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IDA/R2017-0216/1

June 8, 2017

Closing Date: Tuesday, June 27, 2017 at 6 p.m.

FROM: Vice President and Corporate Secretary

Zambia - Electricity Service Access Project

Project Appraisal Document

Attached is the Project Appraisal Document regarding a proposed credit to Zambia for an Electricity Service Access Project (IDA/R2017-0216), which is being processed on an absence-of-objection basis.

Distribution:

Executive Directors and Alternates
President
Bank Group Senior Management
Vice Presidents, Bank, IFC and MIGA
Directors and Department Heads, Bank, IFC and MIGA

The World Bank

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Report No: PAD2303

INTERNATIONAL DEVELOPMENT ASSOCIATION

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED CREDIT

IN THE AMOUNT OF SDR 19.4 MILLION
(US$26.5 MILLION EQUIVALENT)

TO THE

REPUBLIC OF ZAMBIA

FOR AN

ELECTRICITY SERVICE ACCESS PROJECT

JUNE 6, 2017

Energy and Extractives Global Practice
Africa Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective April 30, 2017)

Currency Unit =	Zambian Kwacha (ZMW)
US$1 =	9.33 ZMW
US$1 =	SDR 0.72938396

FISCAL YEAR
January 1 - December 31

Regional Vice President:	Makhtar Diop
Country Director:	Paul Noumba Um
Senior Global Practice Director:	Riccardo Puliti
Practice Manager:	Wendy E. Hughes
Task Team Leader(s):	Mirlan Aldayarov, Jenny Maria Hasselsten

ABBREVIATIONS AND ACRONYMS

AfDB	African Development Bank
BGFZ	Beyond the Grid Fund for Zambia
BoZ	Bank of Zambia
CAPEX	Capital Expenditure
CEO	Chief Executive Officer
CP	Cooperating Partner
CPS	Country Partnership Strategy
DA	Designated Account
DBZ	Development Bank of Zambia
DoE	Department of Energy
EIRR	Economic Internal Rate of Return
ERB	Energy Regulation Board
ESAP	Environmental and Social Action Plan
ESB	Electricity Supply Board
ESCO	Energy Service Company
ESDP	Energy Sector Directions Paper
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
EU	European Union
FI	Financial Intermediary
FM	Financial Management
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gas
GPOBA	Global Partnership on Output Based Aid
GRS	Grievance Redress Service
GRZ	Government of the Republic of Zambia
HV	High Voltage
IAES	Increased Access to Electricity Services
IDP	Institutional Development Plan
IFC	International Finance Corporation
IFR	Interim Financial Report
IPF	Investment Project Financing
IPR	Independent Post Review
IVA	Independent Verification Agent
KfW	German Development Bank (*Kreditanstalt fur Wiederaufbau*)
LED	Light-Emitting Diode
LV	Low Voltage
NPV	Net Present Value
M&E	Monitoring and Evaluation
MIS	Management Information System
MoE	Ministry of Energy
MoF	Ministry of Finance
MoJ	Ministry of Justice
MNDP	Ministry of National Development Planning

MoU	Memorandum of Understanding
MPSA	Ministries, Provinces and Spending Agency
MSEs	Micro and Small Enterprises
MTF	Multi-Tier Framework
MV	Medium Voltage
NBFI	Nonbank Financial Institution
NES	National Electrification Strategy
NGO	Nongovernmental Organization
NPF	New Procurement Framework
OA	Operating Account
O&M	Operation and Maintenance
OBA	Output-based Aid
OPEX	Operational Expense
OGESSP	Off-Grid Electrification Smart Subsidy Program
PayGo	Pay-as-you-Go
PDO	Project Development Objective
PFI	Participating Financial Intermediary
PIA	Project Implementation Agency
PIU	Project Implementation Unit
PMC	Project Management Consultant
POM	Project Operations Manual
PPA	Power Purchase Agreement
PPP	Public Private Partnership
PPR	Procurement Post Review
PSC	Project Steering Committee
PV	Photovoltaic
RAP	Resettlement Action Plan
REA	Rural Electrification Authority
REF	Rural Electrification Fund
REMP	Rural Electrification Master Plan
RPF	Resettlement Policy Framework
RGC	Rural Growth Center
SDG7	Sustainable Development Goal 7
SE4ALL	Sustainable Energy for All
SHS	Solar Home System
SIDA	Swedish International Development Agency
SSMP	Sustainable Solar Market Package
TA	Technical assistance
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Organization
USAID	United States Agency for International Development
VAT	Value added Tax
WB	World Bank
WTP	Willingness to Pay
ZESCO	Zambia Electricity Supply Corporation Limited
ZPL	Zengamina Power Limited
ZPPA	Zambia Public Procurement Authority

BASIC INFORMATION

Is this a regionally tagged project?	Country(ies)	Financing Instrument
No		Investment Project Financing

[ ] Situations of Urgent Need of Assistance or Capacity Constraints

[✔] Financial Intermediaries

[ ] Series of Projects

Approval Date	Closing Date	Environmental Assessment Category
27-Jun-2017	31-Aug-2022	B - Partial Assessment
Bank/IFC Collaboration		
No		

Proposed Development Objective(s)

The project development objective is to increase electricity access in Zambia's targeted rural areas.

Components

Component Name	Cost (US$, millions)
Component A - On-grid Electricity Access Expansion	23.70
Component B - Off-grid Electricity Access Expansion	5.90
Component C - Capacity Building and Project Implementation Support	7.20

Organizations

Borrower : Republic of Zambia

Implementing Agency : Rural Electrification Authority

PROJECT FINANCING DATA (US$, Millions)

[✔] Counterpart Funding	[ ] IBRD	[✔] IDA Credit [ ] Crisis Response Window [ ] Regional Projects Window	[ ] IDA Grant [ ] Crisis Response Window [ ] Regional Projects Window	[✔] Trust Funds	[ ] Parallel Financing

Total Project Cost:	Total Financing:	Financing Gap:
36.80	36.80	0.00
	Of Which Bank Financing (IBRD/IDA): 26.50	

Financing (in US$, millions)

Financing Source	Amount
Borrowing Agency	2.70
Global Partnership on Output-based Aid	7.00
International Development Association (IDA)	26.50
LOCAL: BENEFICIARIES	0.60
Total	**36.80**

Expected Disbursements (in US$, millions)

Fiscal Year	2017	2018	2019	2020	2021	2022	2023
Annual	0.00	1.30	2.15	3.90	7.01	9.57	2.57
Cumulative	0.00	1.30	3.45	7.35	14.36	23.93	26.50

INSTITUTIONAL DATA

Practice Area (Lead)

Energy & Extractives

Contributing Practice Areas

Finance & Markets

Climate Change and Disaster Screening

This operation has been screened for short and long-term climate change and disaster risks

Gender Tag

Does the project plan to undertake any of the following?

a. Analysis to identify Project-relevant gaps between males and females, especially in light of country gaps identified through SCD and CPF

Yes

b. Specific action(s) to address the gender gaps identified in (a) and/or to improve women or men's empowerment

Yes

c. Include Indicators in results framework to monitor outcomes from actions identified in (b)

Yes

SYSTEMATIC OPERATIONS RISK-RATING TOOL (SORT)

Risk Category	Rating
1. Political and Governance	Moderate
2. Macroeconomic	Moderate
3. Sector Strategies and Policies	Moderate
4. Technical Design of Project or Program	Substantial
5. Institutional Capacity for Implementation and Sustainability	Substantial
6. Fiduciary	Substantial
7. Environment and Social	Moderate
8. Stakeholders	Low

9. Other	Low
10. Overall	Substantial

COMPLIANCE

Policy

Does the project depart from the CPF in content or in other significant respects?

[ ] Yes [✔] No

Does the project require any waivers of Bank policies?

[ ] Yes [✔] No

Safeguard Policies Triggered by the Project	Yes	No
Environmental Assessment OP/BP 4.01	✔	
Natural Habitats OP/BP 4.04	✔	
Forests OP/BP 4.36	✔	
Pest Management OP 4.09		✔
Physical Cultural Resources OP/BP 4.11		✔
Indigenous Peoples OP/BP 4.10		✔
Involuntary Resettlement OP/BP 4.12	✔	
Safety of Dams OP/BP 4.37		✔
Projects on International Waterways OP/BP 7.50		✔
Projects in Disputed Areas OP/BP 7.60		✔

Legal Covenants

Sections and Description

The Recipient, not later than 30 days after the Effective Date, shall establish and thereafter maintain at all times during the implementation of the Project, a Project Steering Committee (“PSC”) with functions, composition and resources satisfactory to the Association, chaired by MoE and comprising representatives of REA, ZESCO, DBZ and other relevant ministries and government institutions, including the Ministry of Finance, Ministry of National Development Planning, and ERB. (Schedule 2, Section 1.C. of the Financing Agreement.)

Sections and Description

The Project Implementing Entity shall: establish and thereafter maintain at all times throughout Project implementation a Project Implementing Unit (PIU-REA) with terms of reference, qualifications and experience satisfactory to the Association to be responsible for the coordination of all activities under the Project, comprised of a Project implementation team with terms of reference satisfactory to the Association that shall include qualified and experienced staff in adequate numbers (including staff with technical, environmental, procurement, accounting and monitoring and evaluation expertise), to be responsible for the day to day implementation of the Project. (Schedule, Section I.A.3(a) of the Project Agreement.)

