Document of

The World Bank

FOR OFFICIAL USE ONLY

Report No: ICR00004395

IMPLEMENTATION COMPLETION AND RESULTS REPORT

(IDA-43700; IDA-47260; IDA-49600; TF-91281, TF-99806, TF-96436)

ON A CREDIT IN THE AMOUNT OF US$157.88 MILLION EQUIVALENT,

A GLOBAL ENVIRONMENTAL FACILITY GRANT IN THE AMOUNT OF US$6.5 MILLION EQUIVALENT,

A RUSSIAN GRANT FOR ENERGY FOR SMALL AND MEDIUM ENTERPRISE PROJECT IN THE AMOUNT OF US$6.5 MILLION EQUIVALENT, AND

A GRANT FROM THE AFRICA RENEWABLE ENERGY ACCESS (AFREA) PROGRAM IN THE AMOUNT OF US$1.0 MILLION EQUIVALENT

TO THE

UNITED REPUBLIC OF TANZANIA

FOR A

TZ-ENERGY DEVELOPMENT AND ACCESS EXPANSION PROJECT (P101645)

June 27, 2018

Energy and Extractives Global Practice
Africa Region

CURRENCY EQUIVALENTS

Exchange Rate Effective as of January 31, 2018

Currency Unit =	Tanzanian Shilling (TZS)
TZS 2,253 =	US$1
US$1.42 =	SDR 1

FISCAL YEAR
July 1 - June 30

ABBREVIATIONS AND ACRONYMS

AFREA	Africa Renewable Energy Access Program
AfDB	African Development Bank
CAS	Country Assistance Strategy
CDM	Clean Development Mechanism
CMS	Corporate Management System
ESIA	Environmental and Social Impact Assessment
EIRR	Economic Internal Rate of Return
EOCK	Economic Opportunity Cost of Capital
ENPV	Economic Net Present Value
ESME	Energy Small and Medium Enterprises
ESMF	Environmental and Social Management Framework
EWURA	Energy and Water Utilities Regulatory Authority
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gas
GoT	Government of the United Republic of Tanzania
ICR	Implementation Completion and Results Report
IMF	International Monetary Fund
IPP	Independent Power Producer
IPTL	Independent Power Tanzania Limited
ISR	Implementation Status and Results Report
IT	Information Technology
IUCN	International Union for Conservation of Nature
JAST	Joint Assistance Strategy for Tanzania
JICA	Japan International Cooperation Agency
KST	Kihansi Spray Toad
LRTC	Lighting Rural Tanzania Competition
M&E	Monitoring and Evaluation
MCC	Millennium Challenge Corporation
MEM	Ministry of Energy and Minerals
NDF	Nordic Development Fund
NEMC	National Environmental Management Council
NOx	Nitrogen Oxide
NPV	Net Present Value
NSGRP	National Strategy for Growth and Reduction of Poverty
PAD	Project Appraisal Document
PAP	Project-affected Person
PDO	Project Development Objective
PFI	Participating Financial Institution
PIU	Project Implementation Unit
PM	Particulate Matter
PMU	Project Management Unit
PV	Photovoltaic
RAP	Resettlement Action Plan

REA	Rural Energy Agency
REF	Rural Energy Fund
RMF	Resettlement Management Framework
RMS	Resource Management System
SIDA	Swedish International Development Cooperation Authority
SOx	Sulphur Oxide
SPGD	Small Power Generation and Distribution
SPP	Small Power Projects
SPPA	Small Power Purchase Agreement
SPPT	Small Power Purchase Tariff
SSMP	Sustainable Solar Market Packages
T&D	Transmission and Distribution
TA	Technical Assistance
TANESCO	Tanzania Electric Supply Company Limited
TANROADS	Tanzania National Roads Agency
TEDAP	Tanzania Energy Development and Access Expansion Project
TSMS	Technical Service Management System
TTL	Task Team Leader
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization
WTP	Willingness to Pay

Regional Vice President:	Makhtar Diop
Country Director:	Bella Bird
Senior Global Practice Director:	Riccardo Puliti
Practice Manager:	Sudeshna Ghosh Banerjee
Task Team Leader(s):	Nataliya Kulichenko, Richard H. Hosier, Patrick Thaddayos Balla
ICR Main Contributor:	Nestor Ntungwanayo

TABLE OF CONTENTS

DATA SHEET

BASIC INFORMATION

Product Information

Project ID	Project Name
P101645	TZ-Energy Development & Access Expansion Project
Country	**Financing Instrument**
Tanzania	Specific Investment Loan
Original EA Category	**Revised EA Category**

Related Projects

Relationship	Project	Approval	Product Line
Additional Financing	P117260-Additional Financing - Energy Development and Access Expansion Project	06-Apr-2010	IBRD/IDA
Additional Financing	P125824-Additional Financing for the Tanzania Energy Development and Access Expansion Project	07-Jun-2011	IBRD/IDA
Supplement	P092154-TZ-GEF Energy Dvpt and Access Expansion	13-Dec-2007	Global Environment Project

Organizations

Borrower	Implementing Agency
United Republic of Tanzania	Ministry of Energy and Minerals, TANESCO, Rural Energy Agency

Project Development Objective (PDO)

Original PDO

The objective of the project is to improve the quality and efficiency of the electricity service provision in the three main growth centers of Dar es Salaam, Arusha and Kilimanjaro and to establish a sustainable basis for energy access expansion and renewable energy development in Tanzania. The project is consistent with the latest Joint Assistance Strategy (2007-2010) by specifically supporting the goals of the Government?s National Strategy for Growth and Reduction of Poverty - MKUKUTA.

FINANCING

		Original Amount (US$)	Revised Amount (US$)	Actual Disbursed (US$)
World Bank Financing				
P101645	IDA-43700	105,000,000	105,000,000	94,690,626
P101645	IDA-47260	25,000,000	25,000,000	21,455,051
P101645	TF-96436	1,000,000	995,000	995,000
P101645	IDA-49600	27,880,000	27,880,000	18,438,275
P101645	TF-99806	6,500,000	1,651,682	1,651,682
P092154	TF-91281	6,500,000	6,441,050	6,441,050
Total		**171,880,000**	**166,967,732**	**143,671,684**
Non-World Bank Financing				
Borrower		0	0	0
Total		**0**	**0**	**0**
Total Project Cost		**171,880,000**	**166,967,732**	**143,671,685**

KEY DATES

Project	Approval	Effectiveness	MTR Review	Original Closing	Actual Closing
P101645	13-Dec-2007	30-Apr-2008	06-Dec-2010	31-Mar-2012	29-Sep-2017
P092154	13-Dec-2007	31-Jan-2008	06-Dec-2010	31-Mar-2012	31-Mar-2015

RESTRUCTURING AND/OR ADDITIONAL FINANCING

Date(s)	Amount Disbursed (US$M)	Key Revisions
06-Apr-2010	25.31	
31-Mar-2015	86.96	Change in Results Framework Change in Loan Closing Date(s) Reallocation between Disbursement Categories Change in Legal Covenants Change in Procurement Change in Implementation Schedule
29-Sep-2016	132.66	Change in Results Framework Change in Components and Cost Change in Loan Closing Date(s) Reallocation between Disbursement Categories Change in Implementation Schedule
18-Jul-2017	125.53	Change in Components and Cost Reallocation between Disbursement Categories

KEY RATINGS

Outcome	Bank Performance	M&E Quality
Moderately Satisfactory	Moderately Satisfactory	Modest

RATINGS OF PROJECT PERFORMANCE IN ISRs

No.	Date ISR Archived	DO Rating	IP Rating	Actual Disbursements (US$M)
01	18-Apr-2008	Satisfactory	Satisfactory	.68
02	19-Nov-2008	Satisfactory	Satisfactory	1.70
03	24-Jun-2009	Satisfactory	Satisfactory	2.00
04	16-Dec-2009	Satisfactory	Satisfactory	18.53
05	24-Jun-2010	Moderately Satisfactory	Moderately Satisfactory	26.61
06	20-Mar-2011	Moderately Satisfactory	Moderately Satisfactory	29.98
07	08-Nov-2011	Moderately Satisfactory	Moderately Satisfactory	39.97
08	30-Jun-2012	Moderately Unsatisfactory	Moderately Unsatisfactory	46.93

09	25-Jan-2013	Moderately Unsatisfactory	Moderately Unsatisfactory	55.08
10	18-Aug-2013	Moderately Unsatisfactory	Moderately Unsatisfactory	71.15
11	03-May-2014	Moderately Unsatisfactory	Moderately Unsatisfactory	77.66
12	25-Nov-2014	Moderately Satisfactory	Moderately Satisfactory	78.92
13	30-Jun-2015	Moderately Satisfactory	Moderately Satisfactory	104.96
14	25-Jan-2016	Moderately Satisfactory	Moderately Satisfactory	107.54
15	26-Sep-2016	Moderately Unsatisfactory	Moderately Unsatisfactory	128.84
16	26-Apr-2017	Moderately Unsatisfactory	Moderately Unsatisfactory	133.85
17	13-Nov-2017	Moderately Satisfactory	Moderately Satisfactory	126.67

SECTORS AND THEMES

Sectors

Major Sector/Sector	(%)
Public Administration	**3**
Central Government (Central Agencies)	3
Energy and Extractives	**97**
Renewable Energy Biomass	2
Renewable Energy Hydro	3
Renewable Energy Geothermal	2
Energy Transmission and Distribution	86
Renewable Energy Solar	2
Renewable Energy Wind	2

Themes

Major Theme/ Theme (Level 2)/ Theme (Level 3)	(%)
Private Sector Development	**13**
Jobs	13
Job Creation	13

Urban and Rural Development	**66**
Urban Development	33
Urban Infrastructure and Service Delivery	33
Rural Development	33
Rural Infrastructure and service delivery	33
Environment and Natural Resource Management	**20**
Climate change	20
Mitigation	20

ADM STAFF

Role	At Approval	At ICR
Regional Vice President:	Obiageli Katryn Ezekwesili	Makhtar Diop
Country Director:	John McIntire	Bella Deborah Mary Bird
Senior Global Practice Director:	Subramaniam Vishwanathan Iyer	Riccardo Puliti
Practice Manager:	Subramaniam Vishwanathan Iyer	Sudeshna Ghosh Banerjee
Task Team Leader(s):	Pankaj Gupta	Nataliya Kulichenko, Richard H. Hosier, Patrick Thaddayos Balla
ICR Contributing Author:		Nestor Ntungwanayo

I. PROJECT CONTEXT AND DEVELOPMENT OBJECTIVES

A. CONTEXT AT APPRAISAL

Context

1. **In 2006, wood fuel was the dominating factor in Tanzania's energy supply.** While Tanzania is endowed with diverse energy sources (hydropower, biomass, natural gas, coal, geothermal, solar, and wind power), wood fuel accounted for up to 90 percent of total energy supply, with about 2 percent from hydro-electricity and 8 percent from other oil-derived products. The electricity coverage was in single digits nationally and, in most regions, rural coverage was below 2 percent. The key reasons for this low coverage included (a) a limited outreach of the grid of Tanzania Electric Supply Company Limited (TANESCO) and low intensity of connections in the grid areas, (b) TANESCO's limited financial power to expand grid access, and (c) inappropriate regulatory and financing mechanism for rural electrification and absence of alternative off-grid solutions (Project Appraisal Document [PAD] page1).

2. **A key goal of the 2007 Government's strategy was to enhance the quality of energy supply and to strengthen the sector regulation.** Before the Tanzania Energy Development and Access Expansion Project (TEDAP) approval, little investment had gone into maintaining and modernizing the electricity supply network since the late 1980s, and the quality of service had deteriorated with total losses reaching about 24 percent, due in large part to lack of transmission and distribution (T&D) investments. TANESCO had not been able to invest its own resources in T&D investments, as tariff levels did not allow the generation of adequate income. TANESCO identified priority investments to upgrade the electricity network in three main urban areas—Dar es Salaam, Arusha, and Kilimanjaro—and TEDAP was to provide resources to support the planned T&D investments. Moreover, the 2007 power sector reform strategy opened the electricity generation to independent power producers (IPPs) and TANESCO had to launch, among other things, the development of model bidding documents. Beyond the diversification of energy generation, efficiency and quality of service required an improved sector regulation, and that is why the Energy and Water Utilities Regulatory Authority (EWURA) was made operational in June 2006 and has been functioning as the authority that regulates the electricity supply and services industry. The World Bank agreed to use TEDAP to provide support to both the EWURA and TANESCO initiatives of strengthening energy supply and sector regulation.

3. **Limited access to modern energy services was a key roadblock to the country's long-term economic growth plan, and overcoming this obstacle was one of the Government's highest priorities.** The low access to modern energy services in urban and rural areas was a major constraint to Tanzania's growth potential; contributed to the poverty and isolation of rural population; and hindered the provision of other key services, such as clean water supply, health, and education. Recognizing these constraints, Tanzania's Parliament, in 2005, approved a Rural Energy Act, which established a Rural Energy Agency (REA) and a Rural Energy Fund (REF) to lead and finance the development of rural energy access initiatives. As a new institution, REA faced two key challenges, to develop a robust rural access strategy which combines currently fragmented elements of grid and off-grid expansion and to demonstrate rapid increase in access to electricity in rural areas.

4. **Increasing the use of renewable energy was identified as an option to reduce the risks of depending on fossil fuel and hydropower and harness rural electrification.** In the 2003 National Energy

Policy, the Government of the United Republic of Tanzania (GoT) had reiterated its objectives to reduce the dependency on fossil fuel for isolated grids and remote locations and suggested additional research and development of renewable energy, particularly as part of the rural electrification initiatives. Various studies had demonstrated that Tanzania had substantial potential for renewable energy development, yet new renewable energy sources contributed less than 1 percent of the national energy balance. Moreover, the 2006 energy crisis revealed the vulnerability of hydro-dominated generation systems to drought. The Government then committed to increasing the use of renewable energy, including the generation and monetization of carbon credits, and considered the growth of the renewable energy industry as an integral part of its rural energy and power sector development strategy.

5. **TEDAP's design sought to tackle the three-pronged challenges of low level of electricity access, especially in rural areas; TANESCO's limited capacity to focus on rural electrification; and the need to harness the renewable energy potential for rural electrification.** The project intended to expand energy access in the suburbs of the three major cities of Dar es Salaam, Arusha, and Kilimanjaro and promote rural electrification. While the upgrade of the T&D infrastructure in the three cities was an evident response to expand urban energy access, diversification of power generation and rural electrification were like navigating in unchartered waters. To promote rural and renewable energy, TEDAP's first task was to establish a functional rural energy institution from scratch and then devise models of small power projects (SPPs) that will develop rural power generation plants that could wholesale power to TANESCO or distribute it directly to the consumer. However, the issues of SPP models, technology, financing, pricing, and marketing needed to be worked out to achieve improved outcome in power generation diversification, and expansion of rural and renewable energy.

6. **TEDAP was part of a larger World Bank Group portfolio supporting the energy sector and was derived from an extended sector dialogue supported by the donor community.** The proposed TEDAP was expected to be the first in the series of projects aiming at energy development and access scale-up through both grid and off-grid interventions. This first project in the series was focused on the upgrade of TANESCO's T&D grid and support of rural energy access expansion by boosting REA and targeting new approaches for future electrification scale-up. It was expected that successful implementation of this new project, combined with the proposed use of savings of the Songo Songo project, would reduce the overall cost of generating power and the proposed tariff increase would help the sector get back to a sustainable path of development allowing for additional private sector investment in the sector. The project was prepared based on a consultative approach with other key donors as follows: (a) the Swedish International Development Cooperation Authority (SIDA), (b) the Millennium Challenge Corporation (MCC), (c) the African Development Bank (AfDB), (d) the Nordic Development Fund (NDF), and (e) the Japan International Cooperation Agency (JICA). The latter two donors showed interest in working closely with the World Bank on the proposed project and on the development of a comprehensive scale-up strategy in the energy sector.

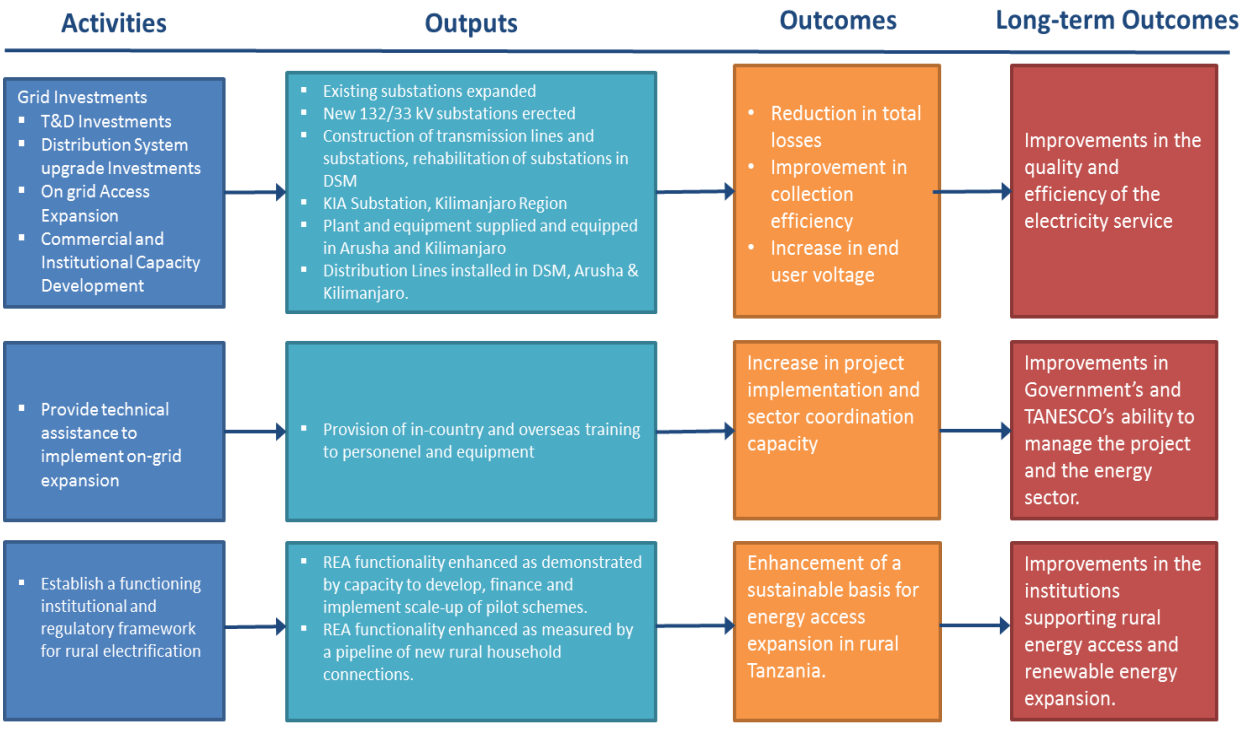
Theory of Change (Results Chain)

7. **The outcomes of the original and restructured project were directly linked to investments supported under the project.** The original project outcomes focused on improving the quality and efficiency of the electricity service, institutional strengthening, and abating greenhouse gas (GHG) emissions. The restructured project added to the development of renewable energy. **Error! Reference source not found.** summarizes TEDAP's theory of change that links project activities to intended

outcomes. It shows the links between the funded activities, the generated outputs and achieved outcomes, and how the latter contributes to long-term outcomes.

8. The results chain shows that the project activities in T&D upgrades led to expansion in the capacity of critical T&D infrastructure serving major load centers in Arusha, Kilimanjaro, and Dar-es-Salaam. These outputs, in turn, led to measurable decreases in technical losses and improvements in the supply voltage. These contributed to the long-term goals of increased quality and efficiency of electricity supply. Similarly, the support for development of renewable energy by SPPs resulted in an output of increased megawatts of small hydropower generation in rural areas, which significantly contributed to the outcome of reduction in CO_2 emissions and increased electricity access in rural areas. This contributed to the longer-term goals of reducing GHG emissions and clean energy supply.

Figure 1. TEDAP's Theory of Change



Project Development Objectives (PDOs)

9. The statement of original objectives in the Financing Agreement is as follows:

- **Original PDO.** The objective of the project is to support the recipient's efforts to improve the quality and efficiency of the provision of electricity service within its territory and to establish a sustainable basis for energy access expansion.

- **Original GEO.** The project's Global Environmental Objective (GEO) is to abate greenhouse gas emissions through the use of renewable energy in rural areas to provide electricity.

10. The statement of revised objectives is as follows:

- **Revised PDO.** To improve the quality and efficiency of the electricity service provision in the three main growth centers of Dar es Salaam, Arusha, and Kilimanjaro and to establish a sustainable basis for energy access expansion and renewable energy development in Tanzania

- **GEO.** The GEO was not revised.

11. In supplement to the 2010 and 2011 additional financing operations, the two following project grants associated with TEDAP were approved: (a) the Lighting Rural Tanzania Project, (US$1.0 million) in June 2010, and (b) the Russian Energy Small and Medium Enterprise (ESME) Grant Project, (US$6.5 million) in November 2011. Their specific objectives are stated in paragraph 15 and were consistent with the overall project objectives.

- **Africa Renewable Energy Access Program (AFREA) Trust Fund Objective.** To facilitate the development of sustainable business models to bring efficient, clean, and affordable lighting services to the Tanzanian poor.

- **ESME Trust Fund Objective.** To support the provision of reliable, sustainable, and affordable modern energy services in rural Tanzania by promoting local entrepreneurship and investment in renewable energy development while ensuring carbon emission reduction.

Key Expected Outcomes and Outcome Indicators

12. The key cluster-level outcomes and the project outcome indicators before and after restructuring are summarized in **Error! Reference source not found.**1. The key changes introduced in the revised Results Framework were (a) the number of beneficiaries, of which females and (b) modification in the statement and targets of other indicators.

Table 1. Key Expected Outcomes and Outcome Indicators

Cluster-level Development Outcomes	Original Project Outcome Indicators (2007–2010)	Revised Project Outcome Indicators (2010–2017) [a]
On-grid and associated TA		
• Reduction in total losses • Improvement in collection efficiency • Improvement in service quality in selected clusters.	• Reduction in total losses (as a measure of improving operational efficiency in selected clusters) • Improvement in collection efficiency (as a measure of improving operational efficiency in selected clusters) • Increase in end user voltage as a measure of improvement in service quality in selected clusters) • Improved customer feedback (as a measure of improvement in service quality)	• Improvement in TANESCO's operational efficiency as measured by electricity losses per year in the project areas • Improvement in TANESCO's operational efficiency as measured by improvement in collection efficiency • Improvement in service quality as measured by increase in end user voltage • Improvement in service quality as measured by improved customer satisfaction
Off-grid and associated TA		
• Improvements in the institutions and systems supporting energy access and renewable energy expansion • Avoided CO_2emissions, CO_2 emission reduction. • Increased electricity access in rural and peri-urban Tanzania • A functioning framework for rural electrification and renewable energy • Removal of barriers to implement renewable energy technologies • Provision of long-term loans to renewable/rural energy developers • Enhanced bank expertise in appraising and supervising rural renewable energy projects	• REA functionality improved as demonstrated by capacity to develop, finance, and implement the scale-up of pilot schemes • REA functionality improved as measured by a pipeline of new rural household connections • CO_2 emission reduction (as measured by MW of renewable energy installed)	• REA fully functional as demonstrated by capacity to develop, finance, and implement scale up of pilot schemes • REA fully functional as demonstrated by pipeline of new rural household connections • Generation capacity (MW) of renewable energy constructed under the project • Direct project beneficiaries, (Component B) • Direct project beneficiaries, (Component B) of which female

Note: TA = Technical Assistance.

a. Outcome and outputs indicators were revised in 2010, 2011, and 2015 to factor in changes in the scope of the project and to adapt to field implementation conditions. Only indicators that were maintained until the project closure are indicated here and their targets and achievements are shown in annexes 2 and 3.

Components

13. The following paragraphs summarize the components of the original TEDAP.

14. **Component A: On-grid Investments (US$85.8 million).** The project was to support urgent investments in TANESCO's T&D networks in Dar es Salaam, Arusha, and Kilimanjaro. The investments included adding, replacing, or upgrading T&D lines and substations and medium and low voltage equipment, meters, spare parts, and tools. Other project investments aimed at improving (a) corporate performance, (b) TANESCO's customer interface, and (c) access expansion in urban areas. The key subcomponents were (a) T&D investments, (b) distribution system upgrade investments, (c) on-grid access expansion, (d) commercial and institutional capacity development, and (e) on-grid technical assistance for project implementation.

15. **Component B: Off-grid Investments (US$16.0 million, IDA and US$6.5 million, Global Environment Facility [GEF]).** This component was to support an institutional setup for the newly established REA and develop, test, and demonstrate new electrification approaches, which could be easily scaled up. The objectives of this component were to (a) increase electricity access in rural and peri-urban Tanzania to productive enterprises, service delivery facilities (in health and education), and to households with the capacity to pay for electricity; (b) establish a functioning institutional and regulatory framework for commercially oriented, sustainable service delivery for rural electrification that can be scaled up; and (c) exploit Tanzania's renewable energy potential. The key subcomponents were (a) Small Power Generation and Distribution, (b) Sustainable Solar Market Development, and (c) Off-grid Technical Assistance.

16. **Component C: Technical Assistance (US$3.2 million).** This component was to fund (a) the training needs assessment for TANESCO with subsequent selected capacity-building implementation and (b) increase in the GoT's capacity to develop public and private generation projects through the provision of legal, technical, financial, environmental, and social advisory services. The key subcomponents were (a) TA provided to TANESCO and (b) TA provided to the Government.

B. SIGNIFICANT CHANGES DURING IMPLEMENTATION

Revised PDOs and Outcome Targets

17. **Project restructuring.** Two credits were added to the project post approval: (a) the March 2010 additional financing in the amount of US$25 million, which extended the project closing date by three years from March 31, 2012, until March 31, 2015, and (b) the May 2011 additional financing in the amount of US$27.88 million, which was maintained till the project closing date.

18. **Revision of PDO.** At the approval of the March 2010 additional financing, there was a change in the PDO to replace 'within its territory' by 'in the three main growth centers of Dar es Salaam, Arusha, and Kilimanjaro' and add, at the end, 'and renewable energy development in Tanzania'. The specific objectives are stated in paragraphs 7 and 8.

19. **Addition of AFREA and ESME Trust Funds.** Supplementing the 2010 and 2011 additional financing operations, the two grants associated with TEDAP were approved: (a) the Lighting Rural Tanzania Project (US$1.0 million) approved in June 2010 and (b) the Russian Energy Small and Medium Enterprise (ESME) Grant Project (US$6.5 million) approved in November 2011. Their specific objectives are spelled out in paragraph 11 and were consistent with the overall project objectives.

Revised PDO Indicators

20. **Revised Results Framework.** At the approval of the additional credits in March 2010 and May 2011, the project's Results Framework was revised to underscore the importance of generation of renewable energy (MW) and the number of connections to rural households, including the share for female beneficiaries. Intermediate indicators and targets were also revised to underscore the above outcomes. Key changes in the Results Framework are as follows:

(a) One PDO indicator was renamed from 'CO_2 emission reduction (as measured by MW of renewable energy installed)' to 'Generation Capacity (MW) of Hydropower constructed under the project', and a core indicator was added: 'the number of direct beneficiaries (number), of which female (percent)'.

(b) Targets were revised for some of the PDO indicators.

(c) Three new intermediate indicators were added and five were revised (see annexes 1 for details).

Revised Components

21. New activities were added during additional financing in May 2010. Component B was renamed as 'Small Power Project Component'. A fourth subcomponent was added to the existing three subcomponents and Subcomponent B.1 was revised.

(a) **Subcomponent B.1: Small Power Generation and Distribution.** This was modified to s (a) expand the original project's matching grant window to include TA to the participating financial institutions (PFIs) for capacity building for the development of their renewable energy lending portfolio and (b) introduce a low-cost distribution pilot to develop new techniques and implementation approaches aimed at reducing the costs of distribution networks.

(b) **Subcomponent B.4: Rural/Renewable Energy Credit Line.** This was added to provide long-term funding (up to 15 years) to eligible PFIs in local currency to onlend to eligible rural renewable energy projects.

22. No significant revision to the project components was made during the second additional financing in May 2011. The additional financing was in response to unexpected budget overruns after making use of the contingencies and unallocated amounts. Two additional capacity-strengthening activities were included in Subcomponent C.1: (a) the hiring of an international procurement adviser to strengthen TANESCO's procurement capacities and (b) the capacity strengthening of TANESCO's Environmental Unit.

23. In addition, the two trust-funded grants, Lighting Rural Tanzania (AFREA) and ESME, were approved in June 2010 and November 2011, respectively, to complement the project's support to renewable energy and rural electrification. The included activities were the following:

(a) **AFREA**—to provide additional parallel financing to TEDAP's matching grant window that

could help the private sector develop business models that deliver a wide array of innovative lighting products to off-grid households and businesses in rural Tanzania.

(b) **ESME**—to establish a financing mechanism managed by REA to support clean, renewable energy generation projects that are expected to generate carbon revenues.

Other Changes

24. Three additional (Level 2) project restructurings, in addition to the two mentioned earlier, were implemented to reallocate funds, adjust scope of activities, and extend project deadlines.

