were reallocated to other components under the sector project restructuring. Effective and timely restructuring and re-allocation of funds should be

proactively sought to minimize the amount of unutilized loan and grant proceeds under the project.

g. ***Disposal of solar PV batteries.*** Hazardous materials in solar PV batteries require appropriate disposal to minimize impact on human health and the environment. The ERT-2 project did not incorporate disposal plans for household solar PV systems. For institutional solar PV systems, contractors were tasked with replacement and disposal of batteries as part of the maintenance contracts. However, no disposal plan was incorporated beyond the period of maintenance contracts. During ERT-2 project implementation, GoU developed a sustainability plan to provide funds for maintenance of institutional solar PV systems, including the disposal of batteries. For similar projects, the financing plan should include provisions for sustainability including maintenance and waste disposal.

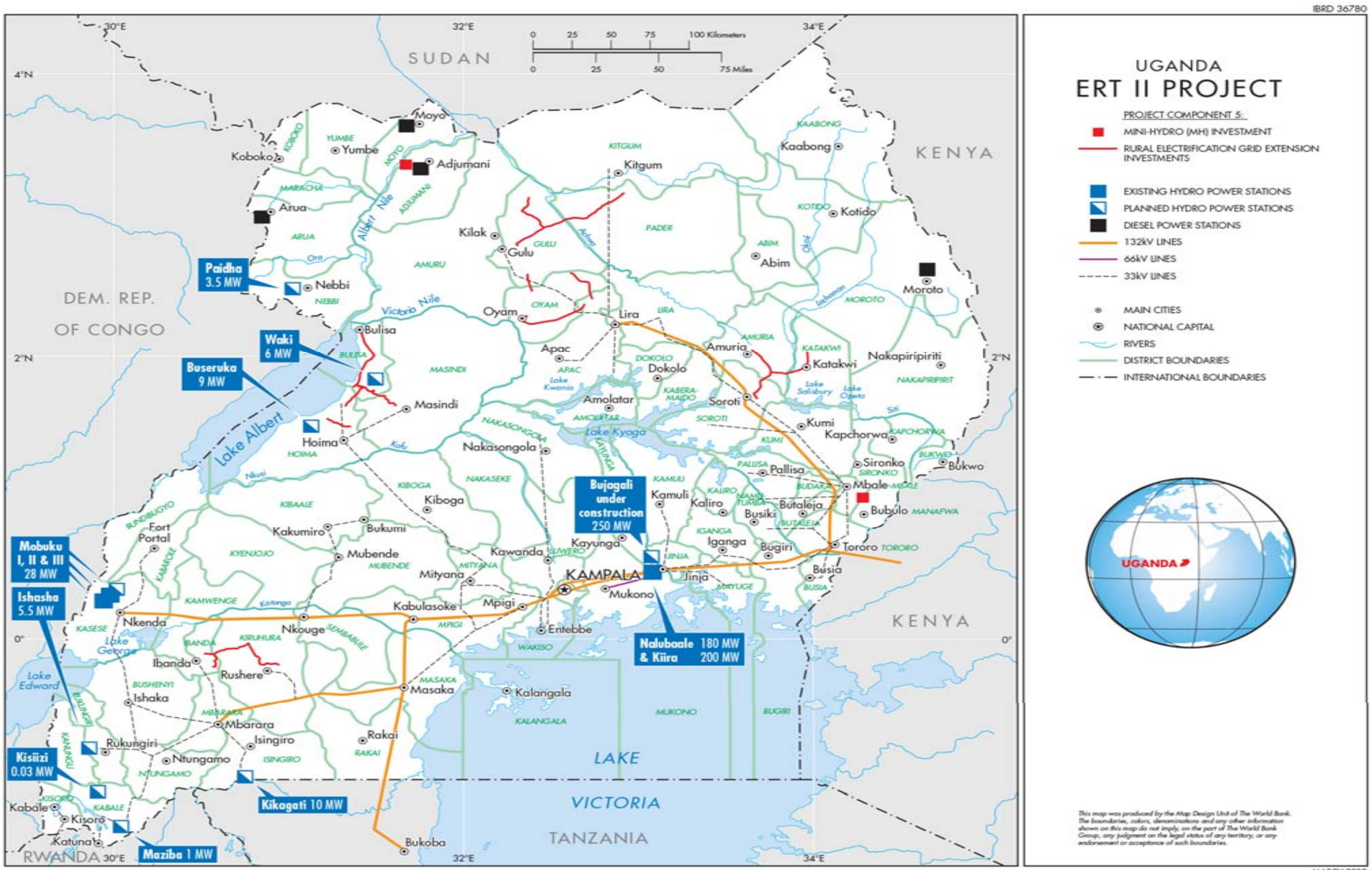
h. ***Allow for multiple options for compensation payments related to RAP implementation.*** During ERT-2 project implementation, GoU requested that compensation payments for Project Affected Persons (PAPs) be made directly to bank accounts. However, it was found that most PAPs did not have bank accounts and opening new accounts was a cumbersome process for PAPs living in rural areas. This delayed compensation payment to PAPs in various sub-projects. For distribution projects, particularly in rural areas, GoU should consider other methods of payments upfront, including as mobile banking, to improve timely compensations to PAPs. Further, awareness campaigns in beneficiary areas should be implemented to disseminate information and support PAPs during the compensation process.