Sections and Description

The Project Implementing Entity shall: cause ZESCO to establish and thereafter maintain at all times throughout Project implementation a Project Implementation Unit within ZESCO (PIU-ZESCO), with terms of reference, qualifications and experience satisfactory to the Association to be responsible for the coordination of the activities under Part 1 of the Project, which shall include qualified and experienced staff in adequate numbers (including staff with technical, environmental, procurement, accounting and monitoring and evaluation expertise), to be responsible for the day to day implementation of said Part 1 of the Project. (Schedule, Section I.A.3(b) of the Project Agreement.)

Sections and Description

The Project Implementing Entity shall: not later than six months after the Effective Date, select, hire and retain a Project Management Consultant with qualifications and experience, and under terms of reference acceptable to the Association, for the purposes of providing implementation support to the PIU during the Project implementation, all in accordance with Section III of this Schedule and the specifications set forth in the POM. (Schedule, Section I.A.3(c) of the Project Agreement.)

Sections and Description

For purposes of carrying out Part 1(a) of the Project, the Project Implementing Entity shall: no later than 120 days after the Effective Date, select, hire and retain an Independent Verification Entity with qualifications and experience, and under terms of reference acceptable to the Association, in accordance with Section III of the Project Agreement (Schedule, Section I.E.1. of the Project Agreement).

Sections and Description

No later than 30 days after receipt of each Independent Verification Report, the Project Implementing Entity shall forward to the Association each said report.

Conditions

Type	Description
Effectiveness	The Subsidiary Agreement has been executed on behalf of the Recipient and the Project Implementing Entity. (Article V, 5.1(a) of the Financing Agreement.)
Effectiveness	The Co-Executing Agreement between the Project Implementing Entity and ZESCO has been executed on behalf of the parties thereto. (Article V, 5.1(b) of the Financing Agreement.)
Effectiveness	The Project Operations Manual has been adopted in a manner acceptable to the Association. (Article V, 5.1(c) of the Financing Agreement.)
Effectiveness	The PIUs have been established in a manner satisfactory to the Association. (Article V, 5.1(d) of the Financing Agreement.)
Disbursement	Notwithstanding the provisions of Part A of Section IV of the Financing Agreement no withdrawal shall be made under Category (3) until the activities described in Part 2(a)(i) of the Project have been completed and the Operational Procedures for the OGESSP has been adopted in a manner satisfactory to the Association. (Schedule 2, Section IV.B.1(a) of the Financing Agreement.)
Disbursement	Notwithstanding the provisions of Part A of Section IV of the Financing Agreement no withdrawal shall be made under Category (4) until: (i) the activities described in Part 2(b)(i) of the Project have been completed; (ii) the DBZ Operations Manual, including safeguard principles and operationalization of the ESMF and RPF, and standard legal agreements, satisfactory to the Association, are adopted by DBZ in a manner satisfactory to the Association. (Schedule 2, Section IV.B.1(b) of the Financing Agreement.)

PROJECT TEAM

Bank Staff

Name	Role	Specialization	Unit
Mirlan Aldayarov	Team Leader(ADM Responsible)	Senior Energy Specialist	GEE01

Jenny Maria Hasselsten	Team Leader	Energy Specialist	GEE08
Wedex Ilunga	Procurement Specialist(ADM Responsible)	Senior Procurement Specialist	GGO01
Lingson Chikoti	Financial Management Specialist	Financial Management Specialist	GGO25
Abdolreza B. Rezaian	Team Member	Senior Energy Consulant	GEEDR
Baison Banda	Team Member	Financial Management Consultant	GGO13
Chita Azuanuka Obinwa	Team Member	Program Assistant	GEE01
Daniel Shepherd	Team Member	Senior Operations Officer	CASEE
Dante Ariel Mossi Reyes	Team Member	Senior Operations Officer	GEE08
Jeesun Han	Team Member	Financial Analyst	GEE08
Joseph Mwelwa Kapika	Team Member	Senior Energy Specialist	GEE08
Kabir Malik	Team Member	Economist	GEE01
Kenta Usui	Team Member	Energy Specialist	GEE01
Knut Opsal	Safeguards Specialist	Lead Social Development Specialist	GSU07
Lien Thi Bich Nguyen	Team Member	Program Assistant	GHNGF
M. Yaa Pokua Afriyie Oppong	Safeguards Specialist	Senior Social Development Specialist	GSU07
Maiada Mahmoud Abdel Fattah Kassem	Team Member	Finance Officer	WFALA
Maria Alexandra Planas	Team Member	Senior Energy Consulant	GEE01
Mariana Margarita Montiel	Counsel	Senior Counsel	LEGAM
Mwansa Lukwesa	Environmental Specialist	Environmental Specialist	GEN01
Pepukaye Bardouille	Team Member	Senior Operations Officer	CASEE
Rajesh K. Advani	Team Member	Senior Infrastructure Specialist	GSUOA
Reynold Duncan	Team Member	Lead Energy Specialist	GEE08
Richard A. Claudet	Team Member	Senior Financial Sector Specialist	GFM01
Richard Everett	Safeguards Specialist	Social Safeguard Specialist	GSU01
Samuel Kwesi Ewuah Oguah	Team Member	Energy Specialist	GEESO
Sanjay Srivastava	Team Member	Lead Environmental Specialist	GEN01

Uzma Khalil	Team Member	Senior Financial Sector Specialist	GFM07

Extended Team

Name	Title	Organization	Location

ZAMBIA
ELECTRICITY SERVICE ACCESS PROJECT

TABLE OF CONTENTS

I. STRATEGIC CONTEXT

A. Country Context

1. **Zambia is a resource-rich, lower-middle-income country with a population of close to 17 million.** In 2016, gross domestic product (GDP) was US$19.7 billion, equating to a per capita income of around US$1,181. Zambia has made significant socioeconomic progress over the past two decades and achieved average growth of 7.4 percent between 2004 and 2014. However, since mid-2015, external headwinds and domestic pressures intensified and economic growth slowed considerably to 2.9 percent in 2015 and was estimated at 3.3 percent for 2016.

2. **In 2015/16 global and domestic conditions for growth deteriorated and the price of copper—typically 77 percent of Zambia's exports—fell further from its 2011 peak.** This reduced the value of exports and opened a trade deficit which, in turn, exerted a downward pressure on revenues, widening the fiscal deficit. Domestic pressures were in the form of (a) high fiscal deficits that reduced confidence in the economy and (b) low and late-onset rainfall in 2015, which undermined agricultural incomes and lowered water levels in the country's main hydro reservoirs, leading to increased power outages. Further, the strengthening of the U.S. dollar in 2015 put pressure on the Zambian kwacha which, combined with lower confidence, led to the local currency losing 41 percent of its value against the U.S. dollar.

3. **Close to the end of 2015, the Government of the Republic of Zambia (GRZ) and the Bank of Zambia (BoZ) acted to contain the impact of ebbing confidence with monetary policy measures.** These measures restored the stability of the kwacha, which appreciated by 12.2 percent between January and December 2016, helping to curb inflation from its peak of 22.9 percent in February 2016 to 6.7 percent recorded in March 2017. Low inflation and exchange rate stability have permitted the BoZ to relax the monetary policy starting in November 2016. However, fiscal policy challenges have remained, with a fiscal deficit close to 10 percent (on a commitment basis) and debt remaining above 50 percent of GDP in 2016.

4. **Due to the prevailing constitutional provisions, five elections were held in the ten-year period (2005–2015). In January 2016, a new constitution that has limited the conditions under which fresh elections can be held came into force.** The August 2016 elections that went in favor of the incumbent President and political party were held under the new constitution and it is therefore expected that a full five-year term shall be served. This raises cautious optimism that there is political space for reform in 2017 and over the medium term. In October 2016, the GRZ presented its economic recovery plan, 'Zambia Plus', which provides a framework for restoring fiscal sustainability, closing the twin deficits (fiscal and current account), and ensuring that structural reforms are carried out to boost the non-copper economy. The GRZ has requested the support of the World Bank, International Monetary Fund, and other partners to make the recovery plan a success. Accordingly, GDP growth is forecasted to rise to 4.0 percent in 2017 and 4.2 percent in 2018. The forecasts are subject to upside and downside risks, but the return of investor confidence in the fourth quarter of 2016 (evidenced by over-subscribed bond auctions), the bold measures adopted by the GRZ (including the removal of fuel subsidies), and a rally in copper prices (November 2016) suggest that the economic circumstances should be improving.

5. **The rapid and sustained growth achieved from the early 2000s to 2014 was insufficiently inclusive and, despite the economy doubling in size, poverty remains widespread.** The 2015 Living Conditions Monitoring Survey Report of the GRZ's Central Statistical Office shows that an estimated 40.8 percent of Zambians live in extreme poverty (below US$1.90 per day, purchasing power parity terms) and poverty is higher among women. Rural poverty, at 76.6 percent, is more than three times the rate of urban poverty, at 23.4 percent. Inequality is high in Zambia, with a Gini coefficient of 0.56 in 2015. According to the 2015 Living Conditions Monitoring Survey, the top 10 percent of Zambians received 56 percent of 2015 income and the bottom 40 percent just 5 percent, while 60 percent of the population shared just 12 percent of the national income. Efforts are needed not only to restore faster economic growth but also to ensure planned pro-poor policies are implemented so that growth is more inclusive.

B. Sectoral and Institutional Context

6. **Electricity is the second most important energy source in Zambia after wood fuel, providing about 10 percent of the national energy supply.** The installed generation capacity is about 2,700 MW and the main source of electricity generation is hydropower, which represents over 90 percent of electricity production. The mining industry is the largest consumer category, accounting, in 2015, for 52 percent of the national electricity consumption, followed by the residential sector at 29 percent.