25. The third project restructuring in March 2015 provided for the following: (a) cancellation of certain activities, (b) reallocation of loan proceeds between and within disbursement categories, and (c) extension of the project closing date by 18 months (from March 31, 2015, to September 30, 2016). There were no changes to the PDO or safeguards.

26. A fourth restructuring on September 29, 2016, was approved to extend the closing date from September 30, 2016, to September 29, 2017. The restructuring intended to give TANESCO the possibility to process outstanding claims and change orders necessary to complete T&D works by the project closing date. Also, REA needed to pay the outstanding balance on matching and performance grants awarded to the SPPs during project implementation.

27. A fifth restructuring was completed in June 2017, which amended the Financing Agreement signed on February 2, 2018, aiming to extend the disbursement deadline date of the project until March 2018. Extending the disbursement deadline date was intended to allow full disbursement and documentation of the undisbursed credits amounting to US$17,416,990 and pay several pending invoices from contractors for works already performed that were yet to be paid since September 2017. The delay in signing the Financing Agreement was occasioned by the new administration, which needed to familiarize itself with the project.

Rationale for Changes and Their Implication on the Original Theory of Change

28. Changes in the project's components, financing, and operational setup were introduced five times in March 2010, May 2011, March 2015, September 2016, and finally in June 2017. The changes did not affect the conceptual result chain but either bolstered it by providing additional resources to specific objectives or potentially weakened it by allocating resources away from certain activities based on implementation performance.

29. The 2010 and 2011 additional financing operations were part of a Level 1 restructuring, as they expanded the project's objectives and scope while maintaining the project integrity by cushioning the negative impacts of increased costs on existing contracts. The 2010 restructuring more than doubled the project allocation to rural and renewable activities with an IDA financial envelope that was increased from US$16 million to US$41 million. The key change brought in by the restructuring was the introduction of a rural and renewable credit line in the amount of US$25 million. Additional grant resources were also approved in 2010 and 2011 to support renewable energy in the rural area. Due to these changes, the volume of activities devoted to rural electrification and renewable energy was increased, and expected

outputs and outcome were revised accordingly, together with the Results Framework. The May 2011 additional financing (US$28,77 million) was prompted by the impact of increased costs, and without this financial cushion, the project's planned activities could not have been implemented.

30. The 2015, 2016, and 2017 changes intended to adjust resources and results with new developments in the field. The March 2015 changes arose from unequal implementation of components and aimed at reallocating the remaining resources among disbursement categories. The September 2016 reallocations authorized TANESCO and REA to harmonize the available resources with project progress in the field. The 2017 restructuring transferred the undisbursed balance on the credit line facility to funding unpaid completed works under the on-grid component.

31. The overall impact of the introduced changes on the project theory of change was limited, because the increased resources from the 2010 additional financing to focus on outcomes in the areas of rural electrification and renewable energy were partially reversed by the 2017 restructuring, by moving the resources previously allocated to the off-grid component back to the on-grid infrastructure. On a positive note, the 2011 additional financing maintained a major portion of the project integrity by cushioning the impact of hiked costs.

II. OUTCOME

A. RELEVANCE OF PDOs

Assessment of Relevance of PDOs and Rating

Original Project (2007–2010; 20 percent of total disbursed resources)
Rating: Substantial

(a) The original PDO was to support the recipient's efforts to improve the quality and efficiency of the provision of electricity service within its territory and to establish a sustainable basis for energy access expansion.

(b) The original GEO was to abate greenhouse gas emissions through the use of renewable energy in rural areas to provide electricity.

32. **TEDAP's objectives were in line with the country's strategic policy orientation.** The project design and objectives were consistent with the 2005 National Strategy for Growth and Reduction of Poverty (NSGRP), which aimed to achieve the Millennium Development Goals and focused on growth and governance. The proposed project was to contribute to the achievement of Goal 6 of the NSGRP, whose purpose was to ensure the provision of reliable and affordable energy to consumers, targeting improved electricity access to the population. The proposed project was also to contribute to the global objective of reducing GHG emissions, and Tanzania ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 1992 and remains committed to the promotion of renewable energy sources and support for renewable energy options, including hydropower generation, mini-hydropower, biomass, and solar energy.

33. **TEDAP's objectives were consistent with the key pillars of the World Bank's strategies that overlapped with the project implementation period.** The project overlapped with two Country Assistance Strategies (CASs): (a) the Joint Assistance Strategy (JAST) adopted in March 2007 and (b) the CAS for FY2012–2015. At approval, the project targeted 6 of the World Bank's 8 JAST milestones related to the achievement of Goal 6 of the NSGRP, including the passing of a new Electricity Act, the establishment of service quality standards, and the creation of REA and an REF. In the context of the FY2012–2015 CAS, the second objective of the CAS was devoted to building infrastructure and delivering services, and one key outcome aimed at improved access, quality, and sustainability of electricity.

34. **TEDAP relied on an extended partnership supporting the country's energy sector.** There was a harmonized framework through which several development partners, directly or indirectly, were supporting the country's energy sector. More specifically, the NDF, JICA, and SIDA were parallel financiers for the project, supporting transmission lines and substations in Kilimanjaro, Arusha, and Dar es Salaam and reforms supporting rural electrification.

35. The original project addressed development constrains identified in the Government's main policy directions and was consistent with the successive World Bank strategies in the country and was supported by a major part of the donor community. However, the scope of the project (number of components and territory coverage) was overly ambitious, and the relevance of the project's objectives is rated Substantial.

Revised Project (2010–2017; 80 percent of total disbursed resources)
Rating: Substantial

(a) The revised PDO was to improve the quality and efficiency of the electricity service provision in the three main growth centers of Dar es Salaam, Arusha, and Kilimanjaro and to establish a sustainable basis for energy access expansion and renewable energy development in Tanzania.

(b) The original GEO was maintained.

(c) The ESME and AFREA Trust Funds added the following objectives:

(i) ESME—to support the provision of reliable, sustainable, and affordable modern energy services in rural Tanzania by promoting local entrepreneurship and investment in renewable energy development, while ensuring carbon emission reductions.

(ii) AFREA—to facilitate development of sustainable business models to bring efficient, clean, and affordable lighting services to the Tanzanian poor.

36. **The project's components and configuration were adjusted to match the changing environment in the borrower country.** In March 2010 and May 2011, two additional financings were processed through project restructurings. At that time, key development policy directions for Tanzania and the World Bank's strategies in that country had not changed substantially. The goal of the restructurings aimed to adjust to changing context of project implementation, including the need to setting up a credit line facility to align with Government's policy toward rural and renewable electrification, and enable smooth transactions

with SPP operations in the rural and renewable energy sector while taking care of the impact of hiked prices of most goods procured in the context of the delayed project implementation. The geographic scope of the first objective was reduced from the entire territory to three major cities. The ESME and AFREA grants were approved to support the promotion of operations for renewable energy generation and connection in the rural area.

37. **Throughout project implementation the project was aligned with the Government's policy direction in the energy sector and the World Bank's successive strategies in the country.** The project was adjusted, over time, to match developments in the field, and the underlying objectives remained highly relevant until project closure. When the project closed in September 2017, the key objectives of stepping up the efficiency and quality of energy access and expanding rural electrification and renewable energy were still at the forefront of the priorities of the GoT and the World Bank. Therefore, the relevance of objectives of the revised project is also rated Substantial.

B. ACHIEVEMENT OF PDOs (EFFICACY)

Assessment of Achievement of Each Objective/Outcome

Original Project (2007–2010; 20 percent of total disbursed resources)
Rating: Substantial

PDO: To support the recipient's efforts to improve the quality and efficiency of the provision of electricity service within its territory, and to establish a sustainable basis for energy access expansion

Subobjective 1: To improve the quality and efficiency of the provision of electricity service within its territory

38. **The outputs generated to enhance the energy transmission infrastructure are the following**:

(a) The upgrade of two existing 220/132/33/11 kV substations at Ubungo and at Factory Zone III in Dar es Salaam

(b) The erection of three new 132/33 kV substations at Factory Zone II, Mbagala, and Kurasini substations in Dar es Salaam

(c) The upgrade of the KIA Substation, which was energized with 6x33 kV feeders and 2x20 MVA power transformers

(d) The installation of transmission lines (57 km) in Dar es Salaam and from the KIA Substation

39. However, the cabling and wiring works are still in progress at the Mbagala Substation and the connections of 132 kV transmission lines (Mbagala-Kurasini and Kurasini-Ubungo) and their commissioning are tied to the completion of the Mzinga Creek crossing. The 13 km for Ubungo-Kurasini portion cannot be implemented now due to a road expansion project by Tanzania National Roads Agency (TANROADS), which affected the wayleave. The Implementation Completion and Results Report (ICR) mission was informed that TANESCO is committed to completing, in the near term, the remaining work

on these infrastructures using its own or other resources.

40. **Achievements to upgrade the energy distribution infrastructure are**

(a) The construction of six new substations in Dar es Salaam located at City Center, Factory Zone I, Factory Zone II, Mburahati, Mikocheni, and Oysterbay;

(b) The rehabilitation of five existing substations in Dar es Salaam in Ubungo, Kariakoo, Kurasini, Chang'ombe, and Mbagala;

(c) The supply and installation of plant and equipment at eight substations in Arusha and Moshi. In Arusha, two new substations were completed in Sakina and Njiro B and four substations were upgraded at Mt. Meru, Kiltex, Themi, and Unga Ltd. In Moshi, two substations were upgraded at Boma Mbuzi and Trade School; and

(d) The installation of distribution lines (184 km) in Dar es Salaam, Arusha, and Kilimanjaro suburbs (33 kV/11 kV overhead lines and 33 kV underground cables).

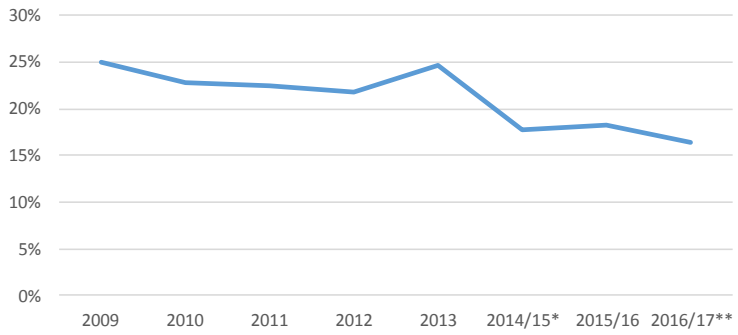
41. **To enhance on-grid access expansion and boost commercial and institutional capacity development, the following outputs were generated:** (a) there was a replacement of credit meters by installing 85,000 prepaid meters, and (b) institutional capacity development needs were identified and a plan to address them was agreed but has not been implemented yet. Also, the solid state remote meters, the centralized call center for Dar es Salaam, and the high-value customer cell activities could not be implemented.

42. **TA to support the implementation of on-grid projects included** (a) hiring of a supervision consultant firm to support the supervision of T&D works, training, preparation of bidding documents, and evaluation and approval of detailed design documents; (b) hiring of a procurement expert, by TANESCO, to augment contract management processes; and (c) the acquisition of a corporate information technology (IT) system for TANESCO. However, the following activities to support the Corporate Management System (CMS) were cancelled due to budget overruns: (a) incorporation of the CMS to improve operational procedures and customer information, (b) incorporation of the Technical Service Management System (TSMS) to attend to customers claims, and (c) incorporation of the Resource Management System (RMS), including definition of new operational procedures (these activities will be supported under the Tanzania-Zambia Transmission Interconnector, P163752, recently approved by the World Bank). The scope for the implementation of a capacity plan was removed following restructuring in September 2016 and will be implemented under another World Bank project (Energy Sector Capacity-building Project).

43. **Project investments resulted in considerable reduction in total losses, thereby improving operational efficiency (see figure 2).** The total T&D losses were reduced to 16.44 percent at project closure against a target of 22 percent, exceeding the target by 39 percent, and from a baseline of 28 percent in 2007. This performance drew from measures to enhance transparency and accountability in TANESCO's operational performance and from investments in on-grid upgrades with TEDAP's support. The performance is expected to increase even more when all T&D upgrades are fully operational. For example, the transmission line at Mzinga Creek crossing was not completed within the span of the project

due to last minute design changes but is currently under implementation with TANESCO financing. Complementary projects funded by other development partners (SIDA and the Republic of Korea) also partially contributed to this.

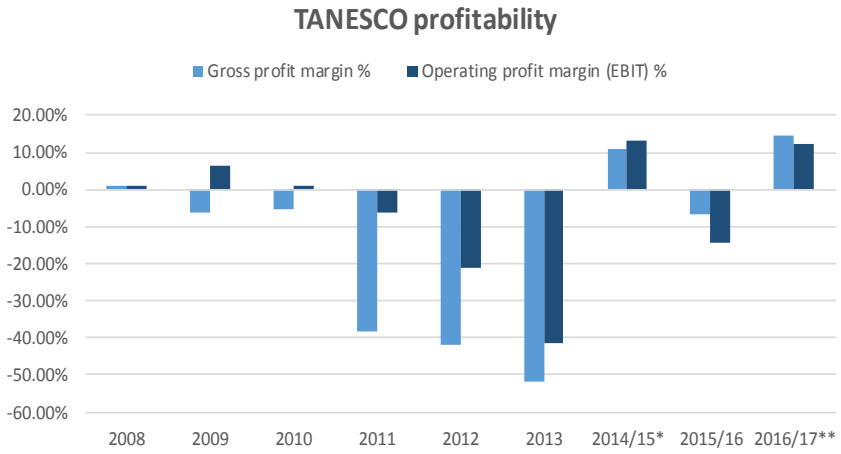
Figure 2. Trend of T&D Losses (percentage)



Source: TANESCO.

44. **Toward improving operational efficiency of the energy sector, there was also a significant improvement in collection rates, but it fell below the target.** TANESCO's revenue collection increased from 70 percent in 2007 to 91.61 percent 10 years later but missed the target by 3.6 percent. The increase in the revenue collection rate has had a positive impact on TANESCO's financial results and its profitability. As indicated in figure 2, TANESCO's gross profit margin and operating profit margin were positive during FY2014/2015 and FY2016/2017, contrasting with highly negative margins during 2011–2013.

Figure 2. Gross Profit Margin (before Government subsidies and other cost and revenues) and Operating Profit Margin of TANESCO during FY2008–2016/17



Source: TANESCO.

45. **There was an improvement in the service quality as measured by the end user voltage.** The end user voltage reached the level of 220 volts, slightly exceeding the target. The end user voltage was obtained in Arusha and Kilimanjaro regions after the completion of the upgrade of KIA 132 kV substation which enabled stability of voltage in the districts of those regions. Stability of voltage provides customers

better service, by increasing the quality of power and the capacity of use, and the performance was derived from the investments made under TEDAP to upgrade T&D infrastructure, including the TA associated with them.

46. **While access to energy improved following new urban household connections to modern electricity services, service quality measurement through customer feedback could not be confirmed.** The number of new urban household connections reached 30,933 households and exceeded the target by 24 percent. Moreover, following the TA provided by the private firm Fichtner, there was an enhancement of the energy sector management and project implementation oversight. Performance of improvement in service quality as measured by customer feedback could not be assessed, because there was no baseline or target set at appraisal or subsequently. The customer satisfaction performed countrywide through a customer satisfaction telephone survey came up with a satisfaction level of 62 percent of the surveyed population.

Subobjective 2: To establish a sustainable basis for energy access expansion.

47. **Toward establishing a sustainable basis for energy access expansion, the project supported the improvement of REA's functionality.** REA has currently a functional organization structure and has shown its capacity to develop, finance, and implement the scale-up of pilot schemes. A review of the organizational structure was approved by the Rural Electrification Board and REA's Procurement Management Unit was strengthened. In addition to the off-grid activities being supported, REA's mandate was expanded to include rural grid-extension activities. REA's performance was boosted, buoyed by the push from Government to expand rural electrification and availability of resources.

48. **In results, REA's contribution consisted in increasing support to small-scale rural power generators, expanding rural connections, and developing a pipeline of new rural household connections.** REA supported the installation of 25 MW of renewable energy exceeding the target by 47 percent, supported 4,865 connections to the grid, and the pipeline of rural connections, reaching 71,966 households, and exceeding the target by 80 percent. These include household connections from operating SPPs and projects supported by the Lighting Rural Tanzania.

GEO: To support the global objective of reducing CO_2 emissions by reducing barriers to renewable energy development.

49. **Toward the creation of favorable conditions for small power generation and distribution (SPGD) projects, TEDAP provided several matching and performance grants.** Matching grants were grants provided to private SPP developers to assist them in the preparation of pre-feasibility and feasibility studies. Performance grants were grants provided to SPPs to enable them to provide electricity services to potential rural consumers within their service areas as required under the SPP regulations. This grant was fixed at US$500 per connection.

50. **A total of 38 matching grants were provided to SPP developers in several districts and regions of the country.** The key output was the completion of part or all of three reports (Feasibility Study, Business Plan, and Environmental and Social Impact Assessment [ESIA]) for each of the promoters that received the matching grant. Potential connections from those projects could amount to 122,000 households, and total installed power capacity could reach 108.2 MW. A total of seven performance

grants were provided to seven private promoters in the districts of Njombe, Mufindi, Ludewa, Mbinga, and Kilolo. The key output was the construction of distribution networks to connect power to district villages. Potential households that could be connected could reach 10,860, and the total installed power capacity for distribution is expected to reach 8.8 MW. Matching and performance grants were seed money for the expansion of renewable energy, and additional resources had to be made available to have the electricity generation infrastructure in place.

51. **The initial Sustainable Solar Market Packages (SSMP) under the GEF financing was not effective in stimulating the local market for solar home systems.** Winning bidders were given a small grant to promote their own brand of quality-certified solar home systems to local households, using the public institutions as a market entry point. The piloting of the SSMP model under SSMP-1 resulted in no sales of solar home systems to households. Results achieved under the pilot SSMP-1 in the Sumbawanga District included solar power being provided to 35 dispensaries, 6 health centers, 9 secondary schools, 7 dormitories, 71 staff houses, 9 police posts, and 240 public streetlights. However, marketing beyond the public sector to private households never occurred and the maintenance of the public equipment was not adequately undertaken despite the signing of a maintenance Memorandum of Understanding with the local authorities. The GEF grant provided full support to SSMP-1 through the Ministry of Energy and Minerals (MEM), but the contractor hired for SSMP-1 was not effective at stimulating the local market for solar home systems.

52. **The SSMP-2 model funded the provision of solar equipment to remote rural communities, but results were mixed.** The GEF grant was used to provide partial support to the expansion of SSMP-1 experiment into SSMP-2 targeting several other districts. The contracts under SSMP-2 were won by two private firms: SINOTEC and REX. REX, a local firm, proved not to be very effective at the SSMP model and its contracts were eventually cancelled. But SINOTEC has shown an ability to master the complex business model required and has sold roughly 70,000 household systems under its contract. Achievements under SSMP-2 include the installation of a total energy capacity of 484.24 kW out of a planned 526 kW in the localities of Sikonge, Chato, Kasulu, Kibondo, Tunduru, and Namtumbo. In these localities, 66 schools, 142 dispensaries, 19 health centers, 12 police posts, and 755 staff houses were provided with solar power, and 1,648 streetlights were installed. Finally, an energy capacity of 6.6 kW, out of a planned 135 kW, was installed in the localities of Bukombe and Biharamulo. In these localities, work is still in progress, but two schools, two dispensaries, two health centers, two police posts, and two staff houses were provided with solar power, and two streetlights were installed.

53. **TA provided by TEDAP contributed in building capacity in REA and EWURA and modernized the regulatory environment for renewable SPPs.** TEDAP provided TA to the off-grid part of the project, and key achievements include the following:

(a) Feasibility studies and partial cost subsidies for building distribution networks

(b) Support for the creation of favorable regulatory environment to encourage private investment in renewable SPPs

(c) Pre-feasibility study of small hydro projects

(d) Implementation support to REA II

(e) Wind resources assessment for six sites

(f) Internet configuration and web hosting

(g) A two-year consultant hired to provide advisory services to MEM/REA in bringing the SSMP contracts to financial closure

(h) Support to MEM/REA in supervision and monitoring of contracts

(i) Based on lessons learned from the procurement, help revise the procedures and documentation for award of future SSMP contracts

(j) Training district environmental management officers and training support provided to the National Environmental Management Council (NEMC)

54. **Three out of four targeted outcomes toward the GEO were exceeded under the project.**

(a) The CO_2 emission reduction, as measured by the volume of MW of renewable energy installed, was exceeded, as 25 MW were installed, surpassing the target by 47 percent. Delivery of renewable energy by grid-connected SPPs under Standardized Small Power Purchase Agreements (SPPA)/Small Power Purchase Tariffs (SPPTs) was achieved through the following grid-connected SPPs: Tanwat (1.5 MW), TPC (9 MW), Mwenga (4 MW), Ngombeni (2.5 MW), Tulila (7.5 MW), and Darakuta (0.95 MW).

(b) New rural household and business connections to modern electricity services through new off-grid electrification models with the SPP were exceeded as new rural population connected to electricity was 694,189 or 144,622 households at the rate of 4.8 persons per household. The target was multiplied by 10, due to contribution from the SPPs, Lighting Rural Tanzania 1, SSMP-1, capacity building, and grid.

(c) The target of using standard SPPAs/SPPTs' methodology for small renewable power projects was exceeded, as 12 SPPAs were signed, with aggregate export capacity of 50.3 MW and installed capacity totaling 58.3 MW. There are also 15 letters of intent with potential installed capacity of 70.9 MW.

(d) The target of new public institutions electrified through new off-grid electrification models with SPP was missed by 17 percent, as community connections completed are estimated at 996 against a target of 1,200. These institutions include dispensaries, health centers, secondary schools, staff houses, police posts, and public lighting.

55. **Overall assessment of the original project.** Key achievements reflecting the performance of the first phase of TEDAP are summarized as follows:

(a) Toward the PDOs, there was improvement in operational efficiency of the energy sector, arising from (i) significant reduction in total losses, (ii) significant improvement in collection rate, although it fell below the target, (iii) enhanced service quality as measured by the end user voltage, and (iv) accelerated new urban household connections to modern electricity

services. However, while the service quality improved, its measurement through customer feedback could not be confirmed. This performance was possible because T&D infrastructure was accomplished in Dar es Salaam, Arusha, and Kilimanjaro and significant TA was provided. However, there are activities that could not be implemented because of budget overruns, which reduced the performance of the project. Moreover, REA matured as an institution overseeing rural electrification and its mandate was expanded to include rural grid-extension activities.

(b) Toward the GEO, REA's efficacy targets were exceeded regarding the installed renewable energy power and the new rural household and business connected to modern electricity services through new off-grid electrification models. However, the target of new public institutions electrified through new off-grid electrification models was missed.

56. On balance, the efficacy of the original project is rated Substantial.

Revised Project (2010–2017; 80 percent of total disbursed resources)
Rating: Substantial

57. **Expanding the country's renewable energy agenda was the key innovation of the 2010 project restructuring and TEDAP-associated grants approved thereafter.** The 2010 restructuring modified the statement of the two project objectives in the following ways: (a) while a major part of the first objective remained unchanged, the addition consisted in establishing a sustainable basis for 'renewable energy development in Tanzania' and in concentrating the project T&D investments 'in the three main growth centers of Dar es Salaam, Arusha, and Kilimanjaro'. (b) The GEF objective was not modified, but the AFREA and ESME Trust Funds were approved in 2010 and 2012 to support the renewable and rural energy agenda of the project.

58. **Additional resources provided during and after the Level 1 restructuring aimed at enhancing the financing mechanisms supporting SPPs in launching renewable energy activities in the rural area.** The overarching activities brought in during the 2010 restructuring were (a) the creation of a rural and renewable energy credit line facilitated by PFIs to support SPPs, (b) the provision of additional trust fund resources to step up the Clean Development Mechanism (CDM)activities, and (c) the awarding of AFREA grants in support of renewable energy activities in favor of the poor. Based on these resources, Table 22 shows the value added achieved from the SPPs that arose from the additional resources mobilized by the restructuring operation.

Table 2. Value Added from the Financing Facilities Brought in by the Level 1 Restructuring

Financing Facility	Number of Beneficiary SPPs	Disbursed Amount in % of Allocation	Installed capacity/Status
Credit line to SPPs (US$25.0 million)	4	23	7.2 MW/all power plants are operational
Green generation performance grant (US$6.5 million)	7	26	14 MW/all power plants are operational
AFREA grant (US$1.0 million)	25	100	305 kW/micro-projects at appraisal phase

Source: REA.

59. **The credit line was partially disbursed toward funding four SPPs, which also benefitted from other TEDAP-associated grants.** The complicated procedures involved in getting various approvals and licenses to reach financial closure constrained some SPP developers' ability to access the credit facility. At project closure, withdrawals from the credit line facility amounted to about US$5.77 million, or 23 percent of the restructuring allocation of US$25.0 million, and funded four SPPs engaged in hydropower generation. All beneficiary SPPs are managing hydropower plants with installed capacity of 7.2 MW, as well as a distribution networks to households, and some of them are connected to TANESCO's grid. Moreover, some of the SPPs benefitted from the matching and/or performance grants (Mwenga Hydro Ltd.) before applying to the credit line resources.

60. **Seven SPPs benefitted from the Green Generation Performance Grant under the EMSE Trust Fund, though in the end the grant remained underused.** Under the trust fund financing, a CDM program of activities has been launched in several districts. Several eligible projects were identified as prospective receipts of the grant. In several regions, solar, wind, solar/wind hybrid, and biomass technologies were proposed as a part of the 25 projects which aimed to generate electricity for households, schools, and health centers for an expected capacity of 305 kW. However, many of the identified eligible projects did not reach the benchmark level of preparedness to access the grant. In the end, only 26 percent of the grant resources was disbursed. However, the projected annual generation of the seven beneficiary SPPs is estimated at 52,185 MWh per year, with a contract volume of 297,324 carbon emissions reductions (tCO_2) and a green generation performance value of €1.2 million.

61. **The deployment of the AFREA grant to alleviate poverty was mostly successful.** A total of 25 solar, wind, or solar/wind mix micro-projects were identified and funds were disbursed to undertake feasibility studies and appraisal. The expected results and efficacy in terms of installed power generation capacity and the potential for connection to households are, respectively, estimated at 305 kW and electricity connections to 20,875 households, 50 health centers, 100 schools, and 4 water pumps.

62. **Overall assessment of the revised project.** Achievements under the revised project do not differ fundamentally from the outcomes achieved under the initial project. Key outcomes completed and presented under the initial project count for the revised project. Additional outcome brought in by the restructuring mainly included the impact of the credit line operations, the launching of the CDM program of activities, and the launching of micro-projects devoted to target poverty-stricken households and communities in selected districts of the country. Because of the credit line facility and the additional trust funds, the volume of operations and transactions with SPPs has improved. This could not have happened without the restructuring and the additional funding that came with it. However, the utilization of the three financing mechanisms remains small-scale in nature and has not matured yet, and the results for installed generation capacity and connection to households or grid are still limited.

Justification of Overall Efficacy Rating

63. The efficacy of the project is rated Substantial and is summarized in tables 3 and 4.

64. At appraisal, the project included seven PDO indicators. Out of these, four exceeded the target, two achieved the target, and one only partially achieved the target. The restructured project included nine PDO indicators. The target was exceeded for six indicators, achieved for two indicators, and partially achieved for one indicator. Thus, for both the original and restructured projects, the majority of indicator

targets were exceeded or achieved by project closure.

65. **The TEDAP-supported activities played a central role in achieving the outcomes observed at project's closure.** At the same time, the Government's policy and regulatory regime facilitating the engagement of the private sector, other World Bank Group operations (investments and policy operations), and bilateral support to the Government from other donors created enabling conditions to reach the project objectives. The Government took key policy decisions and promulgated regulations that created a conducive environment for project implementation. For instance, the 2003 National Energy Policy aimed at establishing an efficient energy production, procurement, and transportation and promoted entrepreneurship and private initiative in the production and marketing of products and services for rural and renewable energy. In 2007, the Government established REA and the REF under the Rural Energy Act of 2005. The SPPs were allowed to sell electricity to both customers and TANESCO, as access to TANESCO's grid was open to private sector electricity producers.

66. **During the TEDAP implementation, key World Bank projects that supported the energy sector included** (a) the Backbone Transmission Investment Project (FY11), (b) Rusumo Falls Hydroelectric Project (FY13); (c) the First Power and Gas Development Policy Operation (FY13), (d) and the Second Power and Gas Development Policy Operation (FY14), as well as International Finance Corporation's support to the private sector investment in upstream gas development and TA to facilitate grid electrification. Key donors with activities that also provided bilateral support to TANESCO, REA, and MEM included JICA and the Republic of Korea that funded T&D infrastructure; and the SIDA and Russian trust funds which supported access Scale-up and Electricity Regulatory System and the CDM program, respectively.