i. ***PAP identification.*** There were recurring differences in PAPs identified during studies on resettlement action plans and studies to prepare detailed engineering designs of distribution lines. The differences raised contention and conflict amongst PAPs and local leaders, requiring additional time to resolve grievances and contributing to delays in compensation payments. For similar projects, a new approach should be introduced to synchronize the implementation of studies for resettlement action plans and detailed engineering designs of distribution lines. Harmonizing the two categories of studies will improve PAPs identification and timely compensation, and facilitate compliance with Bank's social safeguards requirements.

Annex 6. List of Supporting Documents

- Energy for Rural Transformation Phase 1 Project Appraisal DocumentEnergy for Rural Transformation Phase 2 Project Appraisal Document
- Energy for Rural Transformation Phase 3 Project Appraisal Document
- ERT-2 Restructuring Papers 2014 and 2015
- ERT-2 Additional Finance Project Paper
- ERT-2 Financing and subsidiary agreements
- ERT-2 Borrower's implementation Completion Report prepared by the PCU at MEMD
- ERT-2 ISRs
- ERT-2 Aide Memoires
- Implementation Completion Report ERT Phase 1
- Quarterly Progress Reports on OBA Facility
- Output Verification Reports on OBA Facility

MAP


IBRD 36780
UGANDA
ERT II PROJECT
PROJECT COMPONENT 5:
MINI-HYDRO (MH) INVESTMENT
RURAL ELECTRIFICATION GRID EXTENSION INVESTMENTS
EXISTING HYDRO POWER STATIONS
PLANNED HYDRO POWER STATIONS
DIESEL POWER STATIONS
132kV LINES
66kV LINES
33kV LINES
MAIN CITIES
NATIONAL CAPITAL
RIVERS
DISTRICT BOUNDARIES
INTERNATIONAL BOUNDARIES
0 25 50 75 100 Kilometers
0 25 50 75 Miles
SUDAN
KENYA
DEM. REP. OF CONGO
TANZANIA
RWANDA
UGANDA
LAKE VICTORIA
Lake Albert
Lake Kyoga
Lake Edward
Lake George
Victoria Nile
Albert Nile
Paidha 3.5 MW
Waki 6 MW
Buseruka 9 MW
Bujagali under construction 250 MW
Mobuku I, II & III 28 MW
Ishasha 5.5 MW
Nalubaale 180 MW & Kiira 200 MW
Kisiizi 0.03 MW
Kikagati 10 MW
Maziba 1 MW
KAMPALA
Moyo
Adjumani
Koboko
Yumbe
Arua
Nebbi
Kitgum
Kaabong
Kotido
Abim
Moroto
Gulu
Kilak
Oyam
Lira
Apac
Dokolo
Amolatar
Amuria
Katakwi
Nakapiripiriti
Soroti
Kumi
Kapchorwa
Sironko
Bukwo
Mbale
Bubulo
Pallisa
Butaleja
Busiki
Tororo
Busia
Bugiri
Iganga
Kaliro
Kamuli
Jinja
Mukono
Kayunga
Nakasongola
Masindi
Bulisa
Hoima
Kiboga
Kakumiro
Bukumi
Mubende
Mityana
Kawanda
Fort Portal
Kabulasoke
Mpigi
Entebbe
Nkenda
Nkouge
Ibanda
Rushere
Masaka
Kalangala
Ishaka
Mbarara
Rukungiri
Isingiro
Ntungamo
Rakai
Kabale
Kisoro
Katuna
Bukoba
30°E
32°E
34°E
4°N
2°N
0°
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MARCH 2009