7. **The electricity supply industry in Zambia is dominated by the vertically integrated utility company Zambia Electricity Supply Corporation Limited (ZESCO).** The utility is wholly state-owned through the Industrial Development Corporation, the holding company for the majority of state-owned enterprises in Zambia. ZESCO owns and operates over 90 percent of the generation, transmission, and distribution assets in the country and supplies electricity to all grid-connected consumers, with the exception of some of mining consumers in the Copperbelt Province, which are served by Copperbelt Energy Corporation, a private company that purchases bulk power from ZESCO for onward supply to the mines. Electricity consumption by the mining industry accounts for over 50 percent of total consumption. The electricity sector is overseen by the Ministry of Energy (MoE), which provides policy guidance. The independent Energy Regulation Board (ERB) is responsible for licensing, tariff setting, and quality of supply and service standards for all segments of the energy sector (including fuel and electricity) in accordance with the provisions of the 1995 Energy Regulation Act as amended in 2003. The ERB sets electricity tariffs for all consumers, with the exception of the mining industry and other large consumers, which are set through long-term power purchase agreements (PPAs). The Rural Electrification Authority (REA) is responsible for electrification in rural areas and manages the Rural Electrification Fund (REF).

8. **The electricity sector faces numerous challenges and its poor reliability and quality of supply, combined with the low levels of access to electricity services, have a significant, adverse impact on the national economy.** In response to power shortages, firms are forced to invest in self-generation presenting significant additional cost, especially for smaller firms.[1] A survey of 720 firms,[2] conducted between December 2012 and February 2014, showed that 27 percent of firms owned or shared a

[1] Foster V., and J. Steinbucks. 2009. *When do Firms Generate? Evidence on In-house Electricity Supply in Africa.* Energy Economics 32: 505–514.
[2] World Bank Enterprise Surveys. Available at http://www.enterprisesurveys.org/data/exploreeconomies/2013/zambia.

generator and the remainder of the firms experienced losses that averaged at approximately 7.5 percent of annual sales.

9. The electricity sector faces the following three main challenges:

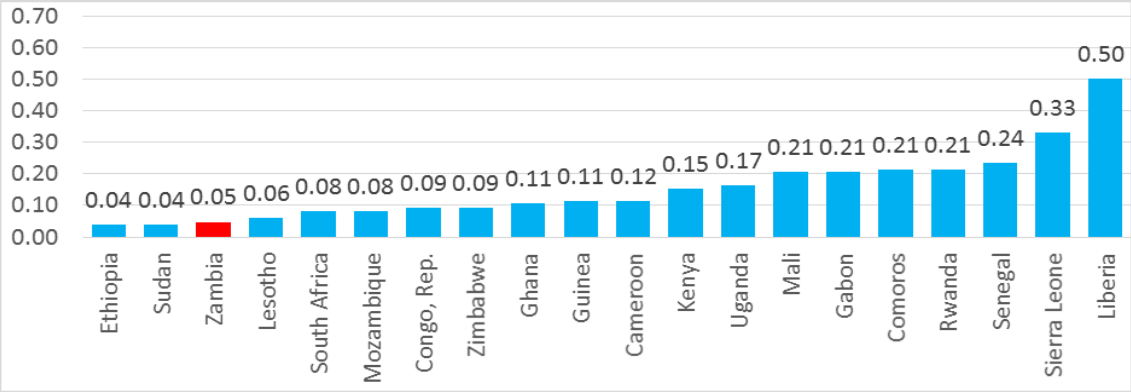
(a) **Electricity demand growth has outpaced generation capacity expansion.** Electricity demand in Zambia has been growing at an average rate of 4 percent per year. Generation capacity expansion has, however, not matched this growth in demand leading to power shortages. This was exacerbated in 2015 and 2016 when, due to lower-than-expected rainfall, water levels in the country's main hydropower reservoirs dropped significantly, leading to nationwide load-shedding of up to 12 hours per day on a rotational basis. Furthermore, although Zambia is endowed with significant resources for power generation, no new plants have been commissioned between 1977 and 2014. This was due to a period of excess capacity that lasted until the early 2000s when demand began to catch up with supply. The poor financial position of the electricity sector, lack of an adequate planning and procurement framework, and an overall high-risk environment made new investments in generation difficult. It is only recently with the commissioning of the 360 MW Kariba North Bank Extension in 2014 and the 120 MW Itezhi-Tezhi Hydro and 300 MW Maamba Collieries power plants, both commissioned in 2016, that new generation plants have been brought on stream. Despite installed capacity now being higher than peak demand, plant availability, reserve requirements, and variable hydrological conditions mean that the risk of power shortages remains.

(b) **The power sector is not financially sustainable.** Electricity tariffs in Zambia remain among the lowest in Sub-Saharan Africa. In 2016, it was estimated that the Zambian power sector loses approximately US$300–-400 million due to underpricing. As a result, there is insufficient revenue to cover operations, maintenance, and the capital expenditures required for plant refurbishment and expansion. This difficult financial situation was exacerbated, when in 2015 and 2016, due to the significant drop in hydro reservoir water levels, ZESCO was forced to start importing costly emergency power. There are two broad consumer categories in the electricity sector: the non-mining retail category, whose tariffs are set by the ERB, and the mining sector, where tariffs are governed through long-term PPAs. For both these categories, tariffs and revenues are in general below cost recovery.

Following the August 2016 elections, the newly formed Government reaffirmed its commitment to the financial sustainability of the sector. This was reflected in the President's address to the National Assembly in September 2016 and the November 2016 budget address by the Minister of Finance. Specifically, the GRZ plans to fully implement an earlier decision on providing financial support to ZESCO to cover the cost of emergency electricity imports that cannot be recovered through the prevailing tariffs, and to adjust tariffs to reach cost recovery levels by 2019. As part of the first steps in implementing this commitment, ZESCO has submitted a tariff application to the ERB that aims at increasing tariffs by 75 percent (except for the energy charge under the lifeline tariff, which will remain at the current level of ZMW 0.15 [US$0.0.15] with expanded coverage up to 300 kWh, while the fixed monthly charges will increase by 75 percent). In parallel, the GRZ has held negotiations with the mining industry, and it is expected that an agreement shall be

reached for an upward tariff adjustment. In addition, the ERB has commissioned a Cost of Service Study, expected to be completed by the end of 2017, that will provide an objective basis for tariff determination in Zambia.

Figure 1. Average Electricity Tariff in Sub-Saharan Africa (US$)[3]



(c) **Access to electricity, especially in rural areas, is strikingly low.** The overall national electricity access rate, defined as connection to the grid, is low at 31 percent.[4] More than 67 percent of the population in urban areas, while only about 4 percent in rural areas, have access to electricity.[5] As part of the national strategy document, Vision 2030, the GRZ has set electrification targets at 90 percent for urban and 51 percent for rural areas to be reached by 2030. However, at the current pace, these targets are not expected to be achieved. The rural electrification target is based on the electrification of Rural Growth Centers (RGCs) through grid extensions, mini-hydro, and solar installations as outlined in the Rural Electrification Master Plan (REMP) of 2008. It is expected, however, that the definition of access will become more granular once the recently launched Multi-Tier Framework (MTF) survey, supported by the World Bank, is completed by end-2017.[6]

10. **While the overall access rate in Zambia has been steadily increasing, rural access has stagnated at 4 percent.** Significant progress in increasing access for urban households has been achieved due to several factors, including a clearer institutional mandate of ZESCO, more commercially attractive consumers with higher use of electricity per capita, more widely available transmission and distribution network infrastructure, and interest from the development community (see figure 2). Another factor was the successful testing and implementation of the World Bank-funded Output-based

[3] Source: Trimble et al. 2016. *Financial Viability of Electricity Sectors in Sub-Saharan Africa.*
[4] In addition, 4.6 percent of households have access to lighting energy through solar photovoltaic (PV) systems.
[5] Electricity access is defined in the national living conditions survey as access to the national grid. Central Statistics Office, Living Conditions Monitoring Survey 2015.
[6] The MTF was developed to monitor and evaluate energy access under the Sustainable Energy for All (SE4ALL) initiative launched by the United Nations in 2011 to achieve universal access to modern energy services by 2030. The MTF approach goes beyond binary measurement of energy access as 'having or not having an electricity connection' or 'relying or not relying on solid fuels for cooking' by considering various service levels and attributes, such as availability, quality, reliability, health/safety, convenience, and affordability, and multiple technology options (for example, grid and off-grid electricity). The MTF measures access on a tiered-spectrum, from Tier 0 (no access) to Tier 5 (the highest level of access). Tier 1, for instance, includes basic applications such as task lighting, radio, and phone charging.

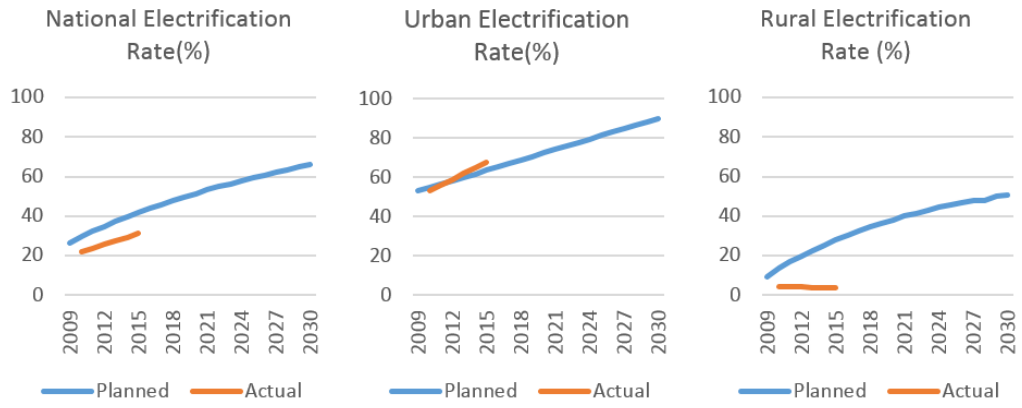
Aid (OBA)/connection subsidy program under the Increased Access to Electricity Services (IAES) Project (P077452), which closed in 2015, and the ongoing Electricity Access for Low-Income Households Project (EALIHP, P146636) grant funded by the Global Partnership on Output Based Aid (GPOBA) with proceeds from the Swedish International Development Agency (SIDA). These two projects combined have enabled over 120,000 low-income households in urban and peri-urban areas to gain access to electricity services by significantly reducing the burden of the fees for grid connection.