Table 3. Achievements of the Original TEDAP (2007–2010)

	Results Indicators	Baseline	Original Target	Achievement	Comment
	A. PDO Indicators				
1	Reduction in total losses (as a measure of improving operational efficiency in selected clusters).	28% (2007)	21%	16.44% (Year ending 06/30/2017)	**Exceeded.** Result of measures to enhance transparency and accountability in TANESCO's operational performance, as well as investments in on grid strengthening with the TEDAP project support. Performance is expected to increase even more when all T&D upgrades are operational by end-2017 and beyond.
2	Improvement in collection efficiency (as a measure of improving operational efficiency in selected clusters).	70% (2007)	95%	94% (Year ending 06/30/2017)	**Basically achieved.** TANESCO's collection efficiency has improved dramatically over the course of the project. The target was eventually missed by only 1 percent for the full fiscal year 2016/17 (ending June 30, 2017), thanks to better payment enforcement and higher penetration of pre-paid meters. TANESCO's collection efficiency is now one of the highest in the region.
3	Increase in end user voltage as a measure of improvement in service quality in selected clusters).	190 volts (2007)	>218 volts	220 volts (09/29/2017)	**Exceeded.** The end user voltage reached the level of 220 volts, slightly exceeding the target. In particular, 220V was obtained in Arusha and Kilimanjaro regions after completion of KIA 132kV substation which enabled stability of voltage in the districts of those regions.
4	Improved customer feedback (as a measure of improvement in service quality).	30% (2009)	75%	62% (09/29/2017)	**Partially achieved.** The target for improved customer satisfaction was missed by 13 percentage points, as customer satisfaction recorded was 62 percent against a target of 75 percent.
5	Improving REA functionality as demonstrated by capacity to develop, finance and implement scale-up of pilot schemes.	REA has an incomplete functional organizatio n (2007)	REA identifies and approves new connections	REA has a functional organization structure (09/29/2017)	**Achieved.** REA has a functional organization structure, and has shown capacity to develop, finance and implement the scale-up of pilot schemes. A review of the organizational structure has been approved by the Board. Procurement Management Unit has been strengthened. Apart from Off-grid activities, REA mandate has been expanded to include numerous n-grid activities.
6	Improving REA functionality as measured by a pipeline of new rural household connections.	0 (2007)	40,000	71,966 connections (09/29/2017)	**Exceeded.** The target was exceeded by 80 percent, as rural households' connections reached 71,966 against a target of 40,000. These include household connections from operating SPPs and projects supported by the Lighting Rural Tanzania and REA's co-financing to TEDAP.
7	**GEO:** CO2 emission reduction (as measured by MW of renewable energy installed).	0 MW (2007)	17 MW	25.45 MW (09/29/2017)	**Exceeded.** 25 MW were installed, exceeding the target by 47 percent, including the number of MW of grid-connected SPPs: Tanwat (1.5 MW), TPC (9 MW), Mwenga (4 MW), Ngombeni (2.5 MW), Tulila (7.5MW), and Darakuta (0.95MW).

Table 4. Achievements of the Revised TEDAP (2010–2017)

	Results Indicators	Baseline	Original Target	Achievement	Comment
	A. PDO Indicators				
1	Improvement in TANESCO's operational efficiency as measured by: Electricity losses per year in the project areas.	28% (2007)	21%	16.44% (Year ending 06/30/2017)	**Exceeded.** Result of measures to enhance transparency and accountability in TANESCO's operational performance, as well as investments in on grid strengthening with the TEDAP project support. Performance is expected to increase even more when all T&D upgrades are operational by end-2017 and beyond.
2	Improvement in TANESCO's operational efficiency as measured by: Improvement in collection efficiency.	70% (2007)	95%	94% (Year ending 06/30/2017)	**Basically achieved.** TANESCO's collection efficiency has improved dramatically over the course of the project. The target was eventually missed by only 1 percentage point for the full fiscal year 2016/17 (ending June 30, 2017), thanks to better payment enforcement and higher penetration of pre-paid meters. TANESCO's collection efficiency is now one of the highest in the region.
3	Improvement in service quality as measured by: Increase in end user voltage.	190 volts (2007)	>218 volts	220 volts (09/29/2017)	**Exceeded.** The end user voltage reached the level of 220 volts, slightly exceeding the target. In particular, 220V was obtained in Arusha and Kilimanjaro regions after completion of KIA 132kV substation which enabled stability of voltage in the districts of those regions.
4	Improved customer feedback (as a measure of improvement in service quality).	30% (2009)	75%	62% (09/29/2017)	**Partially achieved.** The target for improved customer satisfaction was missed by 13 percentage points, as customer satisfaction recorded was 62 percent against a target of 75 percent.
5	REA fully functional as demonstrated by: Capacity to develop, finance, and implement scale up of pilot schemes.	REA has an incomplete functional organization (2007)	REA identifies and approves new connections	REA has a functional organization structure (09/29/2017)	**Achieved.** REA has a functional organization structure, and has shown capacity to develop, finance and implement the scale-up of pilot schemes. A review of the organizational structure has been approved by the Board. Procurement Management Unit has been strengthened. Apart from Off-grid activities, REA mandate has been expanded to include numerous n-grid activities.
6	REA fully functional as demonstrated by: pipeline of new rural household connections.	0 (2007)	40,000	71,966 connections (09/29/2017)	**Exceeded.** The target was exceeded by 80 percent, as rural households' connections reached 71,966 against a target of 40,000. These include household connections from operating SPPs and projects supported by the Lighting Rural Tanzania and REA's co-financing to TEDAP.
7	**GEO:** Global Environment Objective: Generation capacity (MW) of Hydropower constructed or rehabilitated under the Project.	0 MW (2007)	17 MW	25.45 MW (09/29/2017)	**Exceeded**. 25 MW were installed, exceeding the target by 47 percent, including the number of MW of grid-connected SPPs: Tanwat (1.5 MW), TPC (9 MW), Mwenga (4 MW), Ngombeni (2.5 MW), Tulila (7.5MW), and Darakuta (0.95MW).
8	Direct project beneficiaries (Component B)	20,000 (2011)	114,000	206,149 (09/29/2017)	**Exceeded**. The target was exceeded by 81 percent, the number of beneficiaries reaching the number of 206,149, against a target of 114,000, and reflecting the push by the Government for increased rural electrification and REA's full operational functionality.
9	Direct project beneficiaries, of which female (Component B)	0 (2011)	57,000	103,074 (09/29/2017)	**Exceeded**. The target was exceeded, the number of beneficiaries reaching 103,074 against a target of 57,000, and reflecting the push from the Government for increased rural electrification and REA's full operational functionality.

C. EFFICIENCY

Assessment of Efficiency and Rating

Rating: Modest

67. **The economic analysis at project completion covers 99 percent of the total project cost.** Cost not included is related to (a) projects grant funded by the Lighting Rural Tanzania Competition (LRTC), which lacked co-financing and project costing and (b) regulatory or sectorwide-related capacity-building activities in Component C, which are to be assessed at the efficacy level. To be consistent with the appraisal, the analysis at completion is presented in 2007 prices (in local currency compared to U.S. dollar at appraisal) unless otherwise noted, with a 10 percent discount rate for the economic analysis. According to the 2016 World Bank guidance, an economic discount rate of 6 percent and an economic discount rate for the long-term project life period for available forecast data during 2007–2022 estimated at 8.6 percent are also used for the economic analysis as the economic opportunity cost of capital (EOCK). While a summary of key results of the efficiency analysis is presented hereunder, differences between appraisal and completion analyses, additional assumptions, detailed analyses of individual activities and components, sensitivity analysis, risk analysis, and other reference and footnote details are presented in the annex 4. Financial analysis was conducted. However, it was decided that the ICR would not include the financial analysis for the following considerations. Component A' household connections were of social nature. Component B is largely private sector activities that need to respect their confidentiality and the analysis with the very limited data could risk misrepresentation of these private sector performances

Economic Analysis

68. **Overall performance. The underlining determinant of the efficiency assessment was reduction of technical system loss due to the upgrade of the network of Component 1[1].** At completion, the overall project results show that the project's activities and inputs have contributed to the PDO with an economic net present value (ENPV) of TZS 24 billion (US$19 million), with a levelized energy cost of TZS 71 per kWh or US$0.06 per kWh at 10 percent discount rate and an economic internal rate of return (EIRR) at 13 percent. At appraisal, the total project's ENPV and EIRR were not presented in the PAD. However, the PAD presented the ENPV and EIRR of major individual activities. Alternatively, using the default 6 percent discount rate as the EOCK, the ENPV at completion would become TZS 82 billion (US$66 million), and using the estimated EOCK at 8.6 percent, the ENPV would become TZS 40 billion (US$32 million).

Table 5. Results of the Economic Analysis

	ICR Results		Appraisal Results	
	ENPV (US$, millions)	**EIRR (%)**	**ENPV (US$, millions)**	**EIRR (%)**
Grid	23.0	17	87	31
Mini-grids (2)	One is low, the other is negative	One is high, the other is negative	Very low	36

[1] As the system loss indicator in the result framework was also contributed by complementary projects funded by other development partners (SIDA and South Korea) and also might include both technical and non-technical system loss, the ex-ante economic analysis is based on the appraisal technical system loss estimates specific to Dar es Salaam, Kilimanjaro and Arusha.

Solar home system	1.6	85	9	59
SPGD project	n.a.	Between –9 and 111	n.a.	Between 15 and 48
Total project	19.0	13	n.a.	n.a.

Grid

69. At completion, the ENPV for the TANESCO grid component was US$23 million and a levelized cost of US$0.02 per kWh with an EIRR of 17 percent compared to the appraisal's ENPV of US$87 million with an EIRR of 31 percent. The main reasons for the lower ENPV and EIRR at completion are the lower assumed value of household benefits from electrification, additional financing in 2011, and the discounted price-level effects of the inflation rates due to the delayed disbursement and implementation. At appraisal, an average willingness to pay (WTP) at US¢23 per kWh or TZS 36,089 per month per household customer was used for a new customer benefit. At completion, based on the most recent data, a WTP of TZS 8,205 (net economic benefit of cost saving of kerosene and mobile charge of TZS 6,339 per month per household customer) was used for the analysis. The analysis at appraisal assumed that the households' WTP of 43 percent of project connections was valued at the cost of supply of diesel-based electricity in Dar es Salaam. However, at project completion, greater number of connection were made in Arusha and Kilimanjaro, where WTP is assumed to be lower.[2]

Off-grid

70. **Isolated mini-grids.** At completion, two isolated mini-grids (Ngombeni biomass power plant and Mawengi small hydropower) had been commissioned. The first one resulted in an ENPV of TZS 4 million or US$3,000 per customer with an EIRR of 111 percent. The second one resulted in a negative ENPV of TZS 5 million, or negative US$4,000 per customer, and a negative EIRR of 9 percent, partly due to the lack of sufficient demand. At appraisal, based on a survey in the Rukwa region, the ENPV per customer was TZS 19,750 or US$16 with an EIRR of 36 percent.

71. **Solar Home System and Institutions.** At completion, the ENPV for private sales of solar home systems (including solar PV lanterns) was TZS 2 billion or US$1.6 million with an EIRR of 85 percent, compared to the appraisal's ENPV of TZS 12 billion or US$9 million with an EIRR of 59 percent. For PV installations in institutions, at completion, ENPV is a negative TZS 1.7 billion or US$2 million, with a negative EIRR of 13 percent, compared to the appraised ENPV TZS 377 million or US$300,000, with an EIRR of 21 percent. The main reasons for the negative ENPV and EIRR at completion were

(a) The much higher estimate of avoided diesel oil consumption per kWh of diesel gensets (2 gallons per kWh) at appraisal than the actual (0.079 gallon per kWh, which is more consistent with the estimate of Component A and other projects in other countries and is technically

[2] Most of the connections were achieved in Kilimanjaro (68 percent) and Arusha (14 percent), where the poverty rates were about 14.3-14.7 percent compared to 5.2 percent in Dar es Salaam in 2012 and per capita electricity consumptions were estimated to be only 16–34 percent of that in Dar es Salaam in 2015. (REPOA. 2016. *Where Are the Poor: Region and District Poverty Estimates for Tanzania, 2012*; United Republic of Tanzania Ministry of Energy and Minerals. 2016. *Power System Master Plan 2016 Update*).

considered as higher level of the diesel genset technology);

(b) The expected shorter life of the solar system than that expected at appraisal; and

(c) The pilot institutional PV performance being less than expected.

72. At appraisal, the life-span of all solar photovoltaic (PV) systems was assumed to be 15 years. However, the SSMP contracts had limited spare parts (mostly 1 percent of the PV equipment delivered) and the only the SSMP-1 contract required the contractor to replace the batteries (not including inverters) at least once during the contract period. Therefore, the completion analysis assumed the gradual declines of a number of functioning PV systems up to 2030. At completion, the total ENPV for SMPPs was a negative TZS 164 million or US$132,000 with an EIRR of 8 percent. The appraisal analysis did not present the total ENPV or the EIRR for SMPPs.

73. **SPGD.** At completion, 11 SPGDs or SPPs were operational or constructed in total, of which 10 were included in the analysis. At appraisal, four prospective SPGDs were presented. At completion, the EIRR for the 10 projects ranged between –9 percent and 111 percent, compared to the four projects' EIRRs ranging between 15 percent and 48 percent at appraisal. The main reasons for the lower EIRRs at completion than those at appraisal was because all generation data in 2016 in the most recent CDM program of activities monitoring reports were less than the expected amount of generation. This lower level of generation was despite the fact that the total hydropower generation in Tanzania increased in 2016 after the drought in 2015.[3] As of February 2018, Ikondo (Matembwe) has not been generating power since August 2017 for reasons unknown, and Ngombeni biomass power plant has been out of service since February 2017 due to the poor performance of the used equipment (purchased from salvaged unit in Mauritius), which was assumed to be replaced with a new one.[4] It is assumed that these two power plants will resume operations from 2019.

GEO

74. At completion, the GEF's GEO to abate GHG emissions using renewable electricity energy in rural areas was focused on GEF grant-financed Component B only. This component achieved 0.6 million tons of carbon dioxide equivalent (CO_2e) at a cost to the GEF of US$10 per$CO_2e$. The appraisal estimate of CO_2 abatement was 1 million giving a unit abatement cost of US$6.5 per ton of CO_2e.[5] The main reason for a smaller amount of abated CO_2e was the less-than-expected renewable energy generation as of 2016 (the latest year available), and no reasons for the lower power generations were available from most of these power plants.[6] Thus, the analysis could not assume that any of the power plants could increase generation in the future. However, for the entire project (Components A and B), the total CO_2e ton abated is 1.7

[3] Bank of Tanzania. 2018. *Bank of Tanzania 2016/17 Annual Report*.
[4] African industries face challenges, including access to funding, capital, credit, technical capabilities, and so on. Reducing the financial risks and increasing the cash flow may require purchasing used equipment, which is readily available than the new ones. This is common practice that prevails among the African countries (source: *https://constructionreviewonline.com/2016/07/new-or-used-equipment/*). This practice is also seen in other countries such as the Pacific Islands countries.
[5] There is no significant difference in CO_2 and CO_2e equivalent values.
[6] UNFCCC (United Nations Framework Convention on Climate Change). 2017. Monitoring Report Form for the Clean Development Mechanism (CDM) Program of Activities (version 01.0). Tanzania Renewable Energy Program.

million tons. Following World Bank (2017),[7] with the low value of CO_2e, total ENPV was TZS 40 billion and EIRR of 15 percent; with the high value of CO_2e, total ENPV was TZS 57 billion and EIRR of 17 percent, and the switching value was negative US$54 per CO_2e with a sensitivity indicator of 0.4 (CO_2e low value of US$37 and high value of US$75, which were original values in the guidance note before the price level adjustment in the analysis). The GHG marginal abatement cost is TZS 164,362 per CO_2e ton or US$ 141 per CO_2e ton. Including the local emissions (particulate matter [PM], nitrogen oxides [NOx], and sulphur oxides [SOx]) in addition to high and low CO_2e values, the results of ENPVs and EIRRs differ little from those with only CO_2e (see annex 4).

Distributional Impacts

75. The main beneficiaries of development impacts were the electricity consumers and the Government in terms of access to electricity and increased revenues from taxes and fees, respectively, which are presented in the distributional impacts (stakeholders externalities analysis) in annex 4. In addition, TANESCO benefitted from reduced need for thermal power generation. Other beneficiaries include biodiversity (KST); REA (Rural Electrification Fund fee collection); local government (tax revenues); local labor; EWURA (fee and water user fee); and the society (accounts payable and cash balance of TANESCO, SPPs, and SSMP providers). The project benefited local workers as most of the labor costs in the proposed pre-feasibility and feasibility studies and business plans of the SPPs and the public sector wages (especially parastatal organizations such as TANESCO) were higher than most of the private sector wages in Tanzania. TANESCO's loss arises from the fact that the benefits from technical loss reduction were not enough to cover the investment cost. The SPPs' losses reflected the low level of actual power generation until 2016 and actual power purchase tariffs by some of the SPPs. The details of the SPPs' individual activities details are discussed in annex 4.

Fiscal Impacts

76. The total service and commitment charges discounted at an EOCK of 10 percent amounted to about 0.002 percent of the 2007 gross domestic product (GDP) and were offset by the benefits of increased revenues of taxes, fees, social security contributions, workers funds, skills and development levy, and so on.

Administrative and Operational Efficiency

77. **There were coordination challenges among implementation agencies.** Coordination challenges between the implementing agencies MEM, TANESCO, and REA persisted through the implementation of the project. Based on stakeholders' feedback, institutional rivalries instead of synergy among the three implementing agencies negatively affected the speed of resolving project implementation challenges.

78. **Project supervision was made difficult by its large geographical scope and the complexity of project components.** The project was to be implemented in three main cities (Dar es Salaam, Arusha, and Kilimanjaro) and in several districts of the country. The off-grid component had subprojects in several districts of the country, leading to supervision challenges for both the implementing agencies and the

[7] World Bank. 2017c. Guidance Note on Shadow Price of Carbon in Economic Analysis; World Bank. 2017d. *Shadow Price of Carbon in Economic Analysis Cover Note*. Washington, DC: World Bank.

World Bank's task team leaders (TTLs). Moreover, there were multiple activities under each component, making supervision very challenging. In the end, the following activities had to be cancelled: (a) design and implementation of the CMS, which included a CMS to support commercial functions, a TSMS to attend customers' claims in electricity supply, and an RMS to support centralized functions, and (b) design and implementation of the centralized call center and high-value customer cell. The former of these activities has now been included under the Tanzania-Zambia Transmission Interconnector Project, P163752, which was recently approved by the World Bank.

79. **The actual cost was overall higher compared to cost at appraisal, mainly due to the cost of new activities and budget overruns as well.** The first additional financing did not affect project efficiency because the outcome target indicators were scaled up, the revised targets were achieved, and the credit line was market compliant. The commercial banks applied their standard appraisal criteria in deciding whether to make a loan and how much to lend. The second additional financing, in 2011, aimed to cover the cost overruns caused by (a) higher costs of T&D rehabilitation contracts compared with the original cost estimates and (b) higher-than-anticipated contract costs for various consulting assignments, including an additional consultancy. The second additional financing did not increase the project target indicators but delayed the achievement date of target indicators and had a negative impact on efficiency.

80. **Design and procurement deficiencies, project restructuring, and safeguard issues were at the core of the extended implementation time.** The actual project implementation period was extended by five years and six months to September 29, 2017, against an original project implementation period of about four years and three months. This extension of the closing date arose from procurement delays, scaling up of Component B, and safeguard adjustments related to the change of the wayleave for T&D lines during project implementation. The total service and commitment charges increased in nominal terms due to additional financing and the closing date extension, but due to discounting effects and delayed disbursement and implementation, the net present values (NPVs) were reduced (see annex 4).

81. **Turnover of TTLs might have had an indirect impact on project efficiency.** A total of six TTLs designed and supervised the project over a 10-year period. Based on the feedback from the borrower, and given the complexity of the project and the learning curve required for new TTLs to get acquainted to the project to be effective, the turnover of TTLs could have contributed to delays in implementation and reduced the implementation efficiency. However, reaching a clear conclusion would require a thorough survey and analysis.

82. **The length of project spanned for 10 years largely due to the AF that doubled more than doubled to scale up rural and renewable activities including credit lines that is new to Tanzania's rural and renewable energy subsector, but also due to the slow progress in main grid component.** At the AF in 2010, the closing date was 2015. The time it can be reasonably expected for the additional activities to be implemented and TANESCO's capacity to implement a large infrastructure project, could have been better assessed.

Justification of the Efficiency Rating

83. **Project efficiency is rated Modest, due to good results from the economic analysis and shortcomings in the administrative and operational efficiency of the project.** Results from the economic analysis point to satisfactory ENPVs and EIRRs, although they were lower than those calculated at

appraisal. Finally, there were major challenges in the administrative and operational management of the project, illustrated by the budget overruns, and the doubling of the project implementation duration. On balance, the project efficiency is rated Modest.

D. JUSTIFICATION OF OVERALL OUTCOME RATING

Original Project (2007–2010; 20 percent of total disbursed resources)

84. **The overall outcome rating for the original project is Moderately Satisfactory.** The relevance of objectives is Substantial for the original PDO and GEO. The efficacy of the original PDO project is rated Substantial, and efficiency is rated Modest.

Revised Project (2010–2017; 80 percent of total disbursed resources)

85. **The overall outcome rating for the revised project is Moderately Satisfactory.** The relevance of objectives for the revised project is also Substantial. Efficacy of the revised project is rated Substantial, while efficiency is Modest.

86. **Project implementation and performance slowed down during 2015/2016,** when addressing pending issues with contractors and the wayleave for T&D lines in DAR es Salaam and led to Moderately Unsatisfactory ratings in the 2015 and 2016 Implementation Status and Results Reports (ISRs). Implementation was stepped up significantly in 2017, following the transfer of undisbursed credit line resources to TANESCO and the completion of the distribution upgrade investment works in Dar es Salaam, Arusha, and Kilimanjaro. In the meantime, pending issues with contractors and the wayleave were cleared, and the project performance was assessed to have improved from Moderately Unsatisfactory to Moderately Satisfactory after the September 2017 supervision mission.

87. **The overall outcome rating is based on a split rating for the original and revised project.** Applying the World Bank formula for Level 1 restructured projects, the overall outcome rating for project is [(0.2 × 4.0) + (0.8 × 4.0)] = 4.0, as shown in Table 66, corresponding to the Moderately Satisfactory rating. This rating summarizes the weighted performance of the project before and after restructuring and goes beyond the achievement of expected outputs and outcome indicators. It considers the contribution of this project to the stated objectives, including the contribution of other World Bank projects and other donors to the same objectives through their respective interventions. While the project results contributed to the achieved outcomes and objectives, other World Bank projects and other donors supported the energy sector and similar activities and contributed to the achievement of the same objectives.

Table 6. Weighted Project Performance

	Against Original PDOs	Against Revised PDOs	Overall	Comments
Rating	Moderately Satisfactory	Moderately Satisfactory	Moderately Satisfactory	
Rating value	4.0	4.0		
Weight (Estimated % disbursed	20	80	100	

before/Estimated % disbursed after				
Weighted value	0.8	3.2	4.0	
Final rating	—	—	**Moderately Satisfactory**	Despite changes in objectives and extended implementation period, most outcomes were achieved toward the project objectives.

E. OTHER OUTCOMES AND IMPACTS

Gender

88. **The project's impact on the country's gender issues can only be captured through a topical survey targeting suburbs and rural communities that have recently benefitted from connection to electricity.** At least 50 percent of the direct and indirect beneficiaries of new electricity connections are women, attesting that women have benefitted and will benefit in the future from the project's outcomes. A full account of the project's impact on gender issues in Tanzania requires a stand-alone survey targeting the project's beneficiary communities and households.

89. **A notable contribution of TEDAP to gender and social perspective is illustrated by the Tulila Hydropower Project.** This project was set up as a joint venture between a Swiss donor and the African Benedictine Sister of St. Agnes Chipole at their remote mission station in Songea. The sisters worked with the local community, local electricians and contractors, and Swiss electrical engineers over a two-year period to bring the project to completion. Major maintenance, tax, and legal issues were contracted out, but local contractors were enabled to carry out general repair works and maintenance. The sisters are involved in the project, taking part in everything from administrative tasks to digging work. One of them has earned a license to handle dynamite and managed the rock blasting undertaken as part of the construction. The sisters and the local community have collaborated with foreign engineers to ensure that the project was completed, providing regular progress reporting and collaboration with TANESCO, REA, and EWURA management.

Institutional Strengthening

90. **The creation and operationalization of REA was a key achievement of the project.** From a unit operating in MEM, REA was created from scratch with TEDAP support; has currently reached organizational maturity; and has shown its capacity to develop, finance, and implement the scale-up of pilot schemes. This has shown that the coordination of the Government's commitment to institutional reform and the support of donors can lead to tangible results. However, the task of rural electrification is gigantic and REA will be tested. It is the time for the Government and its partners to undertake an assessment of REA's performance, this being one way to prepare REA for major responsibilities to come.

91. **TA to TANESCO was useful, but opportunities to further strengthen the institution were lost.** The key institutional change brought in by the project was the provision of TA that enhanced TANESCO's capacity to implement the project and manage the power sector. However, TANESCO's institutional independence and its accountability for performance have not changed significantly since the beginning

of the project. Moreover, due to cost overruns, certain TA activities were cancelled, including the centralized call center for Dar es Salaam and the high-value customer cell and the CMS. The cancellation of the TA activities was a lost opportunity for TANESCO, especially because weaknesses are still apparent in the institution entrusted with the oversight of a strategic sector. The CMS will now be supported under the transmission project recently approved by the World Bank.

92. **Institutional strengthening in the GoT was limited.** The Government has put in place a comprehensive reform road map for institutional restructuring and strengthening in the power sector, but certain events and other shortcomings slowed down the implementation of the road map. During project implementation, the power sector and project implementation, were affected by the governance issues related to Independent Power Tanzania Limited (IPTL), which led to changes in leadership at MEM and stalling of the reform agenda. MEM's management of SSMP-1 experienced shortcomings and called for building internal capacity, which did not take place as needed. Suspension of and rotation in MEM's leadership and the reshuffles consecutive to the 2015 elections did not provide a good environment for the project to strengthen technical and institutional capacity in the ministry. However, overseas training for staff overseeing the power sector was funded by TEDAP and contributed to building capacity that will help shepherd the power sector reform. With adequate planning, TEDAP could have provided more in strengthening the Government's services overseeing the energy sector.

Mobilizing Private Sector Financing

93. **The credit line facility initiated to support the SPPs' access to finance was a pilot and needs to be refined and strengthened through stronger agreements among key stakeholders.** The key obstacle for expanding rural electrification has been the weakness of the link between the financial sector and the unexperienced SPPs. The credit line facility succeeded in providing loans to a limited number of SPPs, but to cater to the SPPs scattered all over the country, a simplified and more down-to-earth financing mechanism should be developed, building on the experience of the TEDAP-supported credit line facility. Shortcomings that were observed include the following: (a) policy uncertainty regarding the prices paid by TANESCO to SPPs connected to the grid, (b) delays in TANESCO's payments of the bills due to SPPs connected to the grid, and (c) TANESCO's refusal to sign any new SPPAs from the end of 2015 as they did not agree with the EWURA's revised regulations. For the financing mechanism to hold and mature, a consensual agreement among key stockholders (Government, TANESCO, EWURA, SPPs, and PFIs) must be negotiated and signed, and timely and prompt payment of bills due to the SPPs by TANESCO must be at the core of the agreement to secure the buy-in of the PFIs.

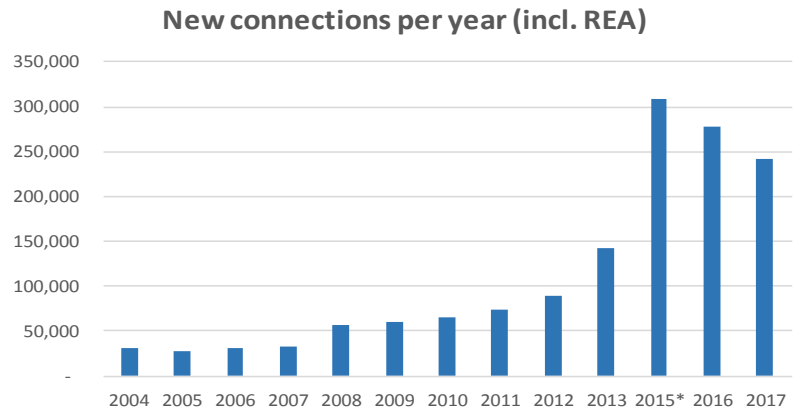
Poverty Reduction and Shared Prosperity

94. **The project's implementation has had an impact on jobs, economic growth, household income, and services delivery, but it has not been assessed in a comprehensive way.** The implementation of project components to upgrade T&D infrastructure in the cities of Dar es Salaam, Arusha, and Kilimanjaro and in the rural area has created temporary and permanent jobs over a period of more than 10 years, improved the income of several neighborhoods, and led to increase in services delivery, especially in health and education. The above information provided by TANESCO staff during the ICR mission can only be confirmed after an independent beneficiary survey.

95. As illustrated in figure 3, there was an increase of connections throughout project implementation

and a surge in the annual new connections starting in 2015. This reflects the combination of the availability of Government and donor resources and the Government's push for energy delivery and rural electrification. A tailored survey aimed at assessing the impact of this project on poverty reduction and shared prosperity could be conducted in the context of a Project Performance Assessment Report that could be envisioned a couple of years from now.

Figure 3. Trend of New Connections during 2014–2017



Source: TANESCO.

Other Unintended Outcomes and Impacts

96. The November 2017 ICR mission did not find and was not informed of any other unintended outcomes and impacts.

III. KEY FACTORS THAT AFFECTED IMPLEMENTATION AND OUTCOME

A. KEY FACTORS DURING PREPARATION

Project Design

97. **The project design was informed by an in-depth sector analytics and was well documented, but critical aspects of project implementation were not perceived at appraisal.** While the project design was summarized into 25 pages, the PAD had additional 110 pages of annexes providing the details of the project, including (a) the description of the project context and components, (b) the Results Framework and monitoring, (c) the expected project costs and a comprehensive economic and financial analysis of the project, and finally (d) an overview of the implementation agencies and arrangements. The analytical work and documentation shed light on the opportunities and challenges in the energy sector to allow key stakeholders to provide their contribution in a level field. In hindsight, the project design overestimated (a) TANESCO's capacity to smoothly implement the grid component and address procurement and safeguards issues and (b) the ability of the country's banking sector to provide timely and adequate funding to the SPPs. Coping with these shortcomings was the cause of many of the delays in implementing the project.

98. **Bundling together several on-grid and off-grid activities and investments into one project resulted in a complex operation that was difficult to implement.** The project was composed of several activities aimed at (a) upgrading the urban electricity grid by rehabilitating energy T&D infrastructure in the three major cities of the country, Dar es Salaam, Arusha, and Kilimanjaro, and (b) expanding energy access by developing rural electrification through leveraging private sector investment for development of off-grid connections and innovative financing. As described earlier, the project scope and coverage became overwhelming, making it difficult to implement and monitor a variety of different activities. Each component could have constituted a stand-alone project with numerous activities that differed in their readiness for and complexity in implementation, as confirmed by the cancellation of some of them. As the project stood after the 2010/2011 restructuring, splitting it into two stand-alone operations (one for the on-grid investments and another for the off-grid investments) might have permitted easier implementation and led to increased results.

Implementation Arrangements and Capacity

99. **The financing and implementation mechanisms set up to support off-grid investments were tentative and had to be adjusted to fit the realities in the field.** Both the World Bank and the borrower were in uncharted territory when it was time to identify bankable promoters of power generation and find financial institutions ready to commit their resources to unexperienced promoters scattered all over the country and making their first entry into the energy sector. Difficulties in identification of appropriate promoters, inadequate institutional setting to link promoters and IDA resources, and many more issues led to adjustments in the project design. The 2010 restructuring aimed to strengthen the financing mechanism by making credit line funds available to extend the tenor of loans offered by PFIs to SPPs.

100. **Project implementation arrangements were as complex as the project itself and made project implementation and coordination cumbersome.** First, coordination was difficult among the two project implementation agencies (and subsequently three, after the restructuring), one embedded in TANESCO and another in MEM, and after the restructuring, in REA. Second, the three Project Management Units (PMUs) in each entity were mainstreamed in the respective entities, had no autonomy, used shared resources within the respective institutions (for example, procurement specialists), and were otherwise subjected to the bureaucratic hierarchy of public administration. Third, the implementation of Component B had to change the PMU from MEM to REA after its consolidation and had to integrate the advice of two ad hoc working groups, making the PMU less agile. Finally, there were additional implementation arrangements for subcomponents that were to be determined in the operational guidelines. Implementing arrangements for the Component B were revised during the 2010 restructuring but were not streamlined enough to facilitate project implementation. Finally, the TA activities of Component C were to be overseen by TANESCO, REA, and MEM, adding to the complexity of the entire implementation setup. Overall, coordination among the implementation agencies should have been designed in a way that allowed more coordination and flexibility to ensure synergy and complementarity in the mission of expanding energy services of good quality.

101. **The key risks were correctly identified, and some of them materialized, triggering mitigating actions and measures (see Table 7).**

Table 7. Developments Related to Identified Project Risks

Major Identified Risks	Mitigation Actions Adopted or Consequences of Absence of Remedy
Another sector crisis may prevent longer-term vision development embodied in the project design.	Key events were (a) the governance issues that hit the energy sector (notably IPTL), weakening the leadership of the reform agenda in the energy sector and (b) the coming to power of a new administration after the 2015 election. While the project was not directly affected by these events, the thrust of the reform in the energy sector was indirectly slowed down and affected the oversight and coordination of project implementation.
TANESCO's financial crisis may continue; appropriate tariff increases may not be allowed/or implemented.	In 2017, TANESCO's financial health somewhat improved. However, during the implementation of the project, the utility sustained a substantial financial impact related to droughts in 2011–2013 and subsequent accumulation of arrears to the company suppliers. In addition, there was a retract in the tariff adjustment in January 2017, and there was some uncertainty regarding the future role and responsibilities of the private sector in energy generation and management, as the current authorities were still consulting stakeholders on the main energy policy directions.
Continued commercial and financial problems at TANESCO	TANESCO's operational and financial performance was fluctuating. Some operational performances were improved between 2008 and 2011. However, after the prolonged droughts resulted in the need to rent expensive emergency generation units, the financial health of the utility worsened with increasing arrears to fuel and electricity suppliers. This situation explains TANESCO's delays in paying the bills of SPPs connected to the grid.
Weak institutional and implementation capacity in REA	The risk materialized and partly justified the 2010 restructuring that broadened and strengthened the institutional oversight of the implementation of Component B.
Private developers may not be able to raise matching funds for investments.	The risk materialized and partly justified the 2010 restructuring that provided additional funding that assisted in supporting the SPPs through grants and TA.
Insufficient volume of quality project proposals	The risk partly materialized and this justified the supply of TA and financial support (matching and performance grants to the SPPs) that supported the SPPs in preparing their business plans, ESIAs, and feasibility studies.

Source: Project ISRs and Aide Mémoires.

B. KEY FACTORS DURING IMPLEMENTATION

Supervision Support

102. **Despite the issues related to project implementation readiness and difficulties, senior staff on the World Bank and borrower sides provided satisfactory supervision and proactive engagement in project implementation.** Both the World Bank and borrower deployed senior staff to work on the implementation of the project and, most importantly, they addressed project preparedness issues and procurement, safeguards, and financing to SPPs, as well as implementation obstacles, allowing the outcomes of the project objectives to be substantially achieved. The borrower's experts in the implementing entities (mainly TANESCO and REA) adequately coordinated all the needed work at the national level to move ahead with project implementation in close collaboration with the World Bank's

supervision teams. The collaboration helped overcome the obstacles arising from the complexity of the project, the project readiness, and design flaws along with the implementation issues and deliver on-grid and off-grid investments, although with extended delays and canceled activities.

Macroeconomic Factors

103. **The World Bank's programmatic Poverty Reduction Support Credit and Development Policy Loan series and policy engagement with the International Monetary Fund (IMF) complemented the design and implementation of TEDAP.** Tanzania's engagement with the Bretton Woods institutions, through policy and budget support operations from the World Bank (Poverty Reduction Support Credit and Development Policy Loans) and the IMF, throughout the period of project implementation created a momentum for reforms in the energy sector that was supportive of progress in implementing TEDAP. Policy reforms related to improved regulation, tariff reviews and adjustments, and diversification of the country's energy generation mix helped the project progress toward the achievement of energy efficiency outcomes, including the rate of revenue collection.

104. **The global financial crisis and shortcomings in the project readiness and design led to the 2010/2011 restructuring.** Adaptation of implementation arrangements added to the delay in project implementation. The global financial crisis affected commercial banks' capacity to lend to SPPs because

(a) The quality of the prepared proposals for funding through the SPP credit line was substandard and did not meet the bankability criterion;

(b) Several SPP proposals that were cleared to access financing under the credit line and obtained 'no objection' from the World Bank sought financing from alternative financial institutions. Hence, some credit line allocations were granted 'no objections' with the funds being advanced, but these funds had never been disbursed; and

(c) The Tanzanian financial market experienced reduction in liquidity, following the Government's ordinance to hold all government accounts at the Bank of Tanzania.

105. Therefore, the liquidity in the commercial banks, including the financial institutions accredited as PFIs under the project to draw funds from the SPP credit line, has been substantially reduced.

Sector Governance and Strategy

106. **Instability in the political governance of the energy sector and some ambiguity regarding the role of the private sector in power generation slowed down the traction of project implementation.** The Government's reform attention to the energy sector and engagement with the World Bank lost momentum when (a) the IPTL controversy led to removal or suspension for prolonged periods of time of MEM and TANESCO officials, including key leadership positions, and (b) after the 2015 election period, the Government's position on the role and place of the private sector in the power generation was unclear. The EWURA's performance as an independent broker has been tested, as TANESCO refused to sign any new SPPAs from the end of 2015. This was against the rule of law as regulations basically compel TANESCO to sign SPPAs after the completion of the relevant due diligence on the design and performance of the power supply installations.

Procurement and Contract Management

107. **The setup and coordination of the World Bank's supervision had shortcomings.** There have always been two TTLs, one covering the on-grid activities and another one in charge of the off-grid activities. The coordination in supervising the project was difficult as the budget went mostly toward on-grid activities, while the off-grid activities did not receive the same attention. Moreover, while TTLs resided in the country for a while, there were instances when no World Bank TTLs were available in the field and this delayed the World Bank's feedback to the borrower's implementation entities and slowed down project progress. The borrower's entities involved in project implementation were all integrated in public or semipublic administration, had limited exposure to World Bank's procedures, and needed prompt support to find solutions to the multiple implementation challenges.

108. **Challenges in executing procurement by the implementation agencies was the source of irregularities and delays throughout the project implementation period.** In one instance, the World Bank cancelled four distribution packages, due to shortcomings in the bidding process, and in two cases, the World Bank imposed, following an inquiry by the World Bank Group's Integrity Vice Presidency, a sanction of debarment to two private companies that submitted false financial documents in bids for contracts to execute activities funded by the project.

109. **Changing the wayleave in the densely populated suburbs of Dar es Salaam has been costly and slowed down the completion of the T&D infrastructure.** The Mzinga Creek crossing related to a change of the wayleave of the Kurasini-Ubungo transmission line necessitated an amendment of the Resettlement Action Plan (RAP). The leveling and foundation works for the high voltage equipment in switchyard were completed, while the civil works for 132 kV switchyard and construction of control and switchgear building are in progress. The change of wayleave not only resulted in expensive RAP disbursements (about US$1.0 million) but was also the source of extended delays that hindered the commissioning of the T&D infrastructure (Mbagala-Kurasini and Mzinga Creek) and the closure of TEDAP. Moreover, the 13 km transmission line for the Ubungo-Kurasini portion cannot be implemented due to a road expansion project by TANROADS, which affected the wayleave. The Ubungo-Kurasini portion is being financed by TANESCO using their own funds, after the closure of TEDAP.

IV. BANK PERFORMANCE, COMPLIANCE ISSUES, AND RISK TO DEVELOPMENT OUTCOME

A. QUALITY OF MONITORING AND EVALUATION (M&E)

Rating: Moderately Satisfactory

M&E Design

110. **Overall, the project M&E design was satisfactory.** The theory of change presented annex 3 of the PAD was comprehensive and detailed. It comprised a Results Framework setting out the project objectives, final and intermediate outcomes, and their respective indicators. It also had a matrix table showing the arrangements for results monitoring, with a baseline and annual target values for each indicator, and the methodology for data collection and reporting. Detailed arrangements were established in the operating guidelines of the project, aimed to ensure the M&E of results and indicators on a cluster basis and evaluate the economywide benefits that were expected from improved electricity services and

the impact on the household welfare. However, the PDO indicators to monitor the performance in renewable energy were not specific enough to reflect the emphasis that the 2011 restructuring put on progress in renewable energy. Moreover, the number of intermediate indicators could have been reduced to allow smooth monitoring.

M&E Implementation

111. **A midterm review conducted in December 2010 suggested the changes in the project scope and financing structure.** The TEDAP Results Framework was revised in 2010 and 2011 to incorporate the changes made necessary by the approval of two additional financing and two grants supporting renewable energy and rural electrification. Following changes in the PDO and in the scope of the project, the PDO indicators and intermediate indicators were revised in 2010 and 2011 as follows: (a) one PDO indicator was reformulated and a new PDO was included, and (b) there were also three new intermediate indicators, while five others were revised. Following a Level 2 restructuring in March 2015, several intermediate results indicators were deleted because the activities linked to these indicators were canceled under the project and financed by other sources.

112. The project's M&E implementation was overall satisfactory as reflected by the 17 filed ISRs prepared during 2008–2017, an average of almost 2 reports per year. All the ISRs systematically reported on the status of outcomes indicators. Moreover, several Aide Memoires were prepared by the two TTLs, who visited the country several times in each year, accompanied by sector specialists in financial management, procurement, and social and environment safeguards. However, toward the end of project implementation, reporting on project supervision weakened, due to the preparation of a follow-on project.

M&E Utilization

113. Aide Memoires and ISRs prepared on a regular basis have helped the project stakeholders to be permanently informed of the progress in the field toward expected outcomes. The close supervision has allowed an adjustment of the Results Framework, which was revised twice to factor in new developments arising from additional funding and obstacles in the field, especially regarding the implementation of Components A and B.

Justification of Overall Rating of Quality of M&E

114. **This review rates the M&E performance as Moderately Satisfactory.** The initial design was appropriate, and needed adjustments were made as required during project implementation, based on the feedback provided through supervision and reporting. However, the M&E efforts could not speed project implementation, because of its complexity and its coverage, which explains that the project was implemented in 11 years instead of the originally planned 5 years. Finally, supervision reporting weakened toward the end of the project, affecting the overall M&E performance.

B. ENVIRONMENTAL, SOCIAL, AND FIDUCIARY COMPLIANCE

Environmental and Social Compliance

115. **The project was classified as a Category B for social and environmental scrutiny, requiring a partial assessment.** The following social and environmental policies were triggered at appraisal: (a) Environmental Assessment (OP/BP 4.01), (b) Natural Habitats (OP/BP 4.04), (c) Physical Cultural Resources (OP/BP 4.11), (d) Involuntary Resettlement (OP/BP 4.12), (e) Safety of Dams (OP/BP 4.37), and (f) Projects on International Waterways (OP/BP 7.50). In 2005, an ESIA was prepared for the transmission lines in Component A (on-grid) and an Environmental Audit was conducted at the substations to be upgraded. TANESCO carried out field reconnaissance to update the ESIA findings and the documents were disclosed in 2007.

116. **An RAP was prepared for the transmission lines and substations in Dar es Salaam, Moshi, and Arusha under Component A (on-grid) and disclosed in July 2007.** A Resettlement Policy Framework and an Environmental and Social Management Framework (ESMF) were prepared for Component B (off-grid) and disclosed in 2007. REA found these to be difficult for subproject developers to understand and work with and had them updated by a consultant in June 2012, after which they were translated into Kiswahili and redisclosed as a revised ESMF and a Resettlement Management Framework (RMF). In January 2014, TANESCO prepared and disclosed an amendment to the RAP to address additional resettlement due to civil works in Dar es Salaam.

117. **No additional RAPs were prepared for the initially unforeseen resettlements and as a result the World Bank conducted a resettlement audit in September 2017, ahead of project closing, setting the number of project-affected persons (PAPs) by Component A at 11,070.** The audit was finalized with an outstanding resettlement activity at the Mzinga Creek, where 16 households will be affected because of a power line extension[8]. The audit concluded that

(a) The World Bank policy on Involuntary Resettlement (OP 4.12) has been followed, though implementation tended to conform more closely to Tanzanian law and practice than to the World Bank policy standards;

(b) Poor recordkeeping of resettlement activities impeded effective monitoring of resettlement and its impact;

(c) Component A has benefited from closer supervision than Component B (off-grid), from both the client and the World Bank, due to TANESCO's better social safeguards, easier access of key sites, the fact that TANESCO implements directly rather than leaving resettlement work to local project developers, and the clearly larger impacts involved.

118. **For the on-grid portion of the project, there were no significant environmental issues along the transmission lines or at the substations.** Contracts for substation work took environmental audit findings into account so that existing environmental, health, and safety issues were resolved. TANESCO has resolved all new pending land issues, except compensation of 16 PAPs at Mzinga Creek transmission line, that came because of last minute changes in the design of the line, necessitating acquisition of new corridor. A Resettlement Action Plan (RAP) that covers the impact on 16 households at Mzinga Creek project area was finalized. Compensation has been made for 13 PAPs, except 3 PAPs and TANESCO is

[8] As indicated in paragraph 118, TANESCO has resolved payments of all the PAPs, except three (3), and TANESCO is working on paperwork to pay them.

working on paperwork to settle compensations. Despite the obvious shortcomings identified, at the time of the mission, the World Bank supervision team believed that there were no issues that could prevent project closure on schedule. TANESCO needs to follow up on the additional resettlement in line with World Bank's OP 4.12 and complete the resettlement compensation.

119. **There are no pending safeguard issues at REA.** For the off-grid part, there were regular reviews and follow-ups of the status and implementation of the ESMF and the RMF. The review of the environmental and social status of subprojects in progress found that there was a progressive understanding by the developers of the ESMF and the RMF instruments and their requirements.

120. **Overall, during the project implementation, there were weaknesses and improvements observed in the safeguards performance.** TANESCO substantially strengthened its safeguards capacity during project implementation. At appraisal, it had an environmental unit of four persons with no social scientist, whereas by the time of completion the unit had 18 people, including social scientists. At project closure, TANESCO was still addressing resettlement issues linked to project works at Mzinga Creek and approved the top up payment compensation after the completion of the project (and before the completion of the ICR).

Fiduciary Compliance

Financial Management

121. **Overall risk assessment of the borrower's entities that were to be involved in the project financial management was rated Modest, but for caution, an action plan was approved, at appraisal, to mitigate the identified financial risks during project implementation**. The key features of the action plan to upgrade TANESCO's financial management system were to (a) implement its financial recovery plan, (b) update the IT systems, including the accounting software and the material module, (c) develop an audit strategy and action plan on a risk-based approach, and (d) customize the project chart of accounts in the financial manual. The two last activities of the action plan were also to be implemented by the Ministry of Energy and Mining (MEM). Implementation of the action plan was in the average range.

122. **Project financial management.** Implementation arrangements for financial management were predicated around the principle that accounting staff of the borrower's implementing agencies (TANESCO, MEM, and REA) will assume overall financial management responsibility for project funds. They were to manage IDA U.S. dollar Designated Accounts, and respectively report on the annual project financial statements, on the basis that they have experience in executing programs financed by other multilateral institutions and international development partners, including IDA.

123. **Overall, the implementing agencies performed well in project financial management during the first four years of project implementation.** However, audits completed in May 2012 for the SSMP-1 component revealed shortcomings in payment approvals and several implementation challenges. On the issues raised by the 2012 audits, MEM reimbursed the World Bank for ineligible expenses and borrowed funds identified in the audit report. Following the abovementioned weaknesses, the rating of financial management performance, which was predominantly Satisfactory throughout the project life, was reduced to Moderately Satisfactory between 2013 and 2015.

124. **The reporting on the resources utilization could have been improved.** Comparison of budget allocation at appraisal and at project closure shows large budget overruns, reflecting initial approximate costing and prices changes on the international market. The project was funded by IDA, GEF, and other grants resources (Russia, SIDA, and AFREA). Both ISRs and Aide Memoires were not detailed in showing the sources and uses of the project's resources. Finally, the undisbursed resources of the credit line facility were to be reallocated and fund Component A activities, but the final closure of this reallocation is unknown so far.

125. **Annual audits** of TANESCO were completed on time and the annual audits of the implementation of Components A and B were regular, but the final external audits are yet to be completed.

Procurement

126. **Procurement arrangements, at appraisal, indicated that procurement activities were to be carried out by the implementing agencies (MEM, TANESCO, and REA), as assessment of the agencies' capacity to implement procurement was found average, because of identified procurement risks.** An action plan was included in the PAD to mitigate identified risks and address weaknesses arising from (a) inadequate skills in procurement of goods, works, and consultancy services; (b) procurement processing; (c) working environment; and (d) inadequate procurement filing and record keeping.

127. **Since the outset, procurement issues marred the implementation of the on-grid component.** In 2009, the procurement of four distribution packages had to be cancelled after the World Bank objected to the shortcomings in the bidding process. The World Bank's evaluation of the Bid Evaluation Report (BER) was delayed due to the pending World Bank's settlement with Siemens AG, which required Siemens (preferred bidder in three out of four packages) to withdraw from the bidding process after evaluation of the bids were conducted by TANESCO.

128. **TANESCO hired a procurement consultant, in 2010, who has further helped strengthen the PMU.** However, on the off-grid part, certain delays related to contract execution and extensions were recorded under MEM's responsibility and MEM and REA had to ensure that the procurement activities maintained the previous good implementation speed.

129. **TANESCO's further strengthened focus on procurement processes has helped complete or advance several contract procurements in the last review period**. However, regarding the Bid Evaluation Report for the four distribution packages under Subcomponent A.1, the World Bank review identified certain shortcomings in the report, which were to be addressed by TANESCO. While there have been additional delays in procurement for the on-grid part, the overall procurement assessment remained Moderately Satisfactory. On the off-grid side, delays in procurement by MEM for the contracts already started by the institution have continued. After delays consecutive to the transition of the implementation responsibilities from MEM to REA, REA has improved its procurement function.

130. **The procurement of the major distribution works contract under Subcomponent A.1 has incurred further delays.** Consequently, the procurement rating for the on-grid part was downgraded to Moderately Unsatisfactory, because of the lack of proactiveness of the Project Implementation Unit (PIU) and inadequate contract management. On the off-grid component, although progress was made in contracting a consultant for preparation of SSMP-2 and verification of SSMP-1, procurement delays

affected the implementation process. The procurement rating was back to Moderately Satisfactory in 2014 until the end of the project, following progress in all pending procurement activities.

131. **Misprocurement.** There was a misprocurement in one instance, whereby a company submitted false financial documents as part of the qualification requirement to bid on a contract. The World Bank imposed sanctions of debarment of the company, following the conclusions of an inquiry by the World Bank Group's Integrity Vice-presidency.

C. BANK PERFORMANCE

Quality at Entry

132. **While the World Bank's TEDAP was strategically thought through, the option of bundling together several on-grid and off-grid activities and investments into one project resulted in a complex operation, which was difficult to coordinate and implement.** The PAD has clearly defined the World Bank's strategic intervention and comprehensive engagement in Tanzania through TEDAP (PAD, pages 5 and 6). However, the design approach could have been better assessed and developed. For instance, bundling together on-grid and off-grid activities and investments into one project to be implemented all over the country's territory resulted in a complex and ambitious operation that was difficult to implement in the field. It was advisable to either split the project into two separate projects, one addressing energy T&D issues in the urban areas and another one focusing on charting a new approach for rural electrification and promoting renewable energy, or reduce the number and scope of activities under each component.

133. **In-depth technical, financial, and economic analyses were carried out at appraisal to support project feasibility and profitability, but in the field, some assumptions did not materialize, especially for the off-grid investments.** The project approval relied on a well-researched analysis, which established technical feasibility and found that EIRRs and NPVs of all key investments were highly positive. During implementation, on-grid investments were completed as designed, but the off-grid investments faced challenges, and the scope of investments was curtailed, reducing the expected economic and financial benefits. The on-grid investments were achieved as planned, although with increased budgets, while the scope of the planned off-grid investments could not be achieved, because of issues related to the design of the approach for stand-alone solar home systems, weak technical capacity of promoters of small power generation projects, and the inability of the banking system to provide funding on time. The latter shortcoming triggered the inception of the credit line that supported the SPPs, but it faced its own challenges and the credit line could not be fully disbursed.

134. **Project implementation arrangements related to fiduciary, M&E, and social and environmental issues were overall well devised, but their performance varied from one category of infrastructure to another.** Arrangements in the on-grid context were based on the principle that borrower institutions and staff had had sufficient exposure to World Bank procedures and could then carry out the needed oversight of the abovementioned implementation aspects. To strengthen the fiduciary capacity of implementation agencies, there were action plans to improve skills of the procurement and financial management staff. Arrangements related to M&E and social and environmental aspects, in the on-grid context, were appropriate and effective in facilitating project implementation. In the context of off-grid investment, implementation arrangements related to fiduciary, M&E, and social and environmental issues faced

severe shortcomings and had to be readjusted to cope with the situations in the field. Regarding the financial aspects, a new credit line had to be envisioned to make up for the weaknesses of the local banking sector affected by the global crisis, so that the SPPs could get adequate funding. Similarly, the SPP had difficulties in designing a bankable project and handling the social and environmental aspects of their projects proposals. All these difficulties led to delays in the implementation of the off-grid component and reduced disbursement of the credit line resources.

135. **While key project risks were correctly identified at appraisal, others were not, and some of those that materialized could not be mitigated.** A major unidentified risk that materialized was the 2008 global financial crisis that weakened the local banking sector that could not provide financing on time to the SPPs. While it is unrealistic to expect the project to have been able to predict this, the financial crises did have an impact on the project. Other unidentified risks that affected project implementation were (a) the change in the legislature after the 2015 elections that reduced the thrust of reforms in the power sector and (b) the governance issues surrounding the IPTL that weakened the borrower's leadership in implementing power sector reforms. Due to these factors, the thrust of the reform in the power sector was diminished and affected the pace of project implementation. For instance, TANESCO ignored tariff orders and regulations related to SPPAs from the posting of the Second Generation SPPA rules in 2015, and the SPP sector did not move forward for the final two years of the project. An identified risk that continued to affect project implementation was the weaknesses of procurement capacity (especially in TANESCO) that continued for a long time, until a procurement adviser was hired to support TANESCO in 2014, to complete the procurement of the last lots of T&D infrastructure. In all, the World Bank overestimated, at appraisal, TANESCO's capacity to ensure smooth and rapid implementation of the grid component.

Quality of Supervision

136. **Weaknesses in the project design and readiness, relatively frequent turnaround of many TTLs, and some of them not resident, are factors that slowed down project supervision and implementation.** Bundling together on-grid and off-grid investments, having two (and then three) implementing agencies of different caliber without clear protocol of collaboration was not a recipe for operational efficiency. Moreover, a total of six TTLs designed and supervised the project; and throughout the 10 years of project implementation, there were instances when there was no resident TTL, making it difficult to support the implementing agencies.

137. **Lack of expertise in the implementing agencies (TANESCO, REA, and MEM) to swiftly handle procurement and safeguards issues was the key factor that explains most of the delays in project implementation.** Resolving procurement and safeguards challenges accounted for much of the delays in project implementation (see paragraphs 111 and 118 for detail). This was exacerbated by the complexity of project components and the absence of resident TTLs for part of the project implementation period. Expertise in procurement and safeguards was brought in late, and the accumulated delay could not be undone. The World Bank needed proactivity and speed in supporting the PIUs in addressing their shortcomings in handling procurement and safeguards issues.

138. **The pursuit of the PDOs by TTLs remained at the center of the project supervision.** A key decision toward focused supervision consisted in appointing two TTLs, one overseeing the completion of on-grid investments and another one in charge of the off-grid activities. Two TTLs concomitantly shared the

burden of supervising a complex project. This arrangement allowed regular presence of two TTLs during supervision missions to support the implementation agencies in their efforts to improve urban energy T&D infrastructure and promote rural electrification through renewable energy. There were instances when the TTLs alternated their field supervision missions, thus extending the TTL's presence with the borrower institutions. In both cases, the goal was to increase the number of project beneficiaries in the urban and rural areas by providing upgraded, efficient, and appropriate infrastructure.

139. **Supervision missions were well staffed and regular.** More than 20 missions visited the country to support the implementing agencies during the project life. The TTLs were generally accompanied by multisector specialists and consultants to advise the team on the best ways to address implementation hurdles in the field. However, the continuous presence of resident TTLs throughout project implementation could have made a difference in the pace of resolving many implementation obstacles. The frequent turnaround of TTLs led to inefficiencies and delays provoked by the time needed for new TTLs to acquaint themselves with the project and country realities. Despite repeated delays and situations requiring immediate solutions to step up the pace of implementation, a permanent resident TTL was dispatched to the country office only two years after the project effectiveness to ensure a closer supervision of the project and proactively accelerate the achievement of results. During 2010–2017, two subsequent resident TTLs continuously oversaw all the TEDAP activities.

140. The reporting on progress toward the project's identified results was regular and comprehensive, but a reporting fatigue appeared toward the end of the project life, which reflected the TTLs' engagement in the preparation of a follow-on operation. During the major part of project implementation, the project team prepared detailed Aide Memoires, and on a regular basis, prepared and filed ISRs. A total of 17 ISRs were prepared during the project life period, and each time, data pertaining to the Results Framework were updated. However, during the last two years of the project life, after the last minute and unexpected requests for extensions of the project closing date by the borrower, first from March 2015 to June 2016 and then from June 2016 through September 2017, a reporting fatigue appeared, whereby the follow-up with the borrower on approval of Aide Memoires was rather sluggish. While this reflected the fact that the World Bank staff were busy preparing a follow-on project, it mattered that TEDAP be properly supervised and closed to ensure that the new project builds a strong foundation.