11. **Low population density makes increasing access in rural areas more challenging.** The World Bank's previous initiatives have focused on urban and peri-urban areas where the combination of high population density, existing networks, and higher per capita energy use would lead to lower unit costs per connection and increase the likelihood of financial sustainability. In rural areas, however, Zambia has one of the lowest population densities in Southern Africa (excluding Lusaka and Copperbelt Provinces, the population density of other provinces varies between 6 and 31 persons per square kilometer) and a rural settlement pattern where an RGC is surrounded by scattered households, which makes providing access particularly challenging. In addition, affordability of the connection fees for grid access remains a major barrier for the rural population. With almost 77 percent of the rural population in Zambia living below the poverty line, the current grid connection fee and the requirement that it is to be paid up front presents a significant barrier to access even in areas where the grid exists.

12. **The cost of providing on-grid access is made more prohibitive due to network expansion choices.** The current network expansions are being carried out using standard three-phase technology and standard conductor and equipment sizes optimized for urban applications, which lead to over-specified medium voltage (MV) and low voltage (LV) networks in rural areas. Achieving the GRZ's access targets, especially in rural areas, will therefore require revamping of current approaches, including a review of the existing institutional framework, adoption of low-cost grid extension technologies, finding a solution to affordability impediments by providing OBA, and introduction of alternative off-grid rural electrification solutions. Preliminary analysis[7] indicates that the least-cost option to provide electricity access for over 50 percent of the population is through off-grid solutions, mainly through mini-grid and stand-alone solar PV systems.

[7] Preliminary analysis indicates that the least-cost option to reach universal access in Zambia by 2030 is to reach 47 percent of the population, living mainly in the more populous regions, through grid extension and densification; to reach 10 percent, mainly living in the north, through isolated mini-grids (mainly solar PV mini-grids); and to reach the remaining 43 percent, dispersed throughout the country, through stand-alone solar systems (offgrid.energydata.info).

Figure 2. Electrification Progress in Urban and Rural Areas in Zambia (percentage)[8]



13. **Scaling up rural access will require a revision of the rural electrification approach and instruments.** The mandate to promote rural access lies with REA, established by the Rural Electrification Act of 2003. REA's functions include administering the REF,[9] developing and implementing rural electrification plans, tendering electrification projects, and providing subsidies to developers. REA's operations are guided by the REMP. The REMP identifies a total of 1,217 RGCs, areas that exhibit the potential for increased economic activity with access, hence making electricity service provision more viable. Initially, the electrification of the RGCs only covered public buildings, such as schools, health clinics, and local government facilities. Following a policy decision in 2012, the REMP's scope was expanded to include the connection of households and commercial establishments in close proximity to electrified RGCs. Despite the existence of the REMP, the rollout of rural access has been slow and, at the current rate, the 2030 targets will be missed by a significant margin. In the RGCs covered under the REMP, which includes around 40 percent of the off-grid population, about 79.9 percent of the identified least-cost electrification options were based on grid extensions, about 19.8 percent were based on solar systems, and less than one percent on mini-hydro solutions. The main assumption behind the REMP was that, once electricity services were made available at an RGC, particularly through grid extensions and/or mini-grids, the local rural households would then take advantage of this availability and would connect to the grid. However, the rate of electrification uptake by rural households and micro and small enterprises (MSEs) located in the catchment areas of the RGCs has been far less than expected even in grid-connected areas. Furthermore, for the remaining 60 percent of the rural population, which is not located in the catchment area of the identified RGCs, there is no electrification plan. In addition, REA has not fully exploited the advances in access technology and innovations in delivery and business models, for example, pay-as-you-go (PayGo). Low-cost technologies, such as Single Wire Earth Return and the shield wire system for grid extensions and solar PV mini-grids, are not reflected in the REMP. Neither REA nor ZESCO have geospatial planning capability, a powerful aid for optimizing the implementation of access programs. Therefore, scaling up rural access will require a revision of the rural electrification approach and instruments, including an update of the REMP and development of a National Electrification Strategy (NES) based on recent technological innovations and successful private sector-driven rural electrification alternatives.

[8] Staff calculations based on the data from the 2015 Living Conditions Monitoring Survey
[9] The REF receives financing from (a) a 3 percent levy on ZESCO electricity bills to non-mining consumers, (b) national budget appropriations, and (c) grants and loans from Cooperating Partners.

14. **Inadequate and unpredictable public funding for rural electrification has also affected the pace of electrification.** To achieve the target of 51 percent access in rural areas by 2030, the REMP estimated that financing of about US$50 million per annum would be required just to electrify the RGCs. There are no rural electrification programs for providing access to the rural population living away from the RGCs. Funding of the REF has been poor; since the establishment of REA, the US$50 million per year level of funding has not been achieved at any point. In general, the 3 percent levy for rural electrification collected on all retail electricity bills is not remitted in full to the REF. Inadequate financing of the REF also limits the growth of REA's operational capabilities, which in turn hampers rural access efforts. Also, even though remitting electricity levy collections in full would significantly improve REA's operational capacity, the amount would still fall short of the annual requirements estimated in the REMP. Due to the magnitude of resources required to achieve the GRZ's electrification targets, all sources of funding should therefore be mobilized and aligned along the GRZ priorities, including from the private sector, particularly for electrification of the non-RGC rural areas as there are neither any plans nor public funding available for electrification of households in these areas.

15. **Private sector participation in the provision of access has been limited, mainly due to inadequate access to finance and a nascent enabling regulatory environment.**[10] The financial sector in Zambia continues to experience high interest rates and a severe shortage of liquidity. According to the The Global Competitiveness Report 2015–2016,[11] companies in Zambia consider access to financing the main constraint to growth. Loans to MSEs and off-grid energy companies are constrained by an insistence of the commercial banks on physical collateral (usually land and representing over 100 percent of the value of the loan), high interest rates (usually over 35 percent), underdeveloped procedures related to credit risk quantification and asset-liability management, nascent credit information systems, and the dominance of short-term capital. In addition to commercial financing, privately developed mini-grids require public co-funding to cover the viability gap (the difference between cost of providing connection and what consumers are willing/able to pay for it). In addition to the access-to-finance constraint, there is no attractive enabling regulatory environment (including an unclear licensing regime, an inconsistent application of the value added tax (VAT) exemption of solar equipment, and a cumbersome tariff setting process). [12] Crowding-in both the domestic and international private sectors to expand access will require the GRZ to improve the enabling environment, including increasing access to commercial and concessional finance, developing financial mechanisms to provide public co-funding, resolving various regulatory hurdles, and building up the existing capacity of sector institutions.

[10] The solar market assessment performed for the World Bank by Open Capital Advisors confirmed that the lack of finance is a key barrier to growth of the solar market in Zambia, which was further confirmed by local solar energy companies during project preparation. Additional factors constraining the off-grid solar sector include (a) high import and in-country distribution costs due to Zambia being a land-locked country, lengthy customs clearance processes, low population density, and limited road infrastructure; (b) lack of an enabling regulatory framework (including unclear licensing regime and inconsistent application of the VAT exemption of solar equipment); (c) low purchasing power and limited access to consumer financing; (d) low mobile money penetration, which limits the use of the mobile payments that has an adverse impact on the PayGo business model for solar home systems used successfully in East Africa; and (e) negative consumer perception of solar systems due to the inflow of low quality products.

[11] The Global Competitiveness Report 2015–2016, World Economic Forum.

[12] Off-grid mini-grid tariffs are set by the ERB and can vary from the grid tariffs, based on the cost of supply for each particular project.

16. **The GRZ recognizes that the existing model for increasing access, especially in rural areas, is not achieving the intended results and that access targets are at risk.** The GRZ recognizes a need for alteration of the rural electrification effort. The GRZ intends to continue applying the successful OBA approach, tested in urban areas, for the rural on-grid electrification as well. However, from the shortcomings of the REMP that have been outlined, GRZ appreciates the need for REA to be repositioned to be less engaged in the actual implementation of projects and more focused on playing a facilitating role and providing incentives to ZESCO and private developers for on-grid and off-grid rural electrification. Therefore, the MoE has called for a review of REA's role and mandate and the agency has been in dialogue with the Cooperating Partners (CPs) community to explore areas where its operational model could be enhanced and what measures could be taken to enable private sector participation. Such a shift in REA's operational model, from a developing to a facilitating role, is further supported by the analysis currently being carried out under the 'SE4ALL' Initiative[13] that also calls for clarifying roles and responsibilities between REA and ZESCO, greater engagement of the private sector, and enhancing the REF financing model to be administered and managed by REA. Following this review, GRZ is expected to amend the corresponding legislation.

17. **Scaling up access requires a comprehensive NES that would provide a planning framework, remove regulatory impediments, provide a policy framework for sustainable financial support, and improve institutional coordination.** To achieve this, MoE concluded that an NES needs to be developed and adopted, covering electrification of both urban and rural areas, and in rural areas covering the electrification of the households in both the RGC and non-RGC areas, thus providing comprehensive and inclusive national electrification coverage. The NES would be informed by geospatial planning that is to be updated regularly, to take into account the expansion of the grid, incorporate delivery of off-grid solutions and changes in demographic and other characteristics, such as infrastructure, technology, and so on. The ongoing MTF survey[14] and its expected incorporation into the national household surveys, conducted every two years, would provide an important complement to the planning process. The NES would also identify incentives for private electricity service providers and remove bottlenecks for private sector participation. The NES is expected to clearly define roles and responsibilities for REA, ZESCO, and the private sector, aiming at achieving optimized implementation of access programs and plans and improved coordination for increasing electricity access throughout the country. The NES will be developed through extensive consultation with all relevant stakeholders, including local government, communities, and private sector.

18. **Placing the sector on a path that enables access scale-up will provide the platform for large-scale future intervention that can be supported by the World Bank, other CPs, and the private sector.** The absence of a demonstrated scale-up model is a key constraint to attracting CPs and private sector financing for access. A modestly sized operation, which establishes workable models, would be key to demonstrating that a conducive environment, capable institutions, and efficient and well-targeted government financial support can successfully mobilize the private sector. Such a demonstration would help attract the needed development partner funding and private sector interest to reach Zambia's 2030 access goals. Once models are established, future support could come in the form of sector-wide approaches that use country-based systems, where the World Bank and other CPs could ultimately

[13] ES-0059: European Union-Technical Assistance Facility Mission: Policy Support to Improve the Enabling Environment of the Zambian Energy Sector, Draft Final Report - Part 2: Rural Electrification, February 2017.
[14] Supported with funding from the World Bank's Energy Sector Management Assistance Program (ESMAP).

apply instruments, such as the Program-for-Results, to provide scaled-up support. In light of the above, the proposed project aims to help establish the enabling environment and build capacity in the key sector institutions and, further, test and learn from new access expansion solutions to inform the design and implementation of future access interventions by the World Bank and other CPs. In support of the effort to create a platform that enables scaled-up electrification and based on the success of the ongoing OBA project, SIDA has indicated a willingness co-finance the project with the World Bank.

C. Higher Level Objectives to which the Project Contributes

19. **While a Systematic Country Diagnostic is under preparation and a new Country Partnership Framework will follow, the proposed project is aligned with the World Bank's FY13–16 Country Partnership Strategy (CPS).**[15] In particular, the proposed project is aligned with the CPS's pillars and strategic objectives of "reduction of poverty and vulnerability of the poor" and "improving competiveness and infrastructure for growth and employment." The CPS also recognizes the energy sector as a key driver and enabler of growth in main economic sectors, such as mining and agriculture.

20. **In addition, the project will contribute to the CPS's cross-cutting issues, such as gender and climate change, by supporting low-emission, renewable energy mini-grids, solar home systems (SHSs), and solar lanterns in remote areas, reducing women's exposure to indoor air pollution.** Attention will be paid to the ability of female-headed households and enterprises to access on- and off-grid electricity connections. The project aligns with Objective 4: "Energy production and distribution for sustainable development" of the GRZ's Seventh National Development Plan covering 2017–2021. Under this objective, two strategies specifically relate to this project: "Promotion of renewable and alternative energy" and "Improved access to Rural and Peri-Urban areas." Furthermore, the project supports the GRZ's Vision 2030's ambitious electrification targets of 90 percent for urban areas and 51 percent for rural areas by 2030.

21. **The proposed project would help meet the World Bank's twin goals of poverty reduction and shared prosperity and is broadly aligned with Sustainable Development Goal 7 (SDG7), SE4ALL, and the World Bank's Energy Sector Directions Paper (ESDP).**[16] The SDG7, SE4ALL, and ESDP all aim to "ensure access to affordable, reliable, sustainable, and modern energy for all." Providing last mile connectivity will increase access to electricity services for poor households in rural areas, thereby enabling opportunities to study and work, and will contribute to raising the project beneficiaries' quality of life. Increased access to a reliable electricity supply will lower operating costs and improve the profitability of business enterprises and will be a key factor in enabling the establishment of new private sector-led enterprises, which will stimulate GDP growth.

22. **The proposed project is closely aligned with the principles set out in the World Bank's Africa Off-Grid Solar Approach Paper** (P149497, 2016), prepared by the World Bank's Africa Energy Practice, which identifies six ways to catalyze the off-grid solar market in Sub-Saharan Africa: developing the policy and regulatory environment for off-grid solar; supporting governments to mainstream off-grid PV into sector planning; facilitating access to working capital; issuing guarantees to reduce risk for commercial lenders that finance off-grid solar projects; using performance-based grants to push the

[15] Report No. 75089-ZM.
[16] World Bank. 2013. *Toward a Sustainable Energy Future for All: Directions for the World Bank Group's Energy Sector*.

market, when and where appropriate; and supporting creation of receptive markets through quality assurance and consumer awareness. These principles have guided the preparation of the proposed project.

II. PROJECT DEVELOPMENT OBJECTIVES

A. PDO

23. The Project Development Objective (PDO) is to increase electricity access in Zambia's targeted rural areas.

B. Project Beneficiaries

24. The project beneficiaries will be households, businesses, community and public facilities, and farmers located in rural areas of Zambia, who will benefit from connections to the main grid or separate mini-grids, as well as those in more dispersed areas, who will benefit from independent solar systems. The project will provide 'last mile' connections to the national grid to about 22,000 low-income households and about 1,000 MSEs in rural areas (about 115,000 beneficiaries). Many of these beneficiaries will receive electricity services for the first time and the use of electricity will replace consumption of kerosene, diesel, wood, dry cell batteries, and other alternative fuels. The proposed project will reduce differences in the electricity services available to urban and rural households and improve opportunities for rural socioeconomic development. The overall population of Zambia will benefit from a more systematic approach applied toward the electrification agenda and from the development of the NES. Furthermore, REA, ZESCO, the Development Bank of Zambia (DBZ), and the Department of Energy (DoE), and other stakeholders will benefit from the project's capacity-building and implementation support activities.

C. PDO-Level Results Indicators

25. **PDO level indicators:**

- People provided with new or improved electricity service (number) (Corporate Results Indicator).

III. PROJECT DESCRIPTION

A. Project Components

26. The GRZ requested World Bank support in implementing its renewed effort in accelerating access to electricity services, particularly in rural areas. The World Bank Group intends to provide its support in scaling up the rural electrification program in two stages. The first stage would be provided through the proposed project, which is designed to increase access to electricity in rural areas served by the grid, and to set the stage for scaling up rural access in areas that will not be served by the grid. It is envisaged that the building blocks put in place under this project would be the basis for a second stage

of scaling up rural electricity access that would be a larger program to be launched by the GRZ and potentially supported by the World Bank Group and other CPs, as well as the private sector.

27. The proposed project will help this effort by:

(a) Applying the OBA subsidy approach for consumer connection, which has been successfully tested in urban areas, to rural on-grid electrification, along with the required network reinforcements and extensions, using low-cost grid electrification techniques;

(b) Supporting the necessary diagnostics, analytical, policy, regulatory, and planning activities required to create the enabling environment for private sector-led off-grid electrification. This will include design of a credit facility and a grant mechanism to address specific constraints identified with respect to private sector participation. Subject to completion of the preparation work for these two financing mechanisms during early project implementation, the project will also support piloting of these two mechanisms; and

(c) Undertaking diagnostic and analytical activities that shall lead to the development of an NES for Zambia. The NES is expected to provide a planning framework, remove regulatory impediments, and aid policy formulation for the sustainable scale-up of access.

28. The proposed project comprises three components: (a) Component A will provide OBA subsidies for consumer connections and finance network reinforcements and extensions for on-grid electrification; (b) Component B will address existing regulatory impediments for private sector participation in off-grid electrification, build the needed capacity at key institutions and design, and potentially pilot[17] financial mechanisms supporting private sector-led electrification through renewable energy mini-grids and stand-alone solar systems; and (c) Component C will help fund the development of a comprehensive NES as well as timely and efficient project implementation.

Component A - On-grid Electricity Access Expansion (SDR 17.3 million (US$23.7 million equivalent), of which IDA SDR 11.6 million (US$15.9 million equivalent), Expected SIDA/GPOBA Trust Fund SDR 3.3 million (US$4.5 million equivalent), Consumers SDR 0.4 million (US$0.6 million equivalent) and REA/ZESCO SDR 2.0 million (US$2.7 million equivalent)).

29. This component will provide financing for on-grid connections in rural areas using the approaches under the OBA/Connection Fee Subsidy Program.[18] To support the 'last mile' connections, the project will also finance critical distribution network reinforcements and extensions through applying low-cost technologies where appropriate that will enable ZESCO to add new connections to the grid, complementing ongoing access expansion efforts by CPs in other parts of the country. The component will be implemented through two subcomponents.

[17] Implementation of piloting would be contingent on meeting disbursement conditions relating to satisfactory design and establishment of the financing mechanisms.

[18] The World Bank has been supporting improved electricity access in low-income areas using results-based approaches through the IAES Project and the grant from the GPOBA. The GPOBA grant to ZESCO is financed with funding from the Government of Sweden's SIDA. The projects have enabled ZESCO to connect over 120,000 households over the last eight years.