Justification of Overall Rating of Bank Performance

141. On balance, the World Bank performance is rated Moderately Satisfactory. The project's quality at entry and supervision had strengths and weaknesses, but the World Bank accommodated multiple demands and showed flexibility and resilience in implementing a complex project. Despite a difficult context, the project team carried out continuous dialogue with key project stakeholders, and significant outcomes were achieved in the field.

D. RISK TO DEVELOPMENT OUTCOME

Rating: Moderate

142. **Sustainability of the achieved outcome in the areas of service quality and efficiency in the energy sector will depend upon the Government's willingness to stay the course with the sector reform agenda.** While achievements in upgrading T&D infrastructure in the three main cities are irreversible,

performance in the areas of service quality and efficiency of the energy sector will depend upon the Government's consistency in continuing the reforms of liberalizing the sector and getting the private sector to invest in the energy sector. A few ongoing contracts with large IPPs, to which TANESCO has historical payment arrears, and a prolonged suspension in signing SPPAs continue to cast a shadow on the outlook for the private sector engagement in the modernization of the energy sector in Tanzania in general. In the absence of a shared vision among the sector stakeholders, the Government's policy toward private sector participation in future generation projects remains unclear, and this will determine the sustainability of the achieved outcome. Finally, sustainability also critically depends on TANESCO's financial situation and ability to invest in grid infrastructure and address critical bottlenecks and warrant T&D maintenance.

143. **Long-term sustainability of project outcomes in rural and renewable energy will require (a) the Government's commitment to diversification of the country's power generation mix and rural electrification, (b) the engagement of the private sector and the resumption of the sector reform, and (c) continued support by development partners.** The future of the Government's behavior toward reforming the power sector and the short- to medium-term directions of the Government's reforms cannot be forecast, because of sector complexity. While the current authorities have shown the willingness to improve governance and efficiency in all sectors of the economy and have advocated for increased progress in rural and renewable electrification, there are signals of ambiguity regarding the Government's commitment to see continued TANESCO reform and pursue greater private sector engagement in the development of the power sector. One indicator showing the Government's interest in the power sector development is that it committed 65 percent of the resources to be disbursed to the energy sector in the context of the World Bank's PforR approved by the World Bank in May 2016, as indicated in Table 88. In the same vein, several external partners are committed to support the Tanzanian program of rural and renewable energy.

Table 8. Program Financing (NREP[9], 2016–2022)

Source	Amount (US$, millions)	% of Total
GoT	900	**65**
IDA	200	**15**
SIDA	70	**5**
Scaling up Renewable Energy Program	25	**2**
U.K. Department for International Development	42	**3**
European Union	50	**4**
Government of Norway	80	**6**
Total	**1,327**	**100**

Source: PAD-Report No. 103827.

144. Based on the Government and donor financial commitment, the risk to development outcome for the project's achieved outcome in the rural and renewable energy is rated Moderate.

[9] National Rural Electrification Plan

V. LESSONS AND RECOMMENDATIONS

Overall

145. **The intertwined relationship between the project design and implementation capacity is salient in determining project scope, complexity, and role for TA.** While many context-specific factors affect the project design, the constraints imposed by the capacity of the implementing agencies on project design and the burden of design complexity on implementation capacity must be simultaneously considered. The large scope and complex set of activities under TEDAP posed difficulties for both the client to implement and the World Bank to supervise. To mitigate this, the project allocated resources to build technical capacity, not only of the government implementing agencies but also the private sector and PFIs. While some of the capacity building was not implemented in the end, TA helped overcome some of the capacity challenges. In addition to capacity strengthening, and to the extent feasible, a reduction in scope or a simplification of design should be considered during preparation or based on the experience during early years of project implementation—for example, where implementation modalities are similar across a large set of activities, not requiring a separate follow-up with multiple entities.

146. **The approach to off-grid electrification laid the ground for similar engagements in other countries in the region.** The credit line for renewable energy development, introduced during the restructuring in 2010, was one of the first such instruments used in the energy sector in Sub-Saharan Africa. The credit line was a recognition of the importance of long-term credit for SPP developers and constraints faced by them in raising debt in the financial markets. The design of the credit line, implemented through local financial intermediaries, laid the ground for similar approaches to off-grid electrification in other countries such as Uganda, Rwanda, and Kenya. Similarly, the full project cycle approach to private sector-led off-grid electrification—from market analysis, to project identification and feasibility study, to capital cost buy-down through matching grants, and finally support for access to credit—was a fairly new approach for the region but has since become a standard part of the toolkit for the support for off-grid electrification. TEDAP has also helped pave the way for a follow-on World Bank project in Tanzania by establishing (a) a conducive institutional and regulatory framework to promote rural electrification, (b) SPPs/mini-grids throughout the country, and (c) an ecosystem of local entrepreneurs and SPP developers. The regulatory framework for the SPPs developed with support under the project was key to enabling the growth of the SPPs in Tanzania and is considered, across the region, as a best practice example for other countries to learn from. Several countries, including Nigeria, Kenya, and Rwanda, have since adopted their mini-grid regulatory frameworks, building on the principles of the Tanzanian framework.

147. **Less prescriptive approaches allow better adaptation to dynamic markets.** SSMP-1 faced challenges in implementation. This was partly due to the designed approach that relied heavily on government procurement and was not adaptable to changing market circumstances. The design of the follow-on phase, SSMP-2, did not seem to adequately take this experience into account. With the growth of private sector providers in the solar home system market, technological innovation has led to the development of innovative business models. In such a dynamic market, an adaptable approach that addresses key bottlenecks (or market failures) without imposing unnecessary constraints is the preferable option. Increasingly, this is the approach being adopted across the region for off-grid electrification.

148. **A conducive and consistent operating environment is an important factor for successful project implementation.** A conducive policy and regulatory environment, bolstered by a constructive and consistent policy dialogue, can increase returns to project investments and project effectiveness. Project implementation has shown that government policy action in lowering connection fees and tariff adjustments increased the ability of the utility to deliver on access and efficiency targets, both overall and in the three growth centers targeted under the project. At the same time, transparent and comprehensive regulatory framework for SPPs helped spur the industry and increased the effectiveness of the support provided under the project. Despite this, in recent years, there has been a shift in the Government's strategy with regard to tariff determination, private sector participation, and the application of the SPPA regulations in practical terms. This has implied pressure on TANESCO's finances and its ability for timely payment of the bills of SPPs connected to the TANESCO's grid. Besides the price and payment uncertainty, the signature of new, or the renewal of the earlier signed, SPPAs between TANESCO and SPPs has slowed down, thus creating doubt for SPPs' engagement in power generation undertakings. The Government's clarity regarding the role to be played by the private sector in energy generation and associated policies are essential to maintain the momentum of the private sector and donor engagement.

149. **For projects with T&D infrastructure components, reducing delays requires that the procurement and social and environment safeguards aspects are carefully addressed during preparation, appraisal, and implementation.** Much of the delays of TEDAP implementation arose from shortcomings in procuring goods and in getting the right-of-way cleared for T&D lines, including related social settlements. The implementing agencies must not only have experts in procurement and environment issues, but the design of T&D infrastructure in urban densely populated settings need to give priority to identifying the RAP requirements at appraisal (Kurasini, Mbagala), by making sure that the right-of-way is warranted when the project is launched. During implementation, coordination among the World Bank staff, the PIU, and the staff of the contractors must be prompt in settling procurement and safeguards issues.

150. **Creating and operationalizing REA was one of the project's key contributions, and there are many lessons learned from its 10 years of operation.** The TEDAP value added was to transform the Government's vision of rural electrification into reality through institutional strengthening. REA was created with support through TEDAP and has currently reached organizational maturity. Institution building is a long-term process, which goes beyond a capacity-building component in the project. It requires a long-term engagement to build capacity through learning by doing and adjusting approaches along the way to take on more responsibility. In the case of REA in Tanzania, the initial focus was on off-grid, but the project also helped increase the capacity to undertake grid electrification, which currently is REA's main responsibility. Further, as electrification efforts accelerate in Tanzania—both in the urban and rural areas—the need for coordination between REA and TANESCO is increasingly important. A clear definition of roles, responsibilities, and coordinating modalities would facilitate harmonization of efforts and prevent inefficiencies. This is important for the both on-grid and off-grid investments. A part of the solution is adequate national-level electrification investment planning. Adequate planning helps set clear pathways for electrification expansion and enables allocation responsibilities. There are ongoing efforts toward increased coordination and planning, but more efforts are possible. In addition, a systematic assessment of REA's performance over its first 10 years of operation could be an effective way to prepare it for the immense task of rural electrification and draw on lessons learned.

151. **Complementary support through effective donor coordination can considerably enhance**

project efficacy. Coordination with other donors, such as JICA, Norwegian Agency for Development Cooperation (NORAD), SIDA, and U.K. Department for International Development, was an important part of the achievement of project results. Complementary donor activities in the sector not only helped create a conducive policy environment, but also put in place complementary investments to ensure achievement and sustainability of project outcomes.

ANNEX 1. RESULTS FRAMEWORK AND KEY OUTPUTS

A. RESULTS INDICATORS

A.1 PDO Indicators

Objective/Outcome: To improve the quality and efficiency of the electricity service provision in the three main growth centers of Dar es Salaam, Arusha, and Kilimanjaro, and to establish a sustainable basis for energy a

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Improvement in service quality as measured by increase in end user voltage	Number	190.00 31-Oct-2007	218.00 31-Mar-2012	218.00 04-Mar-2010	220.00 29-Sep-2017

Comments (achievements against targets): Exceeded. The end user voltage reached the level of 220 volts, slightly exceeding the target. In particular, 220V was obtained in Arusha and Kilimanjaro regions after completion of KIA 132kV substation which enabled stability of voltage in the districts of those regions.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Generation Capacity of Hydropower constructed or rehabilitated under the project	Megawatt	0.00 31-Oct-2007	17.00 29-Sep-2017	25.00 09-May-2011	25.45 29-Sep-2017
Generation Capacity of	Megawatt	0.00	17.00	25.00	25.45

Hydropower constructed under the project		31-Oct-2007	29-Sep-2017	09-May-2011	29-Sep-2017

Comments (achievements against targets): Exceeded. 25 MW were installed, exceeding the target by 47 percent, including the number of MW of grid-connected SPPs: Tanwat (1.5 MW), TPC (9 MW), Mwenga (4 MW), Ngombeni (2.5 MW), Tulila (7.5MW), and Darakuta (0.95MW).

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
TANESCO Customer Satisfaction	Percentage	30.00 01-Jan-2009	30.00 31-Mar-2012	75.00 29-Sep-2017	62.00 29-Sep-2017

Comments (achievements against targets): Partially achieved. The target for improved customer satisfaction was missed by 13 percentage points, as customer satisfaction recorded was 62 percent against a target of 75 percent.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Improvement in collection efficiency	Percentage	70.00 31-Oct-2007	95.00 31-Mar-2012	95.00 04-Mar-2010	94.00 30-Jun-2017

Comments (achievements against targets): Basically achieved. TANESCO's collection efficiency has improved dramatically over the course of the project. The target was eventually missed by only 1 percentage point for the full fiscal year 2016/17 (ending June 30, 2017), thanks to better payment enforcement and higher penetration of pre-paid meters. TANESCO's collection efficiency is now one of the highest in the region.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion

Electricity losses per year in the project area	Percentage	28.00 31-Oct-2007	21.00 31-Mar-2012	21.00 04-Mar-2010	16.44 29-Sep-2017

Comments (achievements against targets): Exceeded. Result of measures to enhance transparency and accountability in TANESCO's operational performance, as well as investments in on grid strengthening with the TEDAP project support. Performance is expected to increase even more when all T&D upgrades are operational by end-2017 and beyond.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
REA is fully functional as demonstrated by: (i) capacity to develop, finance and implement scale up of pilot schemes; and (ii) pipeline of new rural household connections.	Text	(i) Not completely functional organization (ii) 0. 31-Oct-2007	(i) REA identifies and approves new connections; (ii) 40,000 connections. 31-Mar-2012	(i) REA identifies and approved new connections (ii) 50,000 connections. 30-Mar-2015	(i) REA has a fjully functional organization structure; (ii) 71,966 connections. 29-Sep-2017

Comments (achievements against targets): (i) Achieved. REA has a functional organization structure, and has shown capacity to develop, finance and implement the scale-up of pilot schemes. A review of the organizational structure has been approved by the Board. Procurement Management Unit has been strengthened. Apart from Off-grid activities, REA mandate has been expanded to include numerous n-grid activities.
(ii) Exceeded. The target was exceeded by 80 percent, as rural households' connections reached 71,966 against a target of 40,000. These include household connections from operating SPPs and projects supported by the Lighting Rural Tanzania and REA's co-financing to TEDAP.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Direct project beneficiaries	Number	16200.00	20000.00	114000.00	206149.00

		01-Sep-2010	01-Sep-2010	09-May-2011	29-Sep-2017
Female beneficiaries	Percentage	0.00 01-Sep-2010	10000.00 01-Sep-2010	57000.00 09-May-2011	103074.00 29-Sep-2017

Comments (achievements against targets): Exceeded. The target was exceeded by 81 percent, the number of beneficiaries reaching the number of 206,149, against a target of 114,000, and reflecting the push by the Government for increased rural electrification and REA's full operational functionality.

A.2 Intermediate Results Indicators

Component: Component A: On-grid investments

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of persons provided with access to electricity under the project by household connections (Component A)	Number	0.00 31-Oct-2007	0.00 31-Oct-2007	25000.00 09-Sep-2015	30933.00 29-Sep-2017

Comments (achievements against targets): Exceeded. The target of 25,000 households was exceeded by 24 percent and reached 30,933 at end-2017, with connections during October-December 2017 occurring as follows: Arusha =4405, Ilala = 1061, Kinondoni North = 570, Kilimanjaro = 737, Kinondoni South = 165, and Temeke for 150.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of subproject	Text	0	0	10	65

transactions concluded by REA		31-Oct-2007	31-Mar-2012	05-Sep-2011	29-Sep-2017

Comments (achievements against targets): Far exceeded. REA's performance was buoyed by the push from the GoT and availability of resources: 40 Matching Grants, 7 Performance Grants, 5 Credit Lines, SSMP I, 8 SSMP II, 3 LRTC, and 1 Low Cost Design.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Replacement of 60, 000 credit meters with prepaid meters completed	Text	0 31-Oct-2007	60,000 credit meters installed. 31-Mar-2012	60,000 credit meters installed. 05-Sep-2011	85,000 meters installed 29-Sep-2017

Comments (achievements against targets): Exceeded. 85,000 prepaid meters were installed, exceeding the target by 42 percent.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Distribution lines constructed or rehabilitated under the project	Kilometers	0.00 31-Oct-2007	0.00 31-Oct-2007	282.00 30-Mar-2015	184.00 29-Sep-2017
Distribution lines constructed under the project	Kilometers	0.00 31-Oct-2007	0.00 31-Oct-2007	282.00 30-Mar-2015	168.00 29-Sep-2017

Comments (achievements against targets): Partially achieved. The completed new constructed and rehabilitated distribution lines are all in operation. The total distribution line length reached 184.408 km in all three regions (DSM, Arusha and Kilimanjaro) and fell short of the target by 35 percent.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Transmission lines constructed or rehabilitated under the project	Kilometers	0.00 31-Oct-2007	0.00 31-Oct-2007	57.10 30-Mar-2015	37.10 29-Sep-2017
Transmission lines constructed under the project	Kilometers	0.00 31-Oct-2007	0.00 31-Oct-2007	57.10 30-Mar-2015	37.10 29-Sep-2017

Comments (achievements against targets): Partially achieved. About 37.4 km of transmission lines were completed, achieving 65 percent of the target. 13 km for Ubungo-Kurasini portion cannot be implemented now due to a road expansion project by TANROADS, which affects the way leave. 1.3 km for Mzinga Creek, procurement and installation works are progressing with expected time of completion 31st March 2018.

Component: Offgrid Investment Framework and Pilot Investments

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of banks accessing REA capacity building services	Text	0 01-Sep-2010	3 31-Oct-2007	3 05-Sep-2011	8 29-Sep-2017

Comments (achievements against targets): Exceeded. 3 rounds of training workshops to 7 Banks, and 2 rounds of coaching sessions. The Banks with staff trained by REA include TIB, CRDB, NBC, NMB, ECO Bank, Stanbic Bank, Azania Bank and UBA.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of PFI loans approved	Text	0	0	4	5

for rural/renewable energy sub-projects		01-Sep-2010	31-Oct-2007	05-Sep-2011	29-Sep-2017

Comments (achievements against targets): Exceeded. The target of 4 PFIs loans was exceeded, as five were approved as follows: Mwenga (4 MW), Andoya (500 kW) twice, Ngombeni (1.5MW), and Darakuta (0.95MW).

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Delivery of MW of renewable energy by grid connected SPPs under Standard PPA/Ts	Text	SPPA/Ts signed for 0 MW 31-Oct-2007	SPPA/Ts signed for 12 MW 31-Mar-2012	SPPA/Ts signed for 20 MW 05-Sep-2011	SPPA/Ts signed for 58.3 MW 29-Sep-2017

Comments (achievements against targets): Exceeded. The target was overly exceeded, with SPPAs formally adopted by EWURA; 12 SPPAs signed, with aggregate export capacity of 50.3 MW, and installed Capacity totaling 58.3 MW. There are also 15 letters of intent with potential installed capacity of 70.9 MW.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of indirect beneficiaries, of which number of women (Component B)	Text	0 31-Oct-2007	250,000 persons, out of which 125,000 women 31-Oct-2007	250,000 persons, out of which 125,000 women 05-Sep-2011	488,040 of which 244,020 women 29-Sep-2017

Comments (achievements against targets): Exceeded. The target was almost doubled (with an increase of 95 percent), indirect beneficiaries being estimated at 488,040 against a target of 250,000, half of the beneficiaries being women.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of community electricity connections under the project (Component B)	Text	0 31-Oct-2007	800 31-Oct-2007	1200 05-Sep-2011	996 29-Sep-2017

Comments (achievements against targets): Not achieved. The target of community connections was missed by 17 percent, as community connections completed are estimated at 996 against target of 1,200. These include dispensaries, health centers, secondary schools, staff houses, police posts and public lighting.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of persons provided with access to electricity under the project by household connections (Component B)	Text	0 31-Oct-2007	0 31-Oct-2007	110000 30-Mar-2015	144,622 29-Sep-2017

Comments (achievements against targets): Exceeded. New rural population connected to electricity was 694,189 or 144,622 households at the rate of 4.8 persons per household. The target was exceeded by a factor of 10, due to contribution from SPPs, LRT1, SSMPI and capacity building.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Use of Standard PPA/Ts in signing additional MWs of renewable energy	Text	No 31-Oct-2007	Yes. 31-Oct-2007	Yes. 05-Sep-2011	Yes. 30-Mar-2017

Comments (achievements against targets): Achieved. The third generation of the standard PPA/Ts methodology was adopted by EWURA and is in use.

B. KEY OUTPUTS BY COMPONENT

Component A: On-grid Investments	
Subcomponent A.1: Transmission and Distribution Upgrade Investments	**Extension of two existing substations** • Extension of the existing 220/132/33/11 kV Ubungo Substation. There was installation of the GIS, 132 kV cables and sealing ends, support insulators, telecom panels, and protection and control panels in the Ubungo Substation. • At the Factory Zone III 220/132/33/11 kV substation, civil works, including false floor and false ceiling in the control room extension, rehabilitation of the control building, additional earthing works, including switchyard gravelling, and most of the electrical and mechanical installation, including cabling and wiring. **Supply and erection of three new 132/33 kV substations** • **At Factory Zone II Substation.** The construction of the control and switchgear building (including false floor/ceiling) and the equipment foundations, their steel structures in switchyard and installation of high voltage equipment, and the cabling and wiring works were completed. • At Mbagala Substation, the site works (construction) for the substation were completed for control and store buildings; completion of the high voltage equipment foundations and steel structures and the completion of the installation of high voltage equipment. The cabling and wiring works and the pre-commissioning works completed. • At Kurasini Substation, the pre-commissioning works for this substation are subject to the connections of 132 kV transmission lines (Mbagala-Kurasini and Kurasini-Ubungo). However, the cabling and wiring works are still in progress at the Mbagala Substation and the connections of 132 kV transmission lines (Mbagala-Kurasini and Kurasini-Ubungo) and their commissioning are tied to the completion of the Mzinga Creek crossing, and the 13 km for Ubungo-Kurasini portion cannot be implemented now due to a road expansion project by TANROADS, which affected the wayleave. The ICR mission was informed by the TTL that TANESCO is committed to completing, in the near term, the remaining work on these infrastructures using its own or other resources. **Transmission lines, Dar es Salaam** • **Kurasini-Ubungo transmission line.** The pre-commissioning and commissioning of the transmission line was planned for Q1 and Q2 of 2016, respectively. TANESCO has released the route approval for 132 kV Kurasini-Ubungo transmission line and the profile and the pole distribution plan to the contractor. However, the purchase/manufacturing of newly designed poles is subject to approval of a change order proposal of about US$6 million and the revised Letter of Credit being received by the contractor's bank • **Mbagala-Kurasini transmission line.** The contractor has completed accessible lattice tower foundations and structural installations for the 132 kV Mbagala-Kurasini transmission line in all but nine locations where landowners have not yet consented. TANESCO is working with these remaining landowners to resolve the issue enabling the installation to move ahead. The contract for the Mzinga Creek crossing has also been signed and the contractor has started the work. • **Factory Zone II - Mbagala transmission line.** 7.4km of steel polygonal tubular poles is completed and in full operational.

	• **Factory Zone III** - **Factory Zone II transmission line.** The contractor started the foundation and pole erection works for Factory Zone III - Factory Zone II transmission line. However, due to high water level/table and the existing medium voltage lines on the route, these works were stopped temporarily in early August 2014. Foundation works and erection are in progress, pending approval of change order proposal for pile foundations in wet areas • About 93% of the T&D upgrade investments have been completed. The remaining issue is the completion of the transmission lines in Dar es Salaam, to which TANESCO and MEM would need to devote specific attention to ensure their completion. These include transmission alignment from Kurasini to Vijibweni, at the Mzinga Creek, which is currently at 10% completion, and completion of the remaining 5.61 km and 19 pile foundation poles around Mbagala Substation. The remaining works will be financed by TANESCO. The 13 km for Ubungo-Kurasini portion cannot be implemented now due to a road expansion project by TANROADS, which affected the wayleave. • Transmission lines in Dar es Salaam and Arusha were laid for 57 km. **KIA Substation, Kilimanjaro Region** **Extension of an existing substation** • The upgrade of the KIA Substation, which was energized with 6 x 33 kV feeders and 2 x 20 MVA power transformers, supplying reliable power to the designated customers. The internal/external tarmac roads have also been completed.
Subcomponent A.2: Distribution System Upgrade Investments	• Construction of six new substations in Dar es Salaam was completed at City Center, Factory Zone I, Factory Zone II, Mburahati, Mikocheni, and Oysterbay. • Rehabilitation of five existing substations in Dar es Salaam located at Ubungo, Kariakoo, Kurasini, Chang'ombe, and Mbagala. • Supply and installation of plant and equipment at eight new substations in Arusha and Kilimanjaro. In Arusha, two new substations were completed at Sakina and Njiro B, and four substations were upgraded at Mt. Meru, Kiltex, Themi, and Unga Ltd. In Kilimanjaro, two substations were upgraded at Boma Mbuzi and Trade School. • Distribution lines in Dar es Salaam, Arusha, and Kilimanjaro (33 kV/11 kV overhead lines and 33 kV underground cables) were laid for 184 km.
Subcomponent A.3: On-grid Access Expansion	• Procurement of 10,000 pieces of three-phase split type prepayment meters through its own counterpart funds. TANESCO successfully completed the procurement of an initial batch of 5,000 meters all of which are already installed. • An additional 8,000 three-phase meters have been installed and thereby the target number of meters installed and financed by TANESCO's own funds has been not only achieved but exceeded. • 85,000 prepaid meters were installed, funded by TEDAP and TANESCO own funds.

Subcomponent A.4: Commercial and Institutional Capacity Development	• Consultancies for project management provided by Fichtner; see Subcomponent A.5. • Installations of solid state remote meters and centralized call center for Dar es Salaam and high-value customer cell were cancelled by TANESCO, with plans to procure them using its own resources.

Subcomponent A.5: On-grid Technical Assistance for Implementation	• TA contract with Fichtner
	  ○ Consultancy services for training, supervision of TEDAP investments, and project management - Subcomponent A.1 (transmission)
	  ○ Consultancy services for preparation of bid packages for TEDAP - Subcomponent A.1 (distribution)
	  ○ Consultancy services for training, supervision of TEDAP investments, and project management - Subcomponent A.1 (distribution)
	  ○ Planning, design, bid documents, evaluation for high voltage distribution cluster
	• Procurement expert provided
	• Corporate IT system for TANESCO acquired
	• Consultancy services for CMS were cancelled due to budget shortfalls. The following activities could not be implemented: (a) incorporation of CMS to improve operational procedures and customer information; (b) incorporation of TSMS to attend to customers claims; and (c) incorporation of RMS, including definition of new operational procedures.
	• Design and implementation of the centralized call center and high-value customer cell: TANESCO cancelled these activities, intending to achieve them using its own funds.

Component B: Off-grid Investments	
Subcomponent B.1: Small Power Project and Distribution Component	**<u>See B Reducing the cost of distribution networks</u>** • A low-cost distribution pilot to develop new techniques and implementation approaches aimed at reducing the costs of distribution networks could not be implemented.
Subcomponent B.2: Sustainable Solar Market Development	See part B of this annex.
Subcomponent B.3: Off-grid Technical Assistance	
Subcomponent B.4: Rural/Renewable Energy Credit Line	• The credit line facility was established in 2010 with a seed fund of US$25 million. Between 2010 and the project closing date, a total of US$5.77 million has been disbursed in favor of four SPPs: Andoya (2 loans), Darakuta, Mwenga hydropower projects, and Ngombeni biomas gasification project. • Seven commercial banks have been approved by the central bank to refinance renewable energy projects using funds from the credit line facility. The short-listed banks are National Bank of Commerce (NBC), National Microfinance Bank (NMB), CRDB Bank, Azania, Stanbic, Ecobank, and United Bank of Africa. • The undisbursed amount of the credit line was reallocated in June 2007 to pay for completed activities under Component A.
Component C: Technical Assistance	

Subcomponent C.1: Provided to TANESCO	• Mainstreaming implementation of the KST reintroduction management plan advisory • Technical visit of TANESCO management (10 people), engineering assessment for SPP (6 people), utility operation with SPP interconnection (6 people) to China and REA staff participated
Subcomponent C.2: Provided to Government	• Legal advisers for Ruhudji Hydropower Project • Financial adviser for Ruhudji Hydropower Project • Technical adviser for Ruhudji Hydropower Project • Report on the KSTs

B: KEY OUTPUTS FROM TRUST FUNDS ASSOCIATED WITH TEDAP	
A: *The Global Environment Objective Trust Fund (US$6.5 million at appraisal, actual of US$6.4 million)*	
GEO: The Global Environment Objective (GEO) was to abate greenhouse gas emissions through the use of renewable energy in rural areas to provide electricity	• A total of 38 matching grants were provided to SPPs developers in several districts and regions of the country. The key output was the completion of part or all of three reports (feasibility study, business plan, and ESIA for each of the promoters that received the matching grant. • Potential connections from those projects could amount to 122,000 households, and total installed power capacity could reach 108.2MW. • A total of 7 performance grants were provided to 7 private promoters in the districts of Njombe, Mufindi, Ludewa, Mbinga, and Kilolo. The key output was the construction of distribution networks to connect power to district villages. • Potential households that could be connected could reach 10,860, and total installed power capacity for distribution is expected to reach 8.8 MW. • Results achieved under the pilot SSMP-1 in the Sumbawanga District included solar power being provided to 35 dispensaries, 6 health centers, 9 secondary schools, 7 dormitories, 71 staff houses, 9 police posts, and 240 public streetlights. • However, marketing beyond the public sector to private households never occurred and the maintenance of the public equipment was not adequately undertaken despite the signing of a maintenance Memorandum of Understanding with the local authorities. • The GEF grant provided full support to SSMP-1 through the Ministry of Energy, but the contractor hired for SSMP-1 was not effective at stimulating the local market for solar home systems. • Contracts under SSMP-2 were won by two private firms: SINOTEC and REX. REX, a local firm, did not prove to be very effective at the SSMP model and its contracts were eventually cancelled. But SINOTEC has shown ability to master the complex business model required and has sold roughly 70,000 household systems under its contract. • Achievements under SSMP-2 include the installation of a total energy capacity of 484.24 kW out of a planned 526 kW in the localities of Sikonge, Chato, Kasulu, Kibondo, Tunduru, and Namtumbo. In those localities, 66 schools, 142 dispensaries, 19 health centers, 12 police posts, and 755 staff houses were provided with solar power, and 1,648 streetlights were installed. • Finally, an energy capacity of 6.6 kW out of a planned 135 kW was installed in the localities of Bukombe and Biharamulo. In those localities, work is still in progress, but 2 schools, 2 dispensaries, 2 health centers, 2 police posts, and 2 staff houses were provided with solar power, and 2 streetlights were installed. • Technical assistance key achievements include the following: (a) feasibility studies and partial cost subsidies for building distribution networks, (b) support for the creation of favorable regulatory environment to encourage private investment in renewable SPPs, (c) pre-feasibility study of small hydro projects, (d) implementation support to REA II, (e) wind resources assessment for six sites, (f) Internet configuration and

	web hosting, (g) a two-year consultant hired to provide advisory services to MEM/REA in bringing the SSMP contracts to financial closure, (h) support to MEM/REA in supervision and monitoring of contracts, and (i) training to district environmental management officers and training support provided to the NEMC.
B. The Russian Energy Small and Medium Enterprise (US$6.5 million at appraisal, actual of US$1.7 million)	
PDO: To support the provision of reliable, sustainable and affordable modern energy services in rural Tanzania by promoting local entrepreneurship and investment in renewable energy development, while ensuring carbon emission reduction.	• A CDM program of activities was launched in several districts. Several eligible projects were identified as prospective receipts of the grant. In several regions solar, wind, solar/wind hybrid, and biomass technologies were proposed as a part of the 25 projects which aimed to generate electricity for households, schools, and health centers for an expected capacity of 305 kW. • However, many of the identified eligible projects did not reach the benchmark level of preparedness to access the grant. In the end, only 26 percent of the grant resources were disbursed. • The projected annual generation of the seven beneficiary SPPs is estimated at 52,185 MWh per year, with a contract volume of 297,324 carbon emissions reduction (tCO_2) and a green generation performance value of €1.2 million.
C. The AREAP Trust Fund (US$1.0 million at appraisal, actual of US$1.0 million)	
PDO: To facilitate the development of sustainable business models to bring efficient, clean, and affordable lighting services to the Tanzanian poor.	• A total of 25 solar, wind, or solar/wind mixed micro-projects were identified and funds were disbursed to undertake feasibility studies and appraisal. • The expected results and efficacy in terms of installed power generation capacity and the potential for connection to households are respectively estimated at 305 kW and electricity connection to 20,875 households, 50 health centers, 100 schools, and 4 water pumps.