Subcomponent A.1.-– Expanding New Electricity Connections for Low-income Households through OBA-type Financing

30. This subcomponent will support last mile connections to about 22,000 low-income households[19] and 1,000 MSEs (about 115,000 beneficiaries) in rural areas outside the 18 designated city and municipal councils.[20] It will use the ongoing OBA approach, with results-based financing partially subsidizing the cost of new connections for low-income households and MSEs. Payments to ZESCO will be linked to attainment of results based on pre-agreed targets, which will be verified by an Independent Verification Agent (IVA). The progress of this subcomponent will be subject to the grid being able to handle new connections further to the investments being made under Subcomponent A.2. Areas that do not require network reinforcements or MV grid extension will be prioritized for early connections during project implementation.

31. To enable ZESCO to connect rural households and MSEs to the network, the project will reimburse ZESCO for the cost of connections less the subsidized connection fee to be paid by consumers. A flat contribution of ZMW 250 is proposed to be paid by household consumers. The proposed contribution for MSEs is ZMW 769 per connection. Under the previous OBA-based projects, the consumer contribution for households was set at ZMW 150 per standard connection and ZMW 250 per enhanced connection, and ZMW 769 per MSE connection. The proposed consumer connection fee reflects the depreciation of the kwacha, inflation, feedback from residents in the targeted areas, and the fact that consumers who are willing to pay ZMW 250 are more likely to consume greater volumes of energy, which will increase the overall project viability.[21] Options may be provided for consumers to save toward the connection fee using a combination of mobile money and/or a deferred payment mechanism to be set up by ZESCO. The connection costs were assessed using market rates at the time of appraisal in consultation with REA and ZESCO and are reflected in annex 1.

Subcomponent A.2. - Extension and Strengthening of the Grid Network for New Connections

32. This subcomponent will include construction of 33/11 kV distribution lines, installation of distribution transformers, and construction of MV/LV distribution lines (400/230 V) and testing low-cost technologies. REA and ZESCO have jointly agreed on target areas where investments are to be made, which will be prioritized focusing on rural areas with higher population density and projects with positive economic rate of return. About 36 potential rural areas have been identified in a broad geographical scope covering most of the country's provinces (Northern, North Western, Luapula, Muchinga, Copperbelt [Ndola], Eastern, Western, Southern, and Central).[22] In several of these areas, REA has already extended the network to serve public facilities. Implementation will start with these

[19] As rural areas in Zambia are by and large poor, the project makes the implicit assumption that households reached are low income; however, this assumption will be aligned with and confirmed by poverty mapping work.
[20] Areas excluded under the project are the city councils of Lusaka Urban, Ndola Urban, Kitwe, and Livingstone, and the municipal councils of Chingola, Mufulira Mufulira, Luanshya, Kalulushi, Kabwe, Chililabombwe, Kasama, Chipata, Mongu, Solwezi, Mansa, Choma, Mazabuka, and Mbala. Any subareas within these excluded councils that are determined as rural by REA and ZESCO may be eligible for funding subject to endorsement of the Project Steering Committee (PSC).
[21] Consumers who are not able to afford the ZMV 250 co-financing are expected to be served through high-quality pico-PV systems (for example, solar lanterns), supported under Components 2 and 3 (Loan Facility, enhanced regulatory framework/quality assurance and consumer education).
[22] For these 163 target areas, initial estimates show that 410 km of lines (400 V–33 kV) and 234 distribution transformers are required. Investment cost estimates is shown in tables 1.6 and 1.7.

areas, for which minimal extension works are required, and progressively move to those areas that will require more works. Detailed technical assessments, feasibility studies and scoping, and economic and financial analyses have already been initiated as needed, especially for those areas requiring more investment in extension and grid strengthening. The procurement activities will be launched immediately after the project approval and before the project effectiveness to ensure immediate project implementation. The electrification of rural areas currently supported by other CPs (for example, Lusaka division supported by the European Union [EU]-funded project and parts of Southern division supported by the German Development Bank [*Kreditanstalt fur Wiederaufbau*, KfW]-funded project) will be excluded from this project.

Component B - Off-grid Electricity Access Expansion (IDA SDR 4.3 million (US$5.9 million equivalent))

33. This component will initially fund required upstream activities to enable the private sector participation in rural off-grid electrification, including identifying and scoping off-grid sites, helping the GRZ address the existing regulatory impediments, building the needed capacity at key institutions, and designing financial mechanisms. Subject to successful completion of the upstream capacity-building activities, to be confirmed by GRZ and the World Bank, the component will then fund the piloting of two financial mechanisms:[23] (a) a Smart Grant Subsidy Facility and (b) a Loan Facility, to support private sector-led electrification of rural communities through renewable energy mini-grids and stand-alone solar systems and structured to leverage financing and participation from the private sector. The design of the financial mechanisms and upstream activities is based on lessons from earlier off-grid efforts in Zambia[24] and is in line with the recommendations of the World Bank's Africa Off-Grid Solar Strategic Directions paper based on regional experience in supporting the off-grid solar sector.

Subcomponent B.1. - Off-Grid Electrification Smart Subsidy Program

34. This subcomponent will fund upstream work to create an enabling environment to support private sector-led off-grid electrification and activities aimed at designing, establishing, and piloting an Off-Grid Electrification Smart Subsidy Program (OGESSP). The OGESSP is expected to provide partial grant subsidies to support the development of private sector-led mini-grids that may be complemented with stand-alone solar systems.[25] Locations will be selected in accordance with the geospatial plans to be developed under the NES.

35. This subcomponent will be implemented in two phases. The first phase will include (a) identifying potential sites through the use of the geospatial planning platform;[26] (b) preparing market assessments[27] for the potential sites; (c) reviewing the regulatory framework and supporting relevant

[23] Several financing mechanism options were considered during the design stage, including a Loan Facility, equity fund, guarantee mechanism, and different type of grants. The description and assessment of the financing mechanism option is in annex 6.
[24] Description of off-grid approaches tried in Zambia and the region, including lessons learned can be found in annex 6.
[25] The final the decision on types of off-grid solutions (mini-grid and/or stand-alone system) to be supported will be based on the outcome of the geospatial least cost electrification plan, further consultations with private and public actors (for example, ERB) and the development of the NES.
[26] The geospatial-based electrification planning platform developed by the International Finance Corporation (IFC) and the World Bank available through the World Bank's http://electrification.energydata.info/ project will be further refined, detailed, and used. Funding for this activity is expected to be provided by ESMAP.
[27] Including demand estimates, willingness to pay (WTP)/ability to pay assessments, customer segmentation, and so on.

institutions in streamlining requirements in support of private sector-led, off-grid electrification; (d) designing the OGESSP, including types and levels of subsidy to be provided and developing operational procedures for the OGESSP; and (e) developing standard legal documents, including drafts of tendering documents and agreements. These activities have been identified through consultations with the private sector and are based on the experience so far in Zambia, including the initial stage of implementation of the SIDA-supported Power Africa: Beyond the Grid Fund for Zambia (BGFZ)[28] confirming the private sector's interest in off-grid energy electrification. REA will undertake this upstream work[29] in close consultation and collaboration with both public sector agencies, such as the ERB, and private sector developers.

36. In the second phase, REA will pilot the OGESSP, competitively selecting private operators to provide energy services to households, public facilities, and MSEs in the selected rural localities. While the OGESSP will not specify technology, it is expected that mini-grids will be primarily solar PV based, providing an agreed level of electricity service (expected to be Tiers 3–4). [30] In some instances, market characteristics may require mini-grids complemented with stand-alone systems.[31] It is expected that the subsidy will cover the viability gap (the difference between cost of providing connection and what consumers are willing/able to pay for it).

Subcomponent B.2. - Off-Grid Loan Facility

37. The subcomponent will fund upstream capacity-building work and, subject to its successful completion, would further set up and finance piloting a loan/credit line facility for eligible borrowers, including companies importing and selling solar equipment, developers of mini-grids, and end users of solar equipment such as agribusinesses. The loan facility will aim to address the existing constraint of lack of access to finance, which is a key barrier to growth of the solar energy market. It is expected that the DBZ[32] will act as a financial intermediary (FI) for the credit line and would either lend directly to eligible borrowers or act as wholesale lender to one or more commercial banks who would then lend to eligible borrowers.

38. This subcomponent will also be implemented in two phases. The first, upstream phase will include (a) developing and implementing an Institutional Development Plan (IDP)[33] for the DBZ to raise

[28] The BGFZ focuses on lower Tiers (Tier 1–2). The OGESSP will complement the BGFZ and initially focus on rural locations requiring higher tiers 3–4. Further, the OGESSP focuses on developing local institutional arrangements and capacity to implement the program.
[29] With potential support from IFC, subject to mobilization of funding from other sources.
[30] Multi-tier framework (MTF) classifies energy services in tiers – starting from Tier 0 (no service) to Tier 5 (full service). Tier 1 provide a basic service level, such as lighting and cell phone charging. Higher tiers higher capacity and service duration, allowing households to acquire more domestic appliances and using power for productive purposes.
[31] Private operator can serve households with SHS (expected to be Tier 2) where distances require lower service levels. This model, where mini-grid operators also serve some of their consumers with PayGo SHS is currently being tested by the two private mini-grid operators in Zambia (Muhanya Solar Limted and Zengamina Power Limited [ZPL]) given that RGCs are surrounded by much lower-density areas with scattered households.
[32] Annexes 1 and 5 reflect the detailed rationale for the selection of the DBZ as an FI. The project is structured on the assumption that the DBZ will lend directly to solar companies (retail option). However, the wholesale option or selecting an alternative principal FI is preserved and a final decision will be taken based on the results of the IDP at the end of phase 1. The DBZ has previously provided loans to two mini-grids under the United Nation Development Programme (UNDP)/Global Environment Facility (GEF)-funded Renewable Energy Based Isolated Mini-Grids in Zambia Project (see annex 6 for details).
[33] The IDP will raise DBZ's capability in key areas such: i) as the carrying out of a due diligence, under-writing and credit

its capability and skillset in key areas; (b) the development of a DBZ operational manual[34] for this subcomponent, including the development of standard legal agreement and the design of the loan products; and (c) designing the Loan Facility structure and loan terms.[35] Completion of this phase will be signaled by IDA's appraisal and no-objection on all necessary arrangements including the DBZ operations manual, standard Legal Agreement, and meeting the criteria set out in World Bank's Operational Policy 10.00 with regard to Financial Intermediary Lending.

39. This is expected to be completed by the project early midterm or earlier,[36] at which point the second phase (operational phase) will commence.

40. The second phase will pilot the Loan Facility and operationalize the credit line. The DBZ may offer short-, medium-, and long-term loans in U.S. dollar and Zambian kwacha [37] either directly to eligible borrowers or through participating financial intermediaries (PFIs), depending on the role selected for the DBZ in phase 1. Under the project, two main types of credit may be offered to eligible borrowers: (a) short- and medium-term loans in U.S. dollar and Zambian kwacha to provide working capital to eligible borrowers, including locally registered solar system importers, wholesalers, distributors, and retailers with ongoing liquidity access to finance inventories[38] and (b) medium- and long-term loans in Zambian kwacha to finance eligible borrowers, including solar PayGo companies and mini-grid developers.

Component C - Capacity Building and Project Implementation Support (SDR 5.3 million (US$7.2 million equivalent), of which IDA SDR 3.4 million (US$4.7 million equivalent) and Expected SIDA/GPOBA Trust Fund SDR 1.8 million (US$ 2.5 million equivalent)).

41. This component will finance technical assistance (TA) to the GRZ to (a) ensure that the project reaches its objective of enhancing and improving the enabling environment needed for a substantially scaled-up electrification effort and (b) to support effective project implementation. TA will include support for (a) diagnostic and analytical activities that shall lead to the development of the NES[39] and

assessment capability on solar companies and mini-grids, (ii) the carrying out of a review of key risks in the off-grid energy access space and developing and institutionalizing a risk-based loan pricing model; (iii) the secondment of solar energy finance advisors to support review and analysis of potential off-grid energy deals. The IDP will also cover foreign exchange risk management, environmental and social due diligence, and improved governance (see annex 5). As part of the IDP, the governance and ownership structure will be reviewed and appropriate measures (to be jointly developed and aligned with the African Development Bank [AfDB]-supported project) will be recommended. Resolution of this issue will become a part of the disbursement condition to move to the second phase. In addition, the credit line terms will require the DBZ to perform 'Know Your Customer' due diligence and disclose borrower ownership. The project will also require a 'no objection' right to review the first few transactions. The AfDB takes the same approach with its credit line.

[34] The operational manual will include criteria for selecting eligible borrowers, exposure limits, permitted loan products, currencies, tenors, amortization and interest rate terms, and standard loan covenants

[35] The design of the Loan Facility and loan terms will be developed in close consultation with both public and private sector.

[36] If loan facilities take longer than expected to finalize or other conditions are not met fund from Subcomponent B.2, phase 2 will be reallocated to the on-grid component.

[37] The final decision on loan terms and currencies to be provided will be taken in phase 1.

[38] All supported systems will be required to meet the Lighting Global Quality Standards.

[39] The NES is expected to be based on a geospatial electrification planning platform, building on the existing Off-grid Energy Market Opportunities tool (http://offgrid.energydata.info). The NES would include an updated Master Plan and Investments Prospectus to support a systematically staged and coordinated electrification rollout program. Development of the NES would require a comprehensive assessment of the existing REF and preparation, discussion, and adoption of recommendations aiming to increase sustainability of financial mechanism for rural electrification, including for on- and off-grid subsidies. It will also

the geospatial planning tool. The NES will be developed through extensive consultation with all relevant stakeholders, including local government, communities, and private sector; (b) outreach and consumer education activities aimed at informing and assisting consumers (focusing on women and vulnerable groups) with regard to the connection fee subsidy application process, informing of the benefits of solar lighting products, and educating on the characteristics of good quality products; (c) services of a Project Management Consultant (PMC) and IVA; and (d) capacity building to key government institutions (for example, the MoE's DoE, ZESCO, REA), solar companies, mini-grid developers, and PFIs to assist them to efficiently fulfill their functions under the project.

B. Project Cost and Financing

42. The total cost of the proposed project is estimated at US$36.8 million,[40] of which US$26.5 million will be financed by IDA; an estimated in-kind contribution valued at US$2.7 million equivalent will be provided by REA and ZESCO; and an estimated US$0.6 million will be co-financed by households and MSEs for on-grid connections. Further, SIDA has, in principle, agreed to co-finance the project through the GPOBA with US$7 million equivalent, indicating its preference for directing the funds toward the OBA and relevant TA activities, subject to completion of its appraisal. Table 3 provides the project cost and financing breakdown.

Table 3. Project Costs and Financing

Project Components	Total Costs	Project Costs and Financing (US$, million)				
		IDA	Expected SIDA/GPOBA Trust Fund[a]	Consumers	REA/ ZESCO	% IDA financing
A.1 - Expanding New Electricity Connections for Low-income Households through OBA-type Financing	6.6	1.5	4.5	0.6	—	23
A.2 - Extension and Strengthening of the Grid Network for New Connections	17.1	14.4	—	—	2.7	84
Sub-total A - On-grid Electricity Access Expansion	**23.7**	**15.9**	**4.5**	**0.6**	**2.7**	**67**
B.1 - Off-Grid Electrification Smart Subsidy Program	3.4	3.4	—	—	—	100
B.2 - Off-Grid Loan Facility	2.5	2.5	—	—	—	100
Subtotal B - Off-grid Electricity Access Expansion	**5.9**	**5.9**	—	—	—	100
Subtotal C - Capacity Building and Project Implementation Support	**7.2**	**4.7**	**2.5**	—	—	**65**

require development of feasibility studies for grid extension and network reinforcement and recommendations for a Code of Practice for low-cost electrification schemes. Preparation of the terms of reference for different activities are ongoing.

[40] The total amount of the project may increase subject to successful mobilization of additional grant resources. US$0.75 million is expected to be mobilized by IFC Advisory to support the activities aiming to enhance the existing environment for private sector led off-grid electrification, and US$0.5 million is expected to be mobilized through the World Bank administered trust funds for developing geospatial planning platform. However, if these efforts do not materialize, these activities are expected to be funded by reallocating some of the project's Component C funding.

Project Components	Total Costs	Project Costs and Financing (US$, million)				
		IDA	Expected SIDA/GPOBA Trust Fund[a]	Consumers	REA/ ZESCO	% IDA financing
Total	**36.8**	**26.5**	**7.0**	**0.6**	**2.7**	**72**

Note: a. In-principle agreement of co-financing has been reached with SIDA; however, finalizing the specific scope and processing is ongoing and is expected to be completed by August 31, 2017.

C. Lessons Learned and Reflected in the Project Design

43. The following lessons from the earlier Zambia IAES Project and its associated operations, as well as lessons from various rural electrification projects in other regions have informed the project design.

(a) **Effective prioritization and planning are critical for effective rural electrification.** The project will support the development of an NES, based on a high-resolution geospatial data electrification platform and including an updated Electrification Master Plan and Investment Prospectus. These tools will reflect least-cost optimization of grid and off-grid electricity options to support a systematically staged and coordinated electrification rollout program.

(b) **Sustainable financing mechanisms for rural electrification are key for increasing access.** The project will assess the current financial mechanism for rural electrification, REF, managed by REA, and provide recommendations on increasing its effectiveness and sustainability, as well as develop financing mechanisms to engage the private sector in the provision of access.

(c) **Reducing construction and operation costs helps maximize access.** Network extensions in Zambia are carried out with standard three-phase technology and standard conductor and equipment sizes optimized for urban applications; ML/LV lines are often over-dimensioned for targeted demand, which significantly increases the cost and limits electrification progress. The project will therefore support the ERB to develop a Code of Practice for low-cost electrification technologies and capacity-building support to the network planning department at ZESCO in the application of these technologies.

(d) **Project design should benefit from available World Bank guidance on off-grid electrification.** The project design takes into account the principles and elements reflected in the World Bank's guidance note on sustainable off-grid electrification initiatives.[41] The note lists important elements for designing sustainable off-grid electrification projects and their implementation, reflecting the need to take into account:

(i) A wide range of technological and business models to respond to the diverse needs on account of geographic location, population density, and housing patterns;

[41] World Bank. 2008. *Operational Guidance for World Bank Group Staff - Designing Sustainable Off-Grid Rural Electrification Projects: Principles and Practices*. Also see annex 6 for additional lessons learned for design of off-grid electrification interventions.

(ii) Flexibility in adopting to fast-changing off-grid technology and business model environment;

(iii) Linking incentives to the level of service due to the emerging service-oriented approaches and payment schemes;

(iv) The need to crowd-in the private sector as there is an opportunity to leverage increasing volumes of financing even while public sector support for off-grid access will remain essential;

(v) Measures, at the beginning of the project, for quality assurance of stand-alone SHS and products;

(vi) For mini-grids, these require sites where grid extension is not a viable option in the foreseeable future, there is a relatively dense population, and the expected loads and willingness to pay (WTP) to justify the investments;

(vii) furthermore, clarity on legal and regulatory requirements (from project development-related standards and specifications, to tariff frameworks) are critical to enable developers to estimate development costs and mitigate risks along value chain; and

(viii) The financial viability of these projects could be improved by promoting day-use of energy, in particular for productive uses.