ANNEX 2. BANK LENDING AND IMPLEMENTATION SUPPORT/SUPERVISION

A. TASK TEAM MEMBERS

Name	Role
Preparation	
Supervision/ICR	
Nataliya Kulichenko, Richard H. Hosier, Patrick Thaddayos Balla	Task Team Leader(s)
Winter M. Chinamale	Procurement Specialist(s)
Mercy Mataro Sabai	Financial Management Specialist
Reinaldo Goncalves Mendonca	Team Member
Thomas E. Walton	Environmental Safeguards Specialist
Gloria Sindano	Team Member
Rahmoune Essalhi	Team Member
Faustina Chande	Team Member
Collins S. Umunnah	Team Member
Kabir Malik	Team Member
Ferhat Esen	Team Member
Ekaterina Romanova	Social Safeguards Specialist
Florentina Nyamwiza Mutafungwa	Team Member

B. STAFF TIME AND COST

Stage of Project Cycle	Staff Time and Cost	
	No. of staff weeks	US$ (including travel and consultant costs)
Preparation		
FY07	69.519	364,774.59
FY08	61.072	327,702.97
FY09	17.340	66,326.99
FY11	0	0.00

Total	**147.93**	**758,804.55**
Supervision/ICR		
FY08	3.357	22,328.99
FY09	23.593	124,991.86
FY10	16.143	107,824.18
FY11	27.644	172,361.06
FY12	34.310	188,848.56
FY13	45.463	265,861.43
FY14	40.910	175,999.96
FY15	55.203	271,854.20
FY16	19.091	71,049.23
FY17	25.939	156,929.21
FY18	32.385	255,567.47
Total	**324.04**	**1,813,616.15**

ANNEX 3. PROJECT COST BY COMPONENT

Components	Amount at Approval (US$, millions)	Revised Amounts During Implementation (US$, millions) 2010/2011	Actual at Project Closing (US$, millions) TANESCO and REA	Percentage of Approval
Component A: On-grid Investments				
Subcomponent A.1: Transmission and Distribution Upgrade Investments	76.30	104.18	89.2	85.6%
Subcomponent A.2: Distribution System Upgrade Investments	5.00	5.00	0.0	0%
Subcomponent A.3: On-grid Access Expansion	10.00	10.00	0.35	3.5%
Subcomponent A.4: Commercial and Institutional Capacity Development	8.05	8.05	0.29	3.6%
Subcomponent A.5: On-grid Technical Assistance for Implementation	4.33	4.33	8.49	196.11%
Unallocated	9.2	0.00	0.00	0%
Subtotal A	**96.18**	**131.56**	**98.33**	**74.7%**
Subcomponent B.1: Small Power Generation and Distribution	9.20	9.20	8.14	88.5%
Subcomponent B.2: Sustainable Solar Market Development	10.30	10.30	11.410	111.6%
Subcomponent B.3: Off-grid Technical Assistance	3.00	3.00	4.62	154.0%
Subcomponent B.4: Rural/Renewable Energy Credit Line	0.00	25.00	7.33	29.3%
Subtotal B	**16.5**	**47.5**	**31.49**	**66.3%**
Component C: Sectoral Technical Assistance	**3.00**	**3.00**	**1.91**[11]	**63.7%**
Total	**111.5**	**181.5**	**131.73**	**72.6%**

[10] REA utilized US$8.77m
[11] TANESCO utilized 1.11

ANNEX 4. EFFICIENCY ANALYSIS

1. The economic analysis at project completion followed World Bank guidance documents (2001, 2014, 2016, 2017a, 2017b, and 2017c) and the World Bank Directive: Investment Project Financing.[12] Following the guidance note (2014), this analysis addressed (a) the project's development impact, (b) the public sector provision or financing as the appropriate vehicle, (c) the World Bank's value added, (d) fiscal and environmental sustainability, and (e) the project justification nexus—results, risks, and economic rationale. The analysis examined the causal chain that links project activities and inputs to these objectives in Annex 1. Results Framework and Key Outputs. The risk and sensitivity analysis to those results were included in section D. Risk to Development Outcome. Major data sources for the analysis are invoices, interim financial reports, contracts, the World Bank's Client Connection website, UNFCCC and other websites, pre-feasibility or feasibility studies, business plans, other reports in the internal World Bank documents, the GoT agencies websites, data websites of the World Bank and IMF, the client, and the World Bank team. Following the ICR Guidance (2017b), the analyses at appraisal in the PAD and at project completion were compared.

2. The economic analysis at project completion covered 99 percent of the total project cost (Belli et al 2001).[13] The reminder were (a) projects grant-funded by LRTC, which lacked co-financing data and other project details and (B) regulatory or sectorwide-related capacity-building activities in Component C, which according to ICR guidance, was to be assessed at the efficacy level. At appraisal, the economic analysis was estimated to have covered 97 percent of the total project cost. To be consistent with the appraisal, the analysis at completion was presented in 2007 prices (in local currency compared to U.S. dollar at appraisal), unless otherwise noted, and a 10 percent discount rate for the economic analysis. However, pursuant to the 2016 World Bank guidance noted earlier, an economic discount rate of 6 percent and an estimated economic discount rate for the long-term project life period available forecast data from 2007 to 2022 estimated at 8.6 percent were also used for the economic analysis as the EOCK, as presented in table 4.1.

[12] OPSPQ (Operations Policy and Quality). 2014. *Investment Project Financing Economic Analysis Guidance Note*; Fay, M., S. Hallegate, A. Kraay, and A. Vogt-Schilb. 2016. *Discounting Costs and Benefits in Economic Analysis of World Bank Projects*; Meier, P. 2017a. *Power Sector Investment Projects: Guidelines for Economic Analysis*; OPSPQ. 2017b. *Bank Guidance Implementation Completion and Results Report (ICR) for Investment Project Financing (IPF) Operations*; World Bank. 2017c. *Guidance Note on Shadow Price of Carbon in Economic Analysis*; World Bank. 2017d. *Shadow Price of Carbon in Economic Analysis Cover Note*. Washington, DC: World Bank.

[13] Included financing from the World Bank only (IDA, GEF, Russian trust fund, and Africa Renewable Energy and Access Program [AFREA]). Actual economic analysis included other financing whenever such data are available. However, because not all co-financing amounts were available, especially the no co-financing amounts of LRTC, to perform the economic analysis, the complete project cost is not available. Therefore, the project cost coverage (percent) of the economic analysis was based on only the World Bank financing. Costs of TA activities financed by the project within the project scope that supported the feasibility, design, construction, and operational and commercial performance of the power supply equipment and infrastructure under the project were included in the completion analysis, which is consistent with the appraisal analysis and the World Bank guidance, that is, Belli P., J. R. Anderson, H. N. Barnum, J. A. Dixon, and J-P Tan. 2001. *Economic Analysis of Investment Operations: Analytical Tools and Practical Applications*.

Key Differences between Appraisal and Completion Analyses

3. Both analysis at appraisal and at completion used the cost-benefit analysis approach, but the completion analysis had the following differences in the overall project:

- Values were estimated or economic values and conversion factors, such as foreign exchange premium (shadow exchange rate),[14] economic opportunity cost of labor shadow wage rate),[15] and so on. Using the true economic value or opportunity cost of an activity to capture the benefits and costs to society is consistent with the World Bank guidance (2001 and 2014).[16]

- Analysis of the entire project was presented in addition to individual activities and components.

- Levelized energy costs, distribution analysis, and risk analysis were presented.

- GHG impacts assessed CO_2e, including CO_2, methane, and nitrous oxide of Components A and B from diesel oil, natural gas, heavy fuel oil, lubricants, kerosene, hydro run of river and biomass residues, and GHG marginal abatement cost and followed the 2017 World Bank guidance on carbon prices. [17]

- Other emissions impacts on health (PM10, NOx, and SOx) were assessed from external combustion engines, including heavy fuel oil, steam and diesel oil engines (mostly high-speed engines, one medium speed as specified in Ngombeni Biomass Project), and internal combustion engines, including diesel oil and natural gas turbines.

4. Component A had the following major differences in the analysis between appraisal and completion.

- The long run marginal cost of generation of US¢6.4 per kWh has been used at appraisal. At completion, US¢10.3 per kWh for 2016–2040, which was estimated in the master plan update of 2016,[18] was used by converting U.S. dollar 2015 prices to Tanzanian shillings 2007 prices.

[14] Estimated based on the methodology by Glenn P. Jenkins. 2008. *Program on Cost-Benefit Analysis on Economic Analysis/Project Appraisal*. World Bank; and Graham Glenday. 2011. *Program on Project Appraisal and Risk Management May 15–June 10, 2011, Economic Opportunity Cost of Foreign Exchange.* Duke Center for International Development.
[15] Estimated based on the methodology by Jenkins, G., and A. Klevchuk. 2006. *Appraisal of El-Kureimat Combined Cycle Power Plant*; Jenkins, G. P, C. Y. K Kuo, and A. C. Harberger. 2011. "The Economic Opportunity Cost of Labor." In Chapter 12. Cost-Benefit Analysis for Investment Decisions. (2011 Manuscript).
[16] Belli, P., J. R. Anderson, H. N. Barnum, J. A. Dixon, and J-P Tan. 2001. *Economic Analysis of Investment Operations: Analytical Tools and Practical Applications*; and OPSPQ (Operations Policy and Quality). 2014. *Investment Project Financing Economic Analysis Guidance Note*.
[17] World Bank. 2017c. *Guidance Note on Shadow Price of Carbon in Economic Analysis*; World Bank. 2017d. *Shadow Price of Carbon in Economic Analysis Cover Note*. Washington, DC: World Bank.
[18] United Republic of Tanzania Ministry of Energy and Minerals. 2016. *Power System Master Plan 2016 Update*.

- **Tariff structure.** At appraisal, an average tariff increase of 40 percent was assumed. The completion analysis encompassed the following tariff increases. On December 24, 2007, through Order Number 07-012, EWURA approved a tariff increase of 21.7 percent. On December 18, 2010, the Authority increased TANESCO's tariffs by 18.5 percent. On January 15, 2012, the Authority approved an emergency tariff increase of 40.29 percent against a request of 155 percent to cater to increased operational costs due to Emergency Power Projects (EPPs) and excessive use of TANESCO's own thermal plants.[19] In the 'Multi Year Tariff Adjustment Order of 2013', the regulatory authority approved an increase in tariff at an average increase of 40 percent to last up to December 2016.[20] An average increase of 8.5 percent came into effect on January 1, 2017.[21]

- **Customer benefit.** At appraisal, an average WTP at US¢23 per kWh or TZS 36,089 per month per household customer was used for a new customer benefit. At completion, based on the most recent data, a WTP of TZS 8,205 (net economic benefit of cost savings of kerosene and mobile charge of TZS 6,339 per month per household customer) was used for the analysis.[22] The main reason of the lower value at completion is because the appraisal assumed that the WTP of nearly half of the households (43 percent) to be connected was valued at the cost of diesel gensets to supply electricity in Dar es Salaam, the urban capital of Tanzania. However, at completion, most of the connections were achieved in Kilimanjaro (68 percent) and Arusha (14 percent), where the poverty rate was about 275–283 times higher in 2012[23] and the per capita electricity consumptions were estimated to be only 16–34 percent of those in Dar es Salaam in 2015.[24] Dar es Salaam's share of the project connection was 18 percent.

- **New electricity customer connection.** At appraisal, all the new 25,000 electricity customer connections were assumed to be completed by the fourth year of the project. At completion, in 2017, the total of 30,933 connections was achieved.

- **Ubungo-Kurasini transmission line.** The remaining work on Ubungo-Kurasini transmission line was assumed to be funded by other funding sources of TANESCO. Therefore, part of the unserved energy affected by the work was assumed to decline in 2021 when Ubungo-Kurasini transmission line would be ready.

- **KST.** The appraisal did not include TANESCO's specific responsibilities for monitoring key ecological indicators in the Kihansi gorge, sustaining the population of captive bred KST at the captive breeding facilities at the University of Dar es Salaam and Kihansi, and

[19] The Energy and Water Utilities Regulatory Authority. 2012. "Determination of Multi-Year Cost Reflective Electricity Tariffs in Tanzania." Discussion Paper.
[20] Corporate Digest 2014. EWURA Announces New Power Tariffs. Energy and Water Utilities Regulatory Authority (EWURA) have announced new power tariffs which will start in January 2014. http://www.corporate-digest.com/index.php/ewura-announces-new-power-tariffs.
[21] Dar Post. 2017. "TANESCO Boss Sacked over Tariff Hike." Posted By: Daniel Hayduk January 2, 2017. http://www.darpost.com/2017/01/tanesco-boss-sacked-over-tariff-hike/.
[22] Chaplin, Duncan, Arif Mamun, Ali Protik, John Schurrer, Divya Vohra, Kristine Bos, Hannah Burak, Laura Meyer, Anca Dumitrescu, Christopher Ksoll, and Thomas Cook. 2017. "Millennium Challenge Corporation (MCC): Findings from a Rigorous Impact Evaluation." *Mathematica Policy Research*.
[23] REPOA. 2016. *Where Are the Poor: Region and District Poverty Estimates for Tanzania, 2012*.
[24] United Republic of Tanzania Ministry of Energy and Minerals. 2016. *Power System Master Plan 2016 Update*.

implementing the soft and hard releases of KST back to the gorge as detailed in the KST reintroduction plan. This activity was introduced at the additional financing in 2011. This activity contributed to attracting further support and funding from the global community and within Tanzania.[25] A proxy of the benefits of conservation of biodiversity, in particular, KST, was estimated by adapting the contingent valuation method, commonly used in the environmental economics for valuing biodiversity. The global and national (Tanzanian) WTP for the value of conserving biodiversity was assumed to be the global and national funding support but only limited to the funding from the World Bank, especially related to TEDAP. Hence, the KST-related project activities' costs of an IDA credit Lower Kihansi Environmental Management Project (LKEMP, P073397) and a GEF grant Kihansi Catchment Conservation and Management Project (KCCMP, P126361) served a proxy of TEDAP contribution to biodiversity conservation.

5. For Component B, the following are the major differences in the analysis between appraisal and completion.

- **Mini-grids.** The off-grid component subprojects were not yet known at the time of the PAD preparation. Hence, the appraisal used sample subprojects. The appraisal identified two main consumer categories, lower-income customers and higher-income households, which translates into a potential demand of 30–60 kWh per month, and the mini-grid program. The completion analysis was based on the specific estimates presented in the individual pre-feasibility studies, feasibility studies, and business plans. At completion, the domestic consumer benefits were estimated by using the same benefits used in Component A, and the commercial and institutional benefits were based on the avoided use of small diesel gensets.

- **Private solar PV sales as part of SSMP.** The appraisal analysis included an increase in the quality of light. The completion analysis added another benefit of cost saving of cell phone charging by using the same cost used in Component A.

- **Solar PV installation in institutions as part of SSMP.** Based on the PAD (assumption table, page 96), an average consumption of avoided diesel genset was 2 gallons per kWh. The completion analysis adopted the diesel oil consumption per kWh and the business plan of Mbagamao Small Hydropower Project - Mbinga District: the business customers' small diesel generators with a low efficiency (about 0.3 liter per kWh or 0.079 gallon per kWh) and domestic consumers' small diesel generator's diesel consumption was assumed to be 0.063 gallon per kWh, which is in line with the appraisal assumptions of Component A (and other African countries such as Mozambique and Pacific Islands countries and is technically considered as higher level of the diesel genset technology). At appraisal, the life-span of all

[25] As of 2018, KST is included in the Red List 'Extinct in the Wild' in the International Union for Conservation of Nature (IUCN). A GEF grant Kihansi Catchment Conservation and Management Project (KCCMP, P126361) has been providing support for the continued reintroduction of the KST back to the wild which was begun under TEDAP in June 2012. In November 2011, a reintroduction plan for the KST was finalized based on the input and collaboration among more than 15 national and international institutions; the NEMC; Tanzania Wildlife Research Institute; University of Dar es Salaam; Sokoine University of Agriculture; State University of New York, Syracuse; Universities of Utah, Tennessee, Southern Illinois, California, Santa Cruz, and Georgia; North West University; IUCN Conservation Breeding Specialist Group; IUCN Amphibian Specialist Group; Wildlife Conservation Society; San Diego, Toledo, and Bronx Zoos; and Global Wildlife Conservation.

solar PV systems was assumed to be 15 years. However, the SSMP contracts had limited spare parts (mostly 1 percent of the PV equipment delivered) and only the SSMP-1 contract required the contractor to replace the batteries (not including inverters) at least once during the contract period. Therefore, the completion analysis assumed the gradual declines of number of functioning PV systems up to 2030.

- **SSMP.** The completion analysis included the economic analysis of SSMP as a whole (private PV and institutional PV), but the appraisal analysis did not include the economic analysis of SSMP.

- **SPGD—renewable power projects.** The appraisal calculated economic benefits as avoided costs of generation (both grid and off-grid). At completion, for electricity supplying to the main grid, avoided generation cost of TANESCO's main grid or mini-grid was assumed to be the benefits; for supplying electricity to the isolated mini-grid or villages near the SPGD, the similar benefits were assumed as for the mini-grids.

- **Global environmental benefits.** The appraisal included the GEF co-financed Component B only, assuming the price of US$10 per ton of CO_2 from kerosene, diesel oil, and fossil fuel, whose names were unspecified (that is, types of 'fossil fuel') in the PAD. The completion analysis included CO_2e, including CO_2, methane, and nitrous oxide in both Components A and B, and followed the 2017 World Bank guidance on carbon prices.[26]

6. Key data and estimates used for the completion analysis are summarized in table 4.1.

Table 4.1. Summary of Key Data and Estimates (in TZS 2007 prices, otherwise noted)

INFLATION AND EXCHANGE RATES	
Inflation rate (Tanzania, average 2008-2022)	7.6%
Inflation rate (US, average 2008-2022)	2%
Inflation rate (Tanzania, 2018-2051)	5%
Inflation rate (US, 2022-2051)	2%
Exchange rate, 2007 (TZS/US$)	1,245
Economic cost of capital, real (%)	10%
Foreign exchange premium, FEP (%)	7%

[26] World Bank. 2017c. *Guidance Note on Shadow Price of Carbon in Economic Analysis*; World Bank. 2017d. *Shadow Price of Carbon in Economic Analysis Cover Note*. Washington, DC: World Bank.

TAXES, FEES					
VAT (%)					18%
Corporate income tax					30%
Skills and development levy at 4.5% of payroll cash costs.					5%
Workers compensation fund tariff charged monthly at 1% (private sector) or 0.5% (public sector) paid to employees.					
				1%	0.5%
Social security contribution (employer)					10%
Social security (employee)					10%
Non-resident Personal income tax rate (%) annual income TZS deducted at source by the employer					15%
Resident rates - Mainland Tanzania					
Taxable monthly income (TZS)		Tax on column 1	Tax on exces	Tax column 1 (%)	
Over (column 1)	Not over				
0	170,000	0	0%	0%	
170,000	360,000	0	9%	0%	
360,000	540,000	17,100	20%	5%	
540,000	720,000	53,100	25%	10%	
720,000	And above	98,100	30%	14%	
Withholding Tax (WHT)					
Payment					
Dividend:					
To a company controlling 25% or more of the voting power and h		Resident (%)	5%	Non-residen	10%
From a DSE listed company		Resident (%)	5%	Non-residen	5%
Otherwise		Resident (%)	10%	Non-residen	10%
Interest		Resident (%)	10%	Non-residen	10%
Rent:					
Land and buildings		Resident (%)	10%	Non-residen	10%
Aircraft lease		Resident (%)	10%	Non-residen	10%
Other assets		Resident (%)	0%	Non-residen	10%
Royalty		Resident (%)	15%	Non Reside	15%
Natural resource payment		Resident (%)	15%	Non Reside	15%
Service fees		Resident (%)	5%	Non Reside	15%
Money transfer commission paid to money transfer agent		Resident (%)	10%	Non Reside	0%
Payments for goods by government institutions		Resident (%)	2%	Non Reside	0%
Insurance Premium		Resident (%)	0%	Non Reside	5%
Construction Works Ratio of Materials: Services = 3:2 =3/5: 2/5				0.6	0.4
Import Duties					
Raw materials, capital goods, agricultural inputs, pure-bred animals, medicines			0%		
Semi-finished goods			10%		
Finished final consumer goods			25%		
Excise duty rates apply as follows:					
Item	Rate for FY 2016/17 (TZS)				
Motor spirit (gasoline) premium	339 per litre	339			
Motor spirit (gasoline) regular	339 per litre	339			
Gas oil (diesel)	215 per litre	215			
Illuminated kerosene	425 per litre	425			
Other medium oil and preparation	9.32 per litre	9.32			
Industrial diesel oil	392 per litre	392			
Heavy furnace oil	0 per litre	0			
Lubrication oil	669 per m^3	669			
Item			Rate for FY 2016/17 (%)		
Electronic communication services				17%	
Charges or fees by a telecommunication service provider for money transfer service				10%	
Charges or fees by a financial institution for services provided by such institution				10%	
Liquefied petroleum gas (LPG)				0%	
Fuel levy					
Petroleum and diesel at TZS 313 per litre.				313	
Petroleum levy					
Petrol and diesel at TZS 100 and Kerosene at TZS 150 per litre.		100	150		
Stamp duty (e.g., conveyances, leases, share transfers, and issue and transfer of debentures. Mostly, 1%)					
		1%			
Local taxes					
Service levy (The local government charge a 0.3% service levy based on turnover generated in the relevant district.)					
		0.3%			
EWURA Fee % of Gross Operating Revenue			1%		
REF Fee on the commercial generation of electricity to the national grid			5%		
EWURA water user fee rate per MW per year in 2014			300,000		

PROJECT										
Demand Growth% Dar es Salaam, Asura, Kilimanjaro 2015		8%								
Economic monthly household benefits of for mobile phone recharge and kerosene (2007 TZS)			6,339							
Retail Cost of kerosene (2007 TZS/liter)		920	Economic Cost of kerosene (2007 TZS/liter)				666			
Reduction of unserved Energy MWh			19,114	2018-2020		26,963	2021-2027			
Reduction of technical Losses MWh from 2018, increasing with the demand growth			117,073							
Reduction of non-technical Loss MWh from 2018, increasing with the demand growth			23,592							
Bill collection rate %	70%	2007-2012	96%	2013-2014	90%	2015	94%	2016	88%	2017 onward
Heat rate degradation factor		0.5%								
Retail Cost of diesel oil (2007 TZS/gallon)		3,451	Economic Cost of diesel oil (2007 TZS/gallon)				2,267			
Insurance and freight cost (US$/gallon)		0.1								
Taxes of diesel oil (TZS/gallon)		1,184								
Transport and other costs of diesel TZS/gallon		452								
of which retailors' margin TZS/gallon		165								
International price of diesel (US$/gallon)		1.4								
Retail Cost of petrol gasoline (2007 TZS/liter)		977	Economic Cost of petrol gasoline (2007 TZS/liter)				645			
High Speed Lubes Cost US$ / gallon		4.9								
Gross High Speed Lubes Gallon/kWh		0.0002								
Medium Speed System Average Lubes Cost US$ / gallon		11.71								
Gross Med Speed Gallon/kWh		0.0004								
High Speed Diesel gensets variable costs (TZS/kWh) 2007 prices			17							
Medium Speed Diesel gensets variable costs (TZS/kWh) 2007 prices			13							
High Speed Diesel gensets fixed cost (TZS/kW/year)			23,737							
Medium Speed Diesel fixed costs (TZS/kW/year)			11,529							
Major maintenance/overhaul costs (TZS every 3-5 years, % of capital cost)			25%		**Working Capital and Inventory**					
					Accounts Payable (weeks)			31		
Photovoltaic Degradation Rates (%) Year 1, 2-		2.5%	1%		Cash Balance (weeks)			30		
Battery Degradation rate /year (%)	2%									
Solar PV profit margins	20%									
				Emissions						
Economic opportunity cost of labor (EOCL) conversion factor (CF) examples, abbreviated				CH4 Global Warming Potential for 100 years				21		
TANESCO Corporate Management Systems		0.61		N2O Global Warming Potential for 100 years				310		
International consultants		0.87				CO2kg /TJ	CH4 kg /TJ	N2O kg /TJ		
Kihansi Spray Toad Reintroduction Plan		0.44		Diesel		74,100	3.0	0.6		
Parastatal Personnel costs		0.24		Natural Gas		56,100	1.0	0.1		
Public Construction workers		0.44		Heavy Fuel Oil (HFO) No.6,		77,400	3	0.6		
Manager and Liason Officer		0.38		Lubricants		73,300	3	0.6		
Managing Director	Ikondo	0.24		Kerosene		71,900	3	0.6		
Sub-office manager	Ikondo	0.27								
Chief Electrician	Ikondo	0.19		Heavy Fuel Oil No.6, Boilers < 100 Million Btu/hr						
Electrician	Ikondo	0.43		NOx, ton/ga	PM10, ton/gall	SO2, ton/gall	SO3, ton/gallon			
Worker	Ikondo	0.36		0.00002	0.000001	0.000002	0.00000002			
Guard	Ikondo	0.54								
Accountant	Ikondo	0.32		Distillate Fuel Oil, Boilers < 100 Million Btu/hr						
Cashier	Ikondo	0.50		NOx, ton/ga	PM10, ton/gall	SO2, ton/gall	SO3, ton/gallon			
Watchman and attendant	Mbagamao/Andoya	0.31		0.00001	0.0000005	0.000002	0.00000002			
Electricians and attendants	Mbagamao/Andoya	0.22								
Engineer	Mbagamao/Andoya	0.10		Natural Gas Turbine						
Accountant and Clark	Mbagamao/Andoya	0.35		Nox ton/TJ	PM10, ton/TJ	SOx, ton/TJ				
Bill/cashier Secretary	Mbagamao/Andoya	0.50		0.0000002	0.000000003	0.000000002				
Watchman	Darakuta	0.36								
Engineer	Darakuta	0.19		Diesel Gas Turbine						
Engineering and Financial Supervisior	Mwenga	0.87		NOx, ton/ga	PM10, ton/gall	SOx, ton/gallon				
Engineers	Mwenga	0.08		0.00005	0.000001	0.000002				
Service Electrician	Mwenga	0.18								
Assistant Electrician / General Hand	Mwenga	0.41		GHG accounting guidelines, P. Meier. 2017.						
Driver	Mwenga	0.30		Power Sector Investment Projects: Guidelines for Economic Analysis.						
Accounts Clerk	Mwenga	0.41		CO2e emission			gram/kWh			
Reception / General Clerk	Mwenga	0.54		Hydro Run of river 1.18			1.18			
Cashier	Mwenga	0.49		Biomass Residue, combustion			31.17			
Accountant	Mwenga	0.17								
Manager	Mwenga	0.37		Combined Margin (CM) estimated from Darkaruta emission calculation						
General Manager	Ngombeni	0.38		Power generation of Tanzania national grid for 2012-14, all Open Cycle.						
Shift Foremen / Technicians	Ngombeni	0.11		Generation MWh		CM	CM		TJ/MWh	MJ/MWh
Coppice Manager	Ngombeni	0.64		Diesel & Industrial Oil		11%	Diesel & Industrial Oil		0.009	9,194
Other Support Staff	Ngombeni	0.70		Natural Gas		82%	Natural Gas		0.009	9,202
Biomass Fuel	Ngombeni	0.69		HFO		7%	HFO		0.005	4,615
Staff	SSMP private	0.63				100%				

Economic Analysis

7. **PDO achievements.** The overall summary results in table 4.2 show that the project's activities and inputs would meet the PDO with an ENPV of TZS 24 billion (US$19 million) with a levelized energy cost of TZS 71 per kWh or US$0.06 per kWh at 10 percent discount rate, or about 0.1 percent of GDP in 2007, and an EIRR of 13 percent. At appraisal, total project's ENPV and EIRR were not presented in the PAD. However, the PAD presented the ENPV and EIRR of individual activities. Therefore, detailed ENPV and EIRR by specific activities are presented later in this annex. Using the default 6 percent discount rate as the

EOCK under the 2016 World Bank guidance, the ENPV would become TZS 82 billion (US$66 million), and using the estimated EOCK at 8.6 percent, the ENPV would become TZS 40 billion (US$32 million).

Table 4.2. Economic Analysis Overall Results Summary

Summary of Economic Analysis at economic opportunity cost of capital (EOCK) at 10 percent, unless noted (in TZS 2007 prices)							
At Completion	Total Project Costs (IDA, GEF and TFs only) based on each funding approval year	Economic Analysis Conducted (%)	Total ENPV	Total EIRR	Levelized Cost/kWh	Total ENPV at EOCK @ 8.6% discount rate	Total ENPV at EOCK @ 6% discount rate
TZS in 2007 prices	166,588,159,602	99%	23,778,046,642	13%	71	39,955,637,425	82,174,032,441
US$ in 2007 prices	133,801,939		19,098,289		0.06	32,091,967	66,001,359
Percent of GDP in 2007	1%	1%	0.1%			0.1%	0.3%
At Appraisal	Total Project Costs (IDA, GEF only) based on each funding approval year	Economic Analysis Conducted (%)	Total ENPV	Total EIRR	Levelized Cost/kWh	Total ENPV at EOCK @ 8.6% discount rate	Total ENPV at EOCK @ 6% discount rate
TZS in 2007 prices	138,665,790,310	97%					
US$ in 2007 prices	111,374,972		Not presented			World Bank New Guideline was after the apprisal	
Percent of GDP in 2007	1%	1%					

8. **Distributional impacts.** The main beneficiaries of development impacts were the electricity consumers and the Government in terms of access to electricity and increased revenues from taxes and fees respectively, which is presented in the distributional impacts (stakeholders externalities analysis) in table 4.3. In addition, TANESCO benefits from reduced need for thermal power generation. Other beneficiaries include biodiversity (KST); REA (Rural Electrification Fund fee collection); local government (tax revenues), local labor; EWURA (fee and water user fee); and the society (accounts payable and cash balance of TANESCO, SPPs, and SSMP providers).[27] The project benefited local workers as most of the labor costs in the proposed pre-feasibility and feasibility studies and business plans of SPPs and the public sector wages (especially parastatal organizations such as TANESCO) were higher than most of the private sector wages in Tanzania. In Tanzania, the largest proportion of workers in the private sector were in the minimum wage category.[28] TANESCO's loss is mainly because the benefits from technical loss reduction were not sufficient to cover the investment. The SPPs' losses were mainly because the actual power generation by some of the SPPs was less than expected until 2016 (the most recent available year)[29] and that some of the SPPs' actual power purchase tariffs were less than expected. These individual activities' details are discussed later in this annex.

[27] Account payable and cash balance was estimated from TANESCO data for 2011–2014. Some of the SPPs have not been paid by TANESCO on time. For example, as of February 2018 (a) Andoya was paid up to November 2017 invoice, (b) Tulila was paid up to September 2017 invoice, (c) Mwenga were paid up to November 2017 invoice, (d) Yovi were paid up to July 2017 invoice and the invoice up to October 2017 is expected to be paid this week, (e) TPC were paid up to September 2017 invoice, and (f) Darakuta were paid up November 2017 invoice.

[28] Sources: Employees and Earning Survey. 2015. http://www.thecitizen.co.tz/News/Survey--Public-sector-workers-ahead-in-pay/1840340-4207432-jdqxewz/index.html, http://www.thecitizen.co.tz/News/Revealed--Best-paying-jobs-in-Tanzania/1840340-3914780-p7gc9iz/index.html; United Republic of Tanzania, Ministry of Labor and Employment. 2013. *Notice to the Public. New Minimum Wages for Private Sectors*; Danish Trade Council for International Development and Cooperation. 2016. *Labour Market Profile 2016 Tanzania and Zanzibar*.

[29] UNFCCC (United Nations Framework Convention on Climate Change). 2017. *Monitoring Report Form for the Clean Development Mechanism (CDM) Program of Activities (version 01.0)*. Tanzania Renewable Energy Programme.

Table 4.3. Distributional Analysis (Stakeholders Externalities Analysis)

Distributional Analysis (Stakeholders Externalities Analysis)									
ENPV@EOCK									
FNPV@EOCK	Externalities								
TANESCO, SPPs and SSMP providers	TANESCO (SPPs externalities)	Consumers	Governement	Local Government	Biodiversity	Labor	EWURA	REA (REF)	The society (working capital)
-25,763,884,971	10,600,519,737	20,053,878,721	12,264,099,283	1,413,161,039	2,238,122,017	1,102,726,786	268,090,356	1,583,345,074	17,988,600
-108%	45%	84%	52%	6%	9%	5%	1%	7%	0.1%

9. **GEO and emissions.** At completion, the GEF's GEO to abate GHG emissions through the use of renewable energy in rural areas to provide electricity was focused on the GEF grant-financed Component B only, which achieved CO_2e abatement of 0.6 million tons with a GEF grant of US$10 per ton of CO_2e abated. The appraisal estimate of CO_2 abatement is 1 million with a GEF grant of US$6.5 per ton of CO2e abated.[30] The main reason for the smaller amount of abated CO_2e was due to the less-than-expected renewable energy generation as of 2016 (the latest available) and no reasons for the lower power generations were available from most of these power plants.[31] Thus, the analysis could not assume that any of the power plants could increase generation in the future. However, as a total project (Components A and B), the total CO_2e ton abated is 1.6 million tons. Following World Bank (2017),[32] with the low value of CO_2e, the total ENPV was TZS 40 billion and an EIRR of 15 percent, with the high value of CO_2e, the total ENPV was TZS 57 billion and EIRR of 17 percent, and the switching value was negative US$54 per CO_2e with a sensitivity indicator of 0.4 (CO_2e low value of US$37 and high value of US$75, which were original values in the guidance note before the price level adjustment in the analysis). The GHG marginal abatement cost is TZS 164,362 per CO_2e ton or US$141 per CO_2e ton.[33] Including the local emissions (NOx, PM10, and SOx) in addition to high and low CO_2e values, the results of ENPVs and EIRRs differ little from those with only CO_2e (table 4.4).

Table 4.4. Emissions

Emissions									
	Total ENPV with CO2e low	Total EIRR with CO2e low	Total ENPV with CO2e high	Total EIRR with CO2e high	GHG MAC, Real (TZS/CO2e ton)	CO2e low, NOx, PM10, SOx	CO2e low, NOx, PM10, SOx	CO2e high, NOx, PM10, SOx	with CO2e high, NOx, PM10, SOx
TZS 2007 prices	40,124,949,159	15%	56,913,659,852	17%	175,362	40,124,949,221	15%	56,913,659,914	17%
Ton avoided during project life, undiscounted				Original Guidance Value US$ Low	Original Guidance Value US$ High		GEF Global Objectives		
Year	TEDAP Total		Sensitivity of CO	37	75		GEF financed component B CO2e avoided, undiscounted	At Completion	At Appraisal
CO2e ton avoided	1,622,803		NPV	40,124,949,159	56,913,659,852		CO2e ton avoided	620,270	1,000,000
NOX ton avoided	406		SV	-54			US$/ton CO2e undiscounted	10	6.5
PM-10 ton avoided	22		EIRR	15%	17%		Local Emissions		
Sox ton avoided	72		SI	0.4			avoided	194	
							PM-10 ton avoided	10	
							Sox ton avoided	34	

[30] There is no significant difference in CO_2 and CO_2e equivalent values.
[31] UNFCCC (United Nations Framework Convention on Climate Change). 2017. *Monitoring Report Form for the Clean Development Mechanism (CDM) Program of Activities (version 01.0)*. Tanzania Renewable Energy Programme.
[32] World Bank. 2017c. *Guidance Note on Shadow Price of Carbon in Economic Analysis*.
World Bank. 2017d. *Shadow Price of Carbon in Economic analysis Cover Note*. Washington, DC: World Bank.
[33] A little higher than the US$100 threshold is generally considered acceptable in Clean Technology Fund guidelines (Summary of the Co-Chairs Meeting of the Clean Technology Fund Trust Fund Committee October 28–29, 2013, page 5).

10. **Fiscal impacts.** Table 4.5 shows a summary of the fiscal impacts, discounted at an EOCK of 10 percent in 2007 GDP. Total service and commitment charges were offset by benefits of increased revenues of taxes, fees, social security contribution, workers funds, skills and development levy, and so on, which was about 0.002 percent of the 2007 GDP.

Table 4.5. Brief Summary of Fiscal Impacts

Fiscal Impacts		
	Total Service and Commitment	Government benefits (taxes, fees, social security, skills and development levy, workers fund, etc.)
TZS 2007 prices discounted at EOCK@10%	-666,061,486	13,677,260,322
Percent of GDP in 2007 prices	-0.002%	0.07%

11. **Component A. Grid.** At completion (table 4.6), the TANESCO grid component's ENPV was TZS 28 billion or US$23 million and had a levelized cost of TZS 25 per kWh or US$0.02per kWh with an EIRR of 17 percent compared to the appraisal's ENPV of TZS 109 billion or US$87 million with an EIRR of 31 percent. The main reasons for the lower ENPV and EIRR at completion was the much lower value of the updated benefits of the households than at appraisal (as discussed earlier on the differences between the completion and appraisal analyses), additional financing in 2011, and the discounted price-level effects of the inflation rates due to the delayed disbursement and implementation.

Table 4.6. Component A. Grid

Component A. Grid	At Completion			At Appraisal		
	ENPV	EIRR	Levelized Cost/kWh	ENPV	EIRR	Levelized Cost/kWh
TZS in 2007 prices	27,904,203,558	17%	25	108,625,000,000	31%	
US$ in 2007 prices	22,412,376		0.02	86,900,000		Not presented

12. **Component B. Off-grid.** At completion (table 4.7), two isolated mini-grids were commissioned. Ngombeni biomass power plant in Mafia island had been out of service since February 2017. The analysis assumed that the equipment would be replaced or repaired with costs similar to the original cost and that the power plant would resume operations in 2019, which resulted in an ENPV of TZS 4 million or US$3,000 per customer with an EIRR of 111 percent. The Mawengi small hydropower in Njombe District resulted in an ENPV of negative TZS 5 million or US$4,000 per customer with an EIRR of negative 9 percent. The Mawengi small hydropower was the first community-based commercial power plant and consumer network facility in Tanzania. The hydro scheme was implemented as an integrated development program in 2006. Despite the Mawengi hydro scheme improving livelihoods of the people, the negative ENPV and EIRR were partly due to the lack of sufficient demand to capture the larger potential benefits and growing social inequalities and negative effects on the self-esteem of poor people who could not afford to connect. [34] The project contributed to filling the gap with the performance grant to connect 1,343 customers. Applying the social weight in different customer groups could turn the negative ENPV and EIRR into positive because it is likely that the marginal benefit of one monetary unit (Tanzanian shilling) could be

[34] Ahlborg, Helene, and Sverker Molander. 2014. *Changing Rural Economies in Tanzania Following Small-scale Electrification: Opportunities and Challenges Coming with Hydropower Development in Farmer Communities: The Mawengi Hydropower Scheme*. Report from Stakeholder Workshop held in Dar es Salaam, May 6, 2014.
Royal Norwegian Embassy of Tanzania. 2014. *Facilitative Framework for Accelerating Off-Grid Rural Electrification. Preliminary Analysis of Mini-Grid Project Developer Skills, Scale, and Networks*.

worth more to the poor than the rich.[35] At appraisal, based on a survey in the Rukiwa region, the ENPV per customer was TZS 19,750 or US$16 with an EIRR of 36 percent.

Table 4. 7.Component B. Mini-grid

Component B. Mini Grid	At Completion								At Appraisal			
	Ngombeni Biomass Project, Mafia Island				Mawengi Small Hydro Power -Njombe District				Based on survey in Rukwa region			
	Total ENPV	Total EIRR	ENPV per Customer	EIRR per customer	Total ENPV	Total EIRR	ENPV per Customer	EIRR per customer	Total ENPV	Total EIRR	ENPV per Customer	EIRR per customer
TZS in 2007 prices	3,448,386,908	111%	3,764,615	111%	-6,870,698,008	-9%	-5,115,933	-9%			19,750	36%
US$ in 2007 prices	2,769,710		3,024		-5,518,476		-4,109		Not presented		16	

13. **Component B. Off-grid.** At completion of SSMP, the private sales of solar home system's (including solar PV lanterns) ENPV was TZS 2 billion or US$1.6 million with an EIRR of 85 percent, compared to the appraisal's ENPV of TZS 12 billion or US$9 million with an EIRR of 59 percent. For PV installations in institutions, at completion, the ENPV is a negative TZS 2 billion or US$1.7 million at negative EIRR of 13 percent, compared to the appraised ENPV of TZS 377 million or US$300,000 with an EIRR of 21 percent. The main reasons for the negative ENPV and EIRR at completion were the much higher estimate of avoided diesel oil consumption per kWh of diesel gensets at appraisal and the shorter life of solar systems than the appraisal estimate (as discussed earlier on the differences between the completion and appraisal analyses) and the pilot institutional PV performance was less than expected. Table 4.8 shows a brief summary of the results. At completion, the total SMPP ENPV was negative TZS 164 million or US$132,000 with an EIRR of 8 percent. The appraisal analysis did not present the total SMPP ENPV or EIRR in the PAD.

Table 4.8. Component B. Solar Home System and Institutions

Component B. Solar Home System and Institutions	At Completion						At Appraisal					
	Total ENPV	Total EIRR	SHS ENPV	SHS EIRR	Institutions PV ENPV	Institutions PV EIRR	Total ENPV	Total EIRR	SHS ENPV	SHS EIRR	Institutions PV ENPV	Institutions PV EIRR
TZS in 2007 prices	-164,433,496	8%	1,944,419,566	85%	-2,108,853,063	-13%			11,699,415,000	59%	376,688,750	21%
US$ in 2007 prices	-132,071		1,561,738		-1,693,810		Not presented		9,359,532		301,351	

14. **Subcomponent B1: Small Power Generation and Distribution.** At completion, 11 SPGDs or SPPs were operational or constructed, of which 10 were included in the analysis.[36] At appraisal, prospective four SPGDs were presented. The key summary is presented in table 4.9. At completion, the 10 projects' EIRRs ranged between –9 percent and 111 percent, compared to the appraisal's four projects' EIRRs ranging between 15 percent and 48 percent. Except the Mawengi small hydro power in Njombe District, all the other SPPs were part of the CDM program of activities, Tanzania Renewable Energy Programme. The program of activities included (a) Mapembasi hydropower project, Njombe District (Mapembasi Hydropower Company Limited); (b) NextGen solar project, Kigoma region (NextGen Solawazi Limited, Mbinga hydroelectric project); (c) Andoya Hydroelectric Power Company Limited; (d) Yovi small

[35] Social weights recognize a different social value of each monetary unit of consumption by each agent. For details in estimating social weights, refer to the following example references. Newbery, D.M. 1995. "The Distributional Impact of Price Changes in Hungary and the United Kingdom." *The Economic Journal* 105 (July): 847–863; Atkinson, A.B. 1970. "On the Measurement of Inequality." *Journal of Economic Theory* 2: 244–263; Feldstein, M.S. 1972. "Distributional Equity and Optimal Structure of Public Prices." *The American Economic Review* 62: Half-yearly Issue 32–36. .

[36] The one that the analysis did not include was a US$3 million 230 kW Kiliflora hydropower project, mainly used for the Kiliflora flower farm and about 10 kW would be used for electrification of villages around the farm in Arusha (Source: United Nations Industrial Development Organization [UNIDO], 2015. Independent Midterm Review United Republic of Tanzania Mini-grids based on small hydropower sources to augment rural electrification in Tanzania UNIDO Project Number: GF/URT/12/001 UNIDO SAP ID: 100261. GEF Project Number: 4004). Other than the UNIDO's information, insufficient information was available to conduct the economic analysis.

hydropower project (Yovi Hydro Power Company Limited); (e) Tulila hydroelectric plant (Tulila Hydroelectric Plant Company Limited); (f) Maguta small hydropower project (Lungali Natural Resources Company Limited; (g) Ngombeni biomass power plant project (Ngombeni Power Limited); (h) Ikondo micro hydropower plant (Matembwe Village Company Limited); and (i) Darakuta mini hydro project. All generation data in 2016 in the most recent program of activities' monitoring report were less than the expected amount of generation. This lower level of generation was despite the fact that the total hydropower generation in Tanzania increased in 2016 after the drought in 2015.[37] As of February 2018, Ikondo (Matembwe) has not been generating power since August 2017 for reasons unknown, and Ngombeni biomass power plant has been out of service since February 2017 due to the poor performance of the used equipment (purchased from a salvaged unit in Mauritius), which were assumed to be replaced with a new one.[38] It is assumed that these two power plants will resume operations from 2019.

[37] Bank of Tanzania. 2018. *Bank of Tanzania 2016/17 Annual Report*.

[38] African industries face challenges, including access to funding, capital, credit, technical capabilities, and so on. Reducing the financial risks and increasing the cash flow may require purchasing used equipment, which is readily available than the new ones. This is a common practice that prevails among the African countries (Source: https://constructionreviewonline.com/2016/07/new-or-used-equipment/). This practice is also seen in other countries such as Pacific Islands countries.

Table 4.9. Key Summary of Subcomponent B.1 Small Power Generation and Distribution

Component B. Small Power Generation and Distribution Projects (SPGD) in TZS 2007 prices				
At Completion				
Yovi Small Hydro Power - Kilosa (phase 1 for 0.995MW)	Hydro, Main grid and isolated minigrid			
Plant Size MW	0.995	Asset life years	15	
Mini-grid Consumers, Number	200	ENPV	1,187,007,352	
Expected generation, MWh/year	8,300	EIRR	18%	
Actual generation, MWh/year	3,648			
Actual generation year	2016			
Kilolo Madege/Maguta -Kilolo District	Hydro, Main grid and isolated minigrid			
Plant Size MW	2.3	Asset life years	15	
Mini-grid Consumers, Number	3,000	ENPV	785,739,809	
Expected generation, MWh/year	19,973	EIRR	13%	
Actual generation, MWh/year	Not yet commissioned in 2016			
Solawazi Nextgen Ltd - Kigoma Region	Solar, TANESCO mini-grid			
Plant Size MW	5	Asset life years	20	
Expected generation, MWh/year	8,800	ENPV	-522,315,141	
PV annual generation degradation (the first 3 years varies but the of the year)	-0.7%	EIRR	8%	
Actual generation, MWh/year	Built, but not yet operational as of Feb 2018			
Tulila Small Hydropower	Hydro, Main grid and TANESCO minigrid			
Plant Size MW Phase 1 (5MW) plus Phase 2 (2MW)	7	Asset life years	15	
Expected generation Phase 1 of 5MW, MWh/2016	29,750	ENPV	-2,222,366,719	
Actual generation Phase 1 of 5 MW, MWh/2016	15,448	EIRR	6%	
Mawengi Small Hydro Power -Njombe District	Hydro, Isolated mini grid			
Plant Size MW	0.3	Asset life years	15	
Mini-grid Consumers, Number	1,343	ENPV	-6,870,698,008	
Actual generation, MWh/2014	369	EIRR	-9%	
Ikondo-Matembwe Small Hydropower-Njombe District	Hydro, Main grid and minigrid			
Plant Size MW	0.35	Asset life years	20	
Mini-grid Consumers, Number	355	ENPV	-1,240,309,911	
Expected generation, MWh/year	1,960	EIRR	-6%	
Actual generation, MWh/year	213			
Actual generation year	2 months data in 2016, multiplied for 12 months, as of February 2018 no generation since August 2017.			
Mbagamao Small Hydropower - Mbinga District, Andoya Hydroelectric Power Company	Hydro, TANESCO mini grid and main grid			
Plant Size MW	0.5	Asset life years	15	
Mini-grid Consumers, Number	922	ENPV	638,517,380	
Expected generation, MWh/year	3,285	EIRR	19%	
Actual generation, MWh/year	2,469			
Actual generation year	2016			
Darakuta Hydropower - Manyara	Hydro, Main grid			
Plant Size MW	0.32	Asset life years	15	
Expected generation, MWh/year	1,470	ENPV	380,023,012	
		EIRR	39%	
Mwenga Small Hydropower project- Mufindi District, Mwenga Hydro Limited	Hydro, main grid and rural villages			
Plant Size MW	3	Asset life years	15	
Mini-grid Consumers, Number	2,600	ENPV	5,286,795,296	
Expected generation, MWh/year	24,000	EIRR	23%	
Actual generation, MWh/year	17,375			
Actual generation year	2015			
Ngombeni Biomass Project, Mafia Island	Biomass, isolated grid			
Plant Size MW	2.5	Asset life years	15	
Mini-grid Consumers, Number	916	ENPV	3,448,386,908	
Expected generation, MWh/year	15,023	EIRR	111%	
Actual generation, MWh/year	393			
Actual generation year	2016, as of February 2017 out of service since February 2017			
At Appraisal	Njombe Hydro TANESCO sales + Minigrid	Rehab Hydro Mngeta, Kilombero Rehab + Isolated Minigrid	Biomass Cogen Mafia Island TANESCO Mini-grid	Mufindi Hydro TANESCO sales + Minigrid
Plant Size MW	10	0.4	0.4	3
Mini-grid Consumers, Number	1,188	343	0	1,400
EIRR, %	15%	36%	40%	48%

Aspects of Design and Implementation Efficiency

15. The following were assessed in aspects of design and implementation efficiency.

- **Coordination challenges among implementation agencies.** The ICR mission could not have a meeting with representatives of MEM, and a meeting bringing together the representatives of MEM, TANESCO, and REA could not be organized despite multiple requests from the ICR team. This exemplifies coordination challenges that prevailed

throughout project implementation, which were stressed by stakeholders, who reported institutional rivalries instead of synergy among the three implementing agencies. Examples abound showing that instability and coordination weaknesses in project supervision by MEM had a negative effect on the speed of resolving project implementation challenges.

- **Project supervision challenges over the large geographical scope and the complexity of project components.** The project was to be implemented in three main cities (Dar es Salaam, Arusha, and Kilimanjaro) and in several districts of the country. The off-grid component had subprojects in several districts of the country, leading to supervision challenges for both the implementing agencies and the World Bank's TTLs. Moreover, there were multiple activities under each component, making supervision very challenging. In the end, many activities were cancelled under each component. Consultancy services for CMS were cancelled due to budget shortfalls. The following activities could not be implemented: (a) incorporation of CMS to improve operational procedures and customer information, (b) incorporation of TSMS to attend to customers claims, (c) incorporation of RMS, including definition of new operational procedures, and (d) design and implementation of the centralized call center and high-value customer cell.

- **Actual cost higher than appraisal, mainly due to additional financing, which aimed to cover the cost of new activities and cost overruns.** Discrepancy between appraisal and actual costs arose mainly from the two additional financing operations. The first additional financing did not affect project efficiency because the outcome target indicators were scaled up, the revised targets were achieved, and the credit line was market compliant. The commercial banks applied their standard appraisal criteria in deciding whether to make a loan and how much to lend. The second additional financing, in 2011, aimed to cover the cost overruns caused by (a) higher costs of T&D rehabilitation contracts compared with the original cost estimates and (b) higher-than-anticipated contract costs for various consulting assignments, including an additional consultancy. The second additional financing did not increase the project target indicators, but delayed the achievement date of target indicators and had a negative impact on efficiency.

- **High TTL turnover.** Stakeholders in the field indicated that the high turnover of TTLs contributed to delaying project implementation or reduced the implementation efficiency. Six TTLs were involved in the design and implementation of TEDAP. Project implementation suffered from the learning curve needed for each TTL to acquaint himself/herself with the details of a complex project. The combination of several TTLs and the weak coordination among the implementation agencies is part of the factors that explain why project implementation took 10 years instead of less than 5 years, as planned at approval. However, reaching such a conclusion requires thorough survey and analysis.

- **Actual administrative costs compared to expected costs.** The PAD did not include specific allocation of the administrative costs. However, based on data in the available interim financial reports, the completion analysis found that administration costs (for example, mainly bank charges and fees, travel costs, operating costs, and so on) was 4 percent of the total World Bank-financed project cost (in PV terms at EOCK), which was reasonable.

- **Time overruns impact on efficiency.** The original project implementation period was about four years and three months (from the approval on December 13, 2007, to the original closing date of March 31, 2012). The actual project implementation period was extended for five years and six months to September 29, 2017. This extension of the closing date was mainly due to the procurement delay of the project and scaling up of Component B. The total service and commitment charges increased in nominal terms commensurate with additional financings and the closing date extensions and were presented with values of TZS 666 million in Tanzanian shilling 2007 prices discounted at EOCK, which was 0.002 percent of the 2007 GDP. It was found that due to the inflation rate and the large disbursements in the later years of long project extension period, the actual service charges (undiscounted, only one commitment charge in 2008 as the commitment fee was waived by the World Bank Board since FY2009 in each fiscal year) was 33 percent of what was estimated from the PAD in present value in 2007 Tanzanian shilling prices. Due to the discounting effects and delayed disbursement and implementation, the NPVs were reduced. Nevertheless, overall, the EIRR and NPV were positive and thus the cost and time overruns did not significantly impact efficiency.

Sensitivity Analysis

16. A selected number of sensitivity tests were carried out to identify critical parameters affecting the project's performance. The sensitivity analysis addressed some of the risks in section D. Risk to Development Outcome, which included operational performance in terms of diesel oil-fired power plant heat rate, exogenous parameters such as inflation rates and oil prices, and the electricity demand growth,[39] which may influence the levels of avoided unserved energy and system losses. In the summary (table 4.10) sensitivity indicators showed the ratio of the percentage change in the NPV to the percentage change in the parameter tested. The bar charts in the sensitivity indicators in the tables indicated the levels of sensitivity to the results. Because fuel saving in the Tanzanian economy was part of the counterfactual scenarios in the economic analysis, in addition to the electricity demand growth, diesel oil prices were relatively sensitive to the results.

Table 4.10. Sensitivity Analysis Results Summary

Economic sensitivity analysis						
Parameters	Base case	Change	ENPV (TZS)	EIRR (%)	Sensitivity Indicator	Switching Value
Tanzania Annual Inflation Rate 2018 onward	5%	8%	22,298,716,691	13%	-0.1	53%
Diesel Oil Price (per gallon, US$, Real, 2007 prices)	1.4	1.9	30,330,766,131	14%	0.8	-46%
US Annual Inflation Rate	2%	5%	26,338,973,388	14%	0.11	-18%
Annual Diesel Genset Heat Rate Degradation	0.5%	4.5%	25,596,659,934	14%	0.01	-52%
Demand Growth TANESCO Component	7.6%	12.0%	52,971,327,993	16%	2	4%

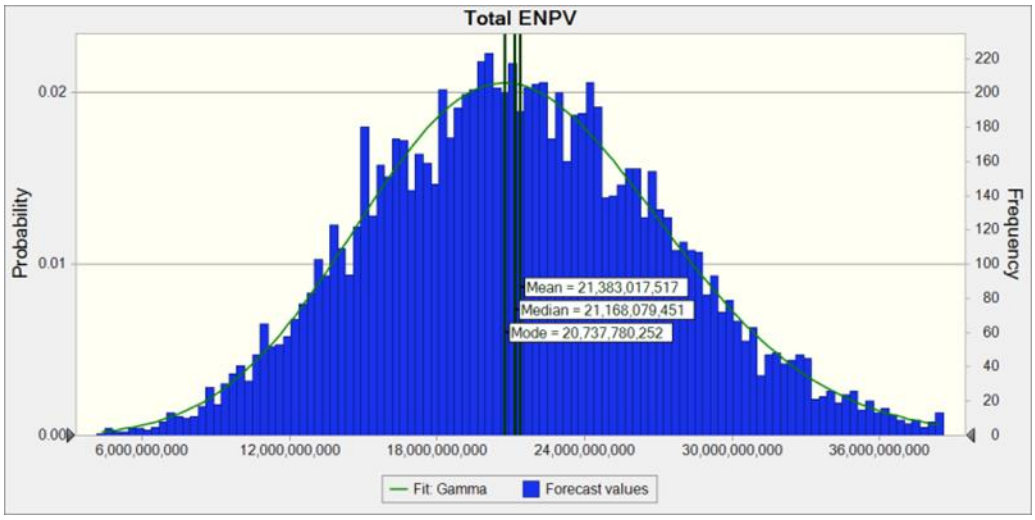
[39] Demand growth projections in the Master Plan update 2016 in the Component A project areas are the following: Dar es Salaam 10 percent for 2015–2040, Kilimanjaro 9.7 percent for 2015–2040, and Arusha 11.7 percent for 2015–2040. (Source: United Republic of Tanzania Ministry of Energy and Minerals. 2016. *Power System Master Plan 2016 Update*.) However, the completion analysis used the same growth projection of 7.6 percent as in the appraisal to be conservative partly because during 2011–2014, the national electricity demand growth was less than what was forecasted in the previous Master Plan 2012. (Source: World Bank data; and United Republic of Tanzania Ministry of Energy and Minerals. 2012. *Power System Master Plan 2012 Update*).

Risk Analysis

17. Based on the sensitivity analyses, the key variables were identified. An appropriate probability distribution and the likely range of values for each risk variable were estimated, based on a historical observation of those variables. Even if an independent variable in the sensitivity analysis may indicate an insignificant impact on the result, it could be possible that multiple variables' interactions could result in significant impacts. Therefore, the following variables have been selected from different risk categories (for example, operational, macroeconomic, and so on): annual utilization factor of PV systems; crude oil prices (which is linked to economic value of diesel oil and lubricants); the electricity demand growth in Dar es Salaam, Asura, and Kilimanjaro; inflation rate of the United States; and Tanzanian inflation rate.

18. The Monte-Carlo risk simulation was carried out over 10,000 trials with the help of the Crystal Ball software. The results suggested that a risk of economic and financial outcome of the project in deviation from the base case results would not be significant (figure 4.1). The Tornado analysis of Crystal Ball was also conducted to analyze the critical variables. The main risks to the economic outcome were exogenous—out of the project's control, that is, due to fluctuating inflation rates in Tanzania in 1980–2016 and volatile historical oil prices of 1960–2016 used for the probability distribution, both of which were the bases for the probability distributions, and partly under the project control (continuing good quality and reliability of power supply)—however, the electricity demand growth in Dar es Salaam, Asura, and Kilimanjaro did not affect the risk significantly.

Figure 4.1. Probability Distributions of Economic Outcomes



19. **Fiscal substantiality.** Table 4.5 showed that the total service and commitment charges are estimated to be very small, that is, 0.002 percent of GDP in 2007 and the Government will receive benefits of taxes, fees, social security contribution, workers funds, skills and development levy, and so on, which is about 0.07 percent of the 2007 GDP. In the long term, these positive spillover effects of the economic development could contribute to the Government's repayment of IDA credits

20. **Environmental sustainability.** As presented in tables 4.4 and 4.3, the project is expected to be environmentally sustainable, but there are some cautions on sustainable water use, which were reported in some SPPs such as Mawengi small hydropower plant's unresolved problem with people farming within

the water catchment area as of 2014.[40] The project would reduce GHG emissions from diesel oil, natural gas, heavy fuel oil, lubricants, and kerosene and the increased GHG emission from hydro run of river and biomass residues are negligible. The project is also expected to reduce other emissions impacts on health (PM10, NOx, and SOx) from external combustion engines, including heavy fuel oil, steam and diesel oil engines, and internal combustion engines, including diesel oil and natural gas turbines. The project, through TANESCO and the GoT, contributed to conservation of biodiversity, especially KST, and attracted support from global community and within Tanzania.

21. **Provision of public sector financing.** During the project period, the private sector alone would be unlikely to take the risk of financing project activities due to the insufficient and uncertain revenue prospects to recover full costs, including large main grid infrastructure investment requirements, small renewable energy projects' feasibility studies, risk assessments, financing arrangements, funding mobilization, implementation, business management, and so on. The project contributed to filling these gaps by financing TANESCO's main grid, having helped develop a comprehensive regulatory framework supporting small renewable energy projects. The framework included standardized SPPAs and SPPTs for SPPs, simplified regulations for SPPs, and comprehensive guidelines for project developers. With combinations of its support to simplified regulations for the SPPs, matching and performance (cost-sharing) grants, credit lines, and TA the project promoted the SPPs to provide power to the isolated and main grids. SSMP was a part of the World Bank/International Finance Corporation Lighting Africa Initiative. The pilot SSMP's performance provided variable lessons on the importance of setting the right incentives to avoid cream skimming and principal agent problems and choosing the right expertise. The pilot contractor could perform less than expected on the households solar PV sales as the potential profits for the base load business of public facilities PV was sufficient. The pilot contractor was more qualified to design and install relatively large-scale PV systems (the project developer or builder type) than for the business of marketing solar home system (the vendor type). The scaled-up SSMP incorporated the pilot lessons and the performance was improved. Also, the matching grant program provided variable initial lessons; some of the inexperienced developers initiated the projects that have never been completed, to the required standards, to move ahead to financial close.

22. **World Bank value added.** The World Bank's value added was the scale of financing, the convening power that attracts co-financings and ensures social and environmental safeguards, the potential longer-term partnership in the sector, and the building of the Government's sector capacity. The TA and capacity-building aspects of the project were a key part of the World Bank's value added and would help ensure sustainability of the project after the IDA credit closure. This contrasted with simply providing a capital grant (or capital grant with all project procurement and management done by a grant provider or a third party). The World Bank Group, as a global organization, could draw on its global experience in the energy sector, including with renewable energy (for example, SSMP experiences were shared with other countries such as the Philippines and Zambia), that could be readily shared with Tanzania.

Conclusion

[40] Ahlborg, Helene, and Sverker Molander 2014. *Changing Rural Economies in Tanzania Following Small-scale Electrification: Opportunities and Challenges Coming with Hydropower Development in Farmer Communities: The Mawengi Hydropower Scheme*. Report from Stakeholder Workshop held in Dar es Salaam, May 6, 2014.
Royal Norwegian Embassy of Tanzania. 2014. *Facilitative Framework for Accelerating Off-Grid Rural Electrification. Preliminary Analysis of Mini-Grid Project Developer Skills, Scale, and Networks*.

23. Overall, the analysis demonstrated the project's achievement of the PDO and GEO. While the GEF-financed Component B alone missed the target of CO_2 abatement, the overall project exceeded the target. The ENPV was equivalent to 0.1 percent of GDP in 2007. However, there are financial, technical, and operational risks. The risk analysis identified that the major risks were electricity demand growth, oil prices, and Tanzanian inflation rates. While these risks were mostly exogenous and out of the project's control (that is, electricity demand growth is partly under the project's control), if the financial, technical, and operational stance of the sector players (TANESCO, REA, SPPs, banks, and so on) are robust, they would be more resilient to withstand these exogenous shocks.

ANNEX 5. BORROWER, CO-FINANCIER AND OTHER PARTNER/STAKEHOLDER COMMENTS

A. ONGRID INVESTMENTS IMPLEMENTED BY TANESCO

Context

1. At the time of appraisal, the electricity supply system in Dar es Salaam was unable to meet the growing demand for electricity from the existing and potential consumers. The high voltage bulk transmission system was not extended in many parts of the city, particularly in the northeast and south, and most of the equipment in the main 132/33/11 kV substations were old and overloaded.

2. In line with the objective to avoid involuntary resettlement, TANESCO conducted an optimization exercise and considered many project design possibilities, involving various options for transmission line structures; transmission line routes; widths of rights-of-way and the use of unoccupied land; waste areas and existing road, rail, pipeline, and electricity distribution line reserves; corridors; and rights-of-way.

3. TANESCO identified priority investments of about US$100 million to upgrade the network in three main urban areas—Dar es Salaam, Arusha, and Kilimanjaro, which accounted for the majority of TANESCO's revenues. The upgrade of the T&D system would not have only improved service in the key urban areas but also would have reduced losses and improved revenue streams, therefore directly contributing to TANESCO's financial recovery. The proposed TEDAP was designed to support this objective.

Objectives for the Grid Reinforcement

4. The project's main objective was to improve the quality, performance, and reliability of the power supply of TANESCO's T&D systems and meet the unmet demand by installation of additional 132/33/11 kV T&D lines to areas with existing and forecasted high load density, increasing the capacity of the overloaded major substation transformers, and reinforcing them by building new ones.

5. TANESCO used funds provided by IDA for financing the 132/33/11 kV Transmission Network Reinforcement Project for Dar es Salaam, Arusha, and Kilimanjaro.

Scope

6. The project was divided into two main parts of transmission and distribution.

7. **Transmission.** The transmission component covers engineering, design, and construction and is divided into three lots under one contract as follows:

- Lot 1: Construction/extension of five substations in Dar es Salaam.
    - Three out of the five were fully operational and two were partially completed.
- Lot 2: Construction of four 132 kV transmission lines in Dar es Salaam
    - All but one transmission line is fully operational.

- Lot 3b: Kilimanjaro International Airport Substation in Kilimanjaro region
    - This is fully operational.

8. **Distribution.** The distribution components covers engineering, design, and construction and is divided into four lots as follows:

- Lot 1: Construction and rehabilitation of one new and five existing 33/11 kV substations in Dar es Salaam. All are in full operation.
- Lot 2: Rehabilitation, extension, and modification of five existing 33/11 kV substations in Dar es Salaam. Four out of five are fully operational.
- Lot 3: Construction and rehabilitation of two new and six existing 33/11 kV substations in Arusha and Kilimanjaro. All eight are fully operational.
- Lot 4: Construction and rehabilitation of two 33/11kV distribution lines in Dar es Salaam, Arusha, and Kilimanjaro. All are fully operational.

Significant Changes during Implementation

9. During implementation, significant changes took place. The commissioning and energization of Ubungo Substation depended on the completion of the Ubungo-Kurasini transmission line. However, this part of the project could not be implemented at this reporting period as TANROADS had planned road expansion which affected the 3 m line corridor, which was initially given to TANESCO for project implementation. Therefore, this part of the project will be implemented later under another arrangement to achieve the intended objective of constructing the 132 kV ring circuit.

10. The Mbagala-Kurasini transmission line was not erected. Initially, the portion of the Mzinga Creek crossing was to be constructed on the existing 33 kV line corridor. This was not possible during implementation due to rapid growth of Kigamboni area and thus making it difficult to find alternative power supply to Kigamboni. Thus, a new configuration of the Mzinga Creek crossing by a 132/33 kV double circuit with connection by underground cables from the crossing to Kurasini Substation was adopted, causing change of design, additional cost, and time.

11. Due to different environmental situations and constraints of the existing rights-of-way, two types of supports had to be used, self-supporting steel lattice towers and tubular monopoles in a triangular or flag configuration for single- and double-circuit 132/33 kV overhead lines. In particular, the steel lattice towers were installed in open urban and suburban areas with a normal corridor for the rights-of-way, while it became necessary to use tubular poles where the corridor was restricted due to running in parallel with roads, railways, and pipelines.

12. The entire process of procuring distribution contractors took a long time, which resulted in TANESCO spending company resources to rescue the deteriorated distribution network system. Thus, at the time of signing the distribution contract, the site condition had slightly changed. A study in the cities of Dar es Salaam, Kilimanjaro, and Arusha was conducted to update the project scope over the new power reliability needs.

13. Apart from the abovementioned components the project also covered other activities, including

- Prepaid meters (Subcomponent A.3 and A.4);
- Associated installation and maintenance equipment;
- Corporate IT systems;
- Reallocation of meters to test instruments for maintenance;
- Centralized call center for Dar es Salaam and high-value customer cell to improve TANESCO's customer relations, modernize information communication technology, and provide rapid improvement in customer services;
- The procurement process for the supply, installation, commissioning, implementation, and support services for a national customer call center system, including high-value customers did not yield any responsive bid. TANESCO was advised to move this procurement to the Energy Sector Capacity Building Project (ESCBP, P126875) due to the short time that remained before closure of TEDAP;
- Marketing cell consultancy;
- T&D supervision contract;
- Training needs assessment;
- Procurement support; and
- Planning, design, bid documents, and evaluation for high voltage distribution cluster.

Impact

14. The completion of the project resulted in improving TANESCO's T&D networks in the Dar es Salaam, Arusha, and Kilimanjaro regions. The T&D components improved the capacity of existing networks, thus improving the service power quality for existing customers and allowing new customers to be connected to the grid in the key urban areas, which are the main growth centers of Tanzania. The improved capacity of the existing networks has resulted in power system performance by reducing system losses, frequent outages due to overloaded transformers and old equipment, low and fluctuating voltage conditions, and poor system power factors.

Next Steps: Completion of the Remaining Parts of the Project

15. TEDAP for Dar es Salaam was planned to construct the 132 kV southern ring circuit which covers the transmission line from Factory Zone III-Factory Zone II-Mbagala-Kurasini-Ubungo. However, the road expansion project along Mandela road by TANROADS affected the whole plans for the transmission line along this section. Therefore, this part of the project was removed from the current scope. Thus, the intended objectives of constructing 132 kV ring circuit could not be realized within the time frame.

16. Generally, the completion of TEDAP caused stable and reliable power supply to industries especially in the areas of Mbagala, Mkuranga, Chang'ombe, Kariakoo, City Center, Oysterbay, Buguruni, Mikocheni, and Gongo la Mboto in Dar es Salaam and some parts of Mirerani, KIA, Unga Limited, Themi, Kiltex, Mount Meru, Njiro, Boma Mbuzi, and Trade School in the Kilimanjaro and Arusha regions.

Lessons and Recommendations

17. From TEDAP, which aimed in upgrade the network in three main urban areas—Dar es Salaam, Arusha, and Kilimanjaro, the lessons learned are the following:

- Issue of taxes in projects should be agreed and clearly indicated in the Financing Agreement and shared with all relevant concerned authorities to avoid conflict during project implementation. In addition, the phrases regarding tax exemptions in the Financing Agreement should match with the signed contract documents.

- The land acquisition and compensation should be completed before the effective date and starting date of civil work, respectively, so that all parties can avoid any disputes, claims, and additional costs due to the time extension from delay in land acquisition and compensation.

- The project should immediately start after compensation to avoid encroachers and further unnecessary complaints or clear the compensated route after the given notice has expired.

- Due to complications which arise during land acquisition, provisional of partial site handing over in areas with no complications should be considered in the contracts to avoid claims and delay of the whole project.

- Due to rapid change in technology, capacity building should be emphasized during project implementation to prepare the staff to take over the facilities for operation and maintenance immediately after commissioning of the facilities.

- Proper coordination from the planning stage between new projects within the same area is very important for smooth project implementation to avoid any disputes, claims, and additional costs.

- Approvals by the TANESCO tender board and the World Bank for change orders should be released within shortest possible time and then immediately confirmed with the contractor.

- The project execution planning relating to routing and construction plots must be specified in consultation with other utilities and relevant ministries at the time of the formulation and, if possible, legally formalized.

- There were delays in project completion due to shutdown requirements. As most of the distribution works were implemented in the existing substations and distribution lines, the existing equipment needed to be shut down from time to time. To avoid longer outages for customers, it was difficult to get the required shutdown permit in time because of the delay in completion of the project, thus inconveniencing customers. Proper plans have to be in place before the project kicks off.

- Changes in laws, price index and regulations during project implementation may result in extra cost and additional time, as it causes problems to resolve any claims for reimbursement (for example, change of labor law which affected the minimum wages for workers resulted in additional claim by the contractor). Contracts should allow for contingents to cover such changes if it happens.

- Due to various reasons, the project completion was delayed for quite some time than what was planned. Hence, the load has grown tremendously so much so that even the new installed equipment is nearly reaching its maximum capacity at the time of commissioning. It is, therefore, recommended that future new projects be implemented within the stipulated time.

- When it takes a longer period to complete the project, the consultant/contractor in the internal organization changes from time to time and this affects the overall project time schedule as it takes time for a newly appointed resident/project manager to be conversant with the project. Therefore, project implementation should take a reasonably short time as practically possible for smooth project execution.

B. Off-grid Investments - Prepared by REA

Context

18. The GoT considers growth of the renewable energy industry as an integral part of its rural energy and power sector development strategies. In its National Energy Policy document, it states it as one of its objectives to reduce the dependency on fossil fuel for isolated grids and remote locations and suggests additional research and development of renewable energy, particularly as part of the rural electrification initiatives. It also stipulates the necessity to establish a legal framework and standards for renewable energy. Several other policies and legislations that have been adopted comprise the foundations for growth of the industry.

19. Identified barriers for renewable energy industry growth during inception of the project were

- Lack of a favorable business environment and policy framework;

- Lack of scale-up capacity-building efforts;

- Lack of understanding of end user need and awareness;

- Lack of a rural delivery infrastructure; and

- Lack of access to finance.

Objective for Off-grid

20. The TEDAP off-grid project aspires to improve the quality and efficiency of the electricity service provision in Tanzania and establish a sustainable basis for energy access expansion. Specifically, the objectives of the off-grid component were

- To increase electricity access in rural and peri-urban Tanzania to productive enterprises, service delivery facilities (in health and education), and to households with the ability to pay for electricity service;

- To establish a functioning institutional framework for commercially oriented, sustainable service delivery for rural electrification that can be scaled up; and

- To exploit Tanzania's renewable energy potential.

Scope

21. The off-grid component has three subcomponents: (a) Small Power Generation and Distribution, (b) Sustainable Solar Market Development, and (c) Technical Assistance to all off-grid electrification stakeholders (Government, private sector, nongovernmental organizations, and users), including support preparation of the comprehensive electricity access expansion strategy (both on-grid and off-grid), and options available to secure financing for such a strategy.

22. Progress toward achieving the off-grid component objectives will be measured by the following indicators:

- Number of new off-grid electricity users

- Number of off-grid investment transactions implemented by REA and identified in a pipeline

- Number of MW of renewable energy installed for generation of electricity to the grid

- Avoided carbon dioxide emissions

23. To achieve the objectives, the project facilitated rural energy development by supporting the private sector. This was achieved by existence of the following facilities within the project:

- Matching grants that were used for pre-investment studies of small hydropower projects for either conducting feasibility studies, environmental impact assessments, and business plan preparations

- Performance grants based on the number of connections made by developers in the SPP

- Long-term loans for the SPP through PFIs refinanced by the project

- Performance grants based on the number of solar home systems sold to the private homes under SSMP-1

Key Factors during Preparation

- Implementation of the SSMP-1 component being new to most rural communities required a firm and/or contractor with rural environment experience. Underachievement was attributed to the implementing contractor being foreign with little knowledge of the

environment. However, local entrepreneurs hijacked the opportunity and increased sales of solar home systems in the project area.

- Despite good results accrued from the participation of local entrepreneurs, quality control of equipment was not under the project management's control, resulting in some poor-quality materials.

Key Factors during Implementation

- Loans were issued in Tanzanian shillings because the SPPs were selling in Tanzanian shillings to TANESCO.
- The onlending interest rates were calculated based on market conditions (floating rates) and hence were more volatile and not attractive to potential borrowers (renewable energy projects).
- Delayed payments to the SPPs by TANESCO made commercial banks, through which loans were channelled, hesitant to use the facility.
- Lack of experience on the commercial banks' side to lend to rural energy projects translated into their inability to timely and appropriately appraise proposals submitted by project developers of renewable energy technologies.
- Little commitment was allocated for matching grants and Lighting Rural Tanzania.
- The amount that was allocated for subsidy in SSMP-1 was small and resulted in poor implementation of the program especially in private market (US$2.5 per Wp).
- Stealing of solar PV panels and batteries in some areas lead to lack of services intended to be provided to the society.
- Misuse of facilities in some public Institutions, that is, police posts, dispensaries, and health centres, lead to poor performance of the system or complete damage to the systems.

Lessons Learned and Recommendations

Sustainable Solar Energy Packages

24. The lack of private market sales does not mean that SSMP model has failed. Many factors were involved, including inadequate marketing skills and language barriers (commercial dissemination) especially for the contractor who was a vendor. However, a better performance was realised in the public facilities PV part. The financial incentive for bidding SSMP was mainly on the public facilities component, while the obligation for private sales was considered as simply an unavoidable part of the deal. The consumer financing plan (marketing plan) was initially not communicated by the contractor until REA intervened.

25. The private market sales reviewed earlier and the current commercial operations strongly support the concept of the 'consumer entry price' as a key factor in achieving significant household sales. The 'cash only' sales approach has not worked and is unlikely to work under any model. The entry price for the consumer must be reduced as much as possible by spreading out payments over time. This could be done through various financing mechanisms like vendor microcredits or fee-for-service and rent-to-own approaches.

26. The microfinance institutions are undeveloped in Tanzania and are unlikely to be a significant source of credits for private sales in the near to medium terms. Consumer financing by the vendors and services providers themselves is the only way to spread out the payments.

27. SSMP-2 aims to achieve the largest coverage in private sales (household coverage) within the shortest time frame. The model considered is a low consumer entry price. In addition, a possibility to include the long-term service fee model is recommended and has been adopted.

28. It is expected that if marketing is implemented under the long-term service fee model in project areas, sales will exceed those implemented in other models.

29. The existing subsidy system for private market though performance grants was flawed and should be revised in future projects to directly address the affordability issue and provide a real incentive for participating companies. The key will be in the design and application of subsidy and findings mechanisms that effectively address the large affordability gap in the lower income markets and thus enable the participating companies to acquire a sufficient customer base while managing the higher cost of doing business in the project area.

Policy Issues

30. The total number of remote, dispersed off-grid households in Tanzania for which the least-cost economic solution is individual solar PV systems is not known but is undoubtedly large. In line with the Government goals in social equity and balanced regional development, it is recommended that the World Bank continues to support household PV programs in Tanzania.

31. However, prioritization of the areas for such programs must be made with practical consideration of cost and the reality of achieving the intended goals with the tools at hand. It is recommended that the Government to give higher priority to areas that are not the poorest and where household income permits a level of affordability to sustain commercial programs, such as subsidized fee for service.

32. The World Bank has a small role in assisting the scale-up of the existing private market systems operation in the peri-urban and relatively higher-income areas of Tanzania. Other agencies should take on this role. It is important to apply such commercial operations to the off-grid, low-income project areas where Government subsidies are inevitably needed.

Implementation Issues

33. The provision of stand-alone power supply to remote off-grid public institutions is an important effort by the Government to improve services to the communities. For PV projects it is also a means of sharing some of the benefits of the project with the low-income households who are unlikely to acquire

an individual PV system under any business model. It is recommended that this support to public facility systems and private market arrangements continue in future programs. The tenders for these two arrangements must be separated to increase the efficiency and enable big penetration of the private market systems.

34. For private market systems, it is important that not only the new, externally funded commercial business models be considered but also the participation of qualified local PV companies to build local capacity in the PV industry. This can be achieved by using a PforR approach to provide performance grants per eligible connection achieved by any company employing any business model/technology while maintaining technical standards and quality.

35. The subsidy level provided to start from tier 2 (5–20 Wp) range and the subsidy must be reduced to move from tier 2 to higher tiers to increase more access to poor communities.

36. Solar credit line will be introduced in the coming Tanzania Rural Electrification Expansion Program.

Lessons and Recommendations from Mini-grids Perspective

37. TEDAP generated a set of lessons learned that have been applied in the designing of the follow-on new program—the Tanzania Rural Electrification Expansion Program. The following paragraphs present an analysis of four key stakeholders—EWURA, TANESCO, project developers, and PFIs (lenders)—comparing challenges and solutions during TEDAP and post TEDAP.

38. **EWURA.** EWURA established a simplified regulatory framework comprising the Electricity (development of SPPs) Rules which include an SPPA and Standardized Tariff Methodology. However, the framework contains several challenges and gaps for the promotion of SPPAs, such as capital costs of technology, payments in local currency, and compensation time frame for mini-grid operators when the main grid arrives. Some of the recommendations to address these issues include introduction of a feed in tariff based on size and technology for biomass and hydropower; introduction of payment in a combination of U.S. dollars and Tanzanian shillings; introduction of Electricity (development of SPPs) Rules, 2017; and approval by the EWURA board to address mini-grid operator concerns when the main grid arrives.

39. **TANESCO.** Some of the challenges faced include that of off-taker's risk. Some developers and lenders were also concerned about TANESCO/off-taker late payment to SPPs. These developers/lenders, at times, request a government guarantee to be assured with the loan they issue. It is important to note that the Government Loans, Guarantee, and Grants Act stipulates the issuance of grants only to companies where the GoT owns majority of the shares (over 50 percent) and not to individuals or private entities. A recommendation that includes the introduction of credit enhancement mechanism alternatives should be explored, such as broader engagement with the African Trading Insurance, exploring other guarantee schemes, and so on.

40. **Developers.** Developers face several challenges, including lack of experience of local owners/controllers who are interested in developing their resources for SPPs; lack of experience with investment projects; and lack of adequate experience/skills to develop, commission, and operate power generation and distribution projects. Another challenge faced by small-scale renewable power developers in Tanzania was the limited availability and access to private sources of investment capital. Moreover,

because most of the power projects are capital intensive, collateral required by financial credit was high. At times, developers also faced political interference, especially during election, in some areas of Tanzania.

41. The recommendations include focusing on economies of scale, particularly through the new Renewable Energy Project Development Facility. REA will pay for a portion of the developers' external costs of consultants in five categories: (a) technical and engineering; (b) project development management, business planning, and finance structuring/arranging; (c) legal; (d) procurement; and (e) social and environmental assessments. This arrangement is similar to TEDAP, but it has been enhanced with the new program. It was noted that, the small scale of these projects, to be operated on an individual basis, indicates that there may be economies of scale and scope in developing and operating the projects, which were not being used under the current system. The Renewable Energy Project Development Facility has options whereby projects can be aggregated through partnerships with experienced developers.

42. Furthermore, it is essential that there be smooth, workable channels by which private equity investments can flow into small, renewable power projects on terms acceptable to the investors as well as the local owners of the renewable resource. In Tanzania, such investments could be undertaken by pension funds, regional investment funds, high net worth individuals, and listed equity investments. Or they may come from external sources that are interested in providing patient or social capital.

43. **Financial institutions.** The TEDAP credit line facility was designed to facilitate the flow of commercial credit from the PFIs to SPP developers and extend the tenor of the loans which they offer to the SPP developers. The credit line worked satisfactory as it proved to be an effective tool to facilitate the longer tenor loans needed for renewable energy in the local market. However, challenges were experienced that led to the need to update some of the details governing the flow of funds. For example, power generation projects require longer grace period for implementation, hence they become unattractive to most commercial banks. Also, given the technical nature of power projects, this becomes a challenge to most financial institutions who are mainly conversant with the financial analysis.

44. Recommendations include the decisions taken in 2016 by the Credit Line Steering Committee which reviewed the Credit Line Operating Guidelines and approved the following approved changes:

- The introduction of onlending in Tanzanian shillings, U.S. dollars, or a combination of both using fixed interest rates
- Proposed changes to the methodology used to calculate the onlending rate so that it allows lower onlending rates to PFIs, hence reducing cost of capital to projects
- Incorporation of new provisions in the existing credit line facility that will enable the delivery of short-term loans for mature technologies such as solar, biogas, biomass gasification, wind, and pico-hydro

45. **Regulatory burden.** Based on interactions with developers, discussions with REA, and other stakeholders, the greatest compliance burden comes from the NEMC, which issues environmental clearances, and the Water Basin Authorities, which issue water use approvals for small hydropower projects. Therefore, it is recommended that the compliance burden be reduced. It is clear that the

developers of off-grid projects have to comply with a number of rules and regulations, obtain many licenses and permissions, and improve the time and steps necessary to obtain permissions.

ANNEX 6. SUPPORTING DOCUMENTS

Title	Date	Reference Number
2016 Power System Master Plan Update	December 2016	n.a.
AfDB Power Sector Reforms and Governance Support Program (PSRGSP) Phases I–III	2015, 2016	n.a.
Aide Memoires for the Project's Supervision Missions	Multiple	Multiple
Development of Electricity Tariff-Setting Methodology and Carrying Out Cost of Service Study (Mercados Study)	August 2012	n.a.
Electricity Supply Industry Reform Strategy and Roadmap 2014–2025	June 2014	n.a.
IMF Staff Reports on Article IV Consultations and Reviews under the Standby Credit Facility Arrangement	2012–2014	Multiple
Project ISRs	Multiple	Multiple
TANESCO Short-term Financial Assessment 2012–2015	June 2012	n.a.
TANESCO Tariff Applications	2012–2016	n.a.
TANESCO Turnaround Study (MCC)	2016	n.a.
Tanzania Development Vision 2025	1999	n.a.
Tanzania National Energy Policy	December 2015	n.a.
Tanzania Rural Electrification Expansion Program—Program for Results	May 2016	103827-TZ
The Tanzania Five-Year Development Plan 2011/12–2015/16	June 2011	n.a.
The Tanzania Five-Year Development Plan 2016/17–2020/21	June 2016	n.a.
World Bank Tanzania CAS for FY2012/15	May 2011	60269-TZ