(e) **Best practices in financial intermediation should be considered.** The project design has been informed by the best practice lessons emerging from evaluations of financial intermediation to catalyze market development. These include the World Bank's Independent Evaluation Group's 2006 Lending for Line of Credit Report and evaluations of other off-grid solar development projects in Rwanda, Ethiopia, and other African markets. Best practice mechanisms include ensuring the implementing entity's accountability and strong management, prioritizing suitable systems and delivery mechanisms, using sound eligibility criteria that meet World Bank Group operational guidelines, and monitoring financial institutions and financial intermediaries to ensure operational and financial quality. The line of credit should focus on a few precisely defined and measurable indicators.

IV. IMPLEMENTATION

A. Institutional and Implementation Arrangements

44. The project will be implemented over five years. The roles and responsibilities of the various institutions in project implementation have been defined. Given the country's slow pace of increasing access in rural areas to date, the GRZ requested to focus the project investment components on rural areas. Therefore, given REA's institutional mandate, the overall fiduciary responsibility for the project will be vested in REA. The overall policy guidance and regular oversight and coordination over project

implementation will be carried out by the Project Steering Committee (PSC) chaired by the MoE and comprising representatives of REA, ZESCO, DBZ, and other relevant ministries and government institutions, such as the Ministries of Finance, National Development Planning, and the ERB, as deemed appropriate by the GRZ. The DoE, within the MoE, will serve as the Secretariat of the PSC and will be staffed with an electrification coordinator reporting to the director of the DoE and funded from the project.

45. The IDA credit will be to the GRZ, through the Ministry of Finance (MoF), which will, through a subsidiary grant agreement, on-grant the funds to REA. As the Project Implementation Agency (PIA), REA will manage the project on behalf of the GRZ and, in this regard, will be responsible for project fiduciary responsibilities. It will account for the deposits and withdrawals and perform the audits and provide financial reports in accordance with the World Bank rules and guidelines. REA will monitor the utilization of the project resources by each beneficiary, including itself, and provide expenditure projections. It will be responsible for tracking the project's Results Framework, providing regular progress reports, as well as the Midterm Review Report and the Implementation Completion and Results Report. It will coordinate overall procurement under the project and prepare and revise Procurement Plans as needed. Implementation of specific activities under the project components will need close involvement of ZESCO and the DBZ and, therefore, these institutions will be co-executing agencies for specific component activities and correspondingly assign dedicated project coordinators and project implementation units (PIUs) to implement respective on-grid and off-grid component activities. REA will liaise closely with the two co-executing agencies to provide procurement guidance where necessary and ensure adherence to the procurement guidelines. A Project Agreement between REA and IDA will capture these obligations and responsibilities. The role of each agency is described in the following paragraphs. Further detail, including funds flow arrangements, is provided in annex 2.

46. **REA.** REA was established according to the Rural Electrification Act No. 20 of 2003 enacted by the Parliament of the Republic of Zambia. The act mandated REA, among others, to administer and manage the REF, develop plans for grid and off-grid rural electrification, and monitor their implementation; mobilize funds to support rural electrification, encourage private sector participation in rural electrification through provision of subsides, competitive bidding, and community mobilization; finance project preparation studies for rural electrification; and recommend suitable policies to the GRZ. REA has experience managing World Bank-funded projects, having previously managed the IDA credit for the IAES Project. The recent assessment concluded that the financial management (FM) arrangements are in place to meet the World Bank's minimum requirements under OP/BP 10.00, Investment Project Financing, and are adequate to provide, with reasonable assurance, accurate and timely information on the status of the project. However, the overall FM risk rating is substantial and requires addressing deficiencies related to REA's internal controls. Correspondingly, an FM Action Plan will be developed and adopted by REA. To further mitigate fiduciary risks, REA will engage a consulting firm in a PMC role to support it in project management, including carrying out supervision of contracts due to REA's capacity constraints. Over the longer run, this capacity will be gradually transferred to REA.

47. REA will establish a PIU, headed by the REA technical director and supported by a project manager, and will comprise a rural electrification engineer, electrification public-private partnership (PPP) specialist, safeguards specialist, accountant, and procurement specialist. The project manager, accountant, and procurement specialist will be funded by the project while the rural electrification engineer, electrification PPP specialist, and safeguards specialist will be selected from the pool of

existing REA staff and assigned to work solely on the project activities. As mentioned earlier, REA's PIU will be responsible for overseeing the overall project implementation, including the on-grid, off-grid, and TA components.

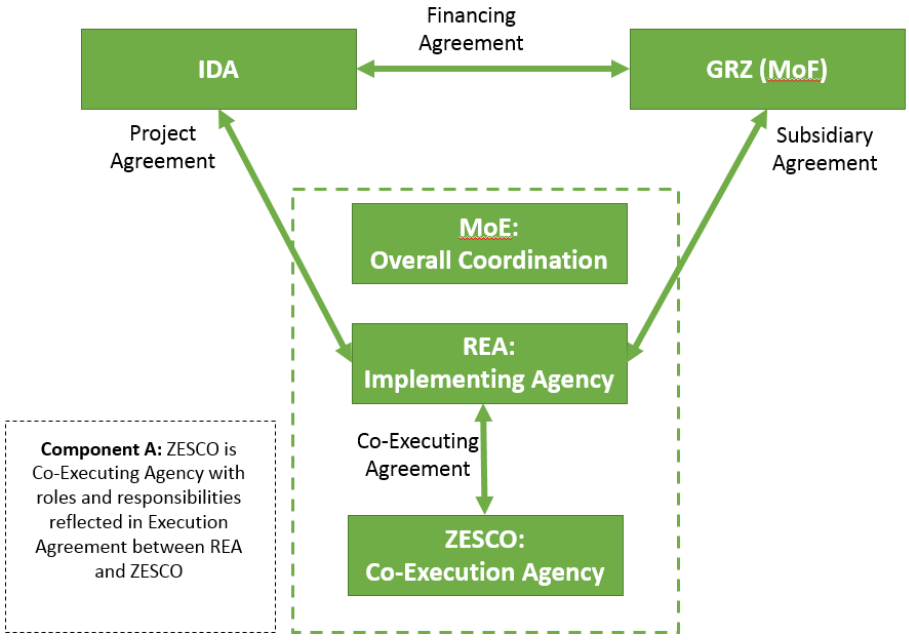
48. **MoE/DoE.** The DoE, as a Secretariat of the PSC and through its electrification coordinator, funded by the project, will be responsible for coordination of project implementation, liaising with other government institutions, monitoring of the performance of all actors, and enforcing adherence to the project implementation schedule. The PSC will need to be established not later than 30 days after the effectiveness date. The DoE will also provide quality assurance on the TA activities related to upstream policy (for example, NES) and regulatory work and outputs under Components B and C, while REA will carry out fiduciary functions, such as procurement and FM, as well as oversee implementation and monitoring of environmental and social safeguards. The DoE will form a joint project coordination team with regularly scheduled meetings to ensure smooth and timely implementation progress and address any issues that may cause delays in project implementation or disbursements.

49. **ZESCO.** ZESCO will be a co-executing agency of activities under Component A and will lead Component A activities through a dedicated PIU. REA will enter into a co-executing agreement with ZESCO, which will specify respective commitments, roles, and responsibilities of REA and ZESCO. Component subprojects will be identified jointly by REA and ZESCO, with REA providing grant financing for ZESCO to implement the identified projects. The activities under Subcomponent A.1. will be implemented using a results-based approach, with payments linked to attainment of results based on pre-agreed targets and indicators (for example, number of connections), which will be verified by an IVA. It is expected that some input activities, such as electrification goods and equipment and minor works, will be procured. The procurement from the proceeds of funds earned by the GRZ from attainment of results will be based on use of open national bidding and/or open international bidding procurement of the GRZ as provided in the Public Procurement Act, 2008, Act. No.12 of 2008, as amended by the Public Procurement (Amendment) Act, 2011, Act No. 15 of 2011, and the Public Procurement Regulations, 2011, Statutory Instrument No. 63 of 2011 (the 'Regulations'), provided, however, that such procedures may be modified to make them acceptable to the World Bank. The procurement will be further modified to include provisions for the World Bank's fraud and anticorruption policies and the right of the World Bank to audit and inspection. ZESCO will follow the approved procurement procedures and report back to REA. REA will be responsible for verifying the works carried out by ZESCO (through the PCM for on-grid works and the IVA for off-grid results) and will provide funding to ZESCO according to the terms of the co-executing agreement, including advances to commence works and subsequent payments against verification by REA that the works have been carried out to the required standards. REA's funding will be deposited to ZESCO's operating account and will be replenished monthly based on the budget estimates and documentation submitted by ZESCO.

50. **DBZ.** REA will have overall responsibility for the implementation of Component B activities. However, Subcomponent B.2. Off-Grid Loan Facility phase 2 activities (that is, managing an operationalized credit line) will be delegated to the DBZ, once the conditions for implementation of the second phase are met. To enable it, REA will enter into a subsidiary agreement with the DBZ for implementing the subcomponent activities. As a potential FI for phase 2 off-grid activities, the DBZ will also have fiduciary and safeguard oversight responsibilities, for which it will receive appropriate capacity building under the TA activities planned for phase 1. However, the DBZ's phase 2 participation can only be initiated after a proper safeguard assessment is carried out which ensures that the arrangement and

capacity meet the World Bank's minimum requirements according to OP/BP 10.00 and OP/BP 4.01. Similar to the on-grid implementation arrangements, the implementation of the off-grid component will support the evolution of REA's role toward becoming a facilitator for electrification efforts in rural areas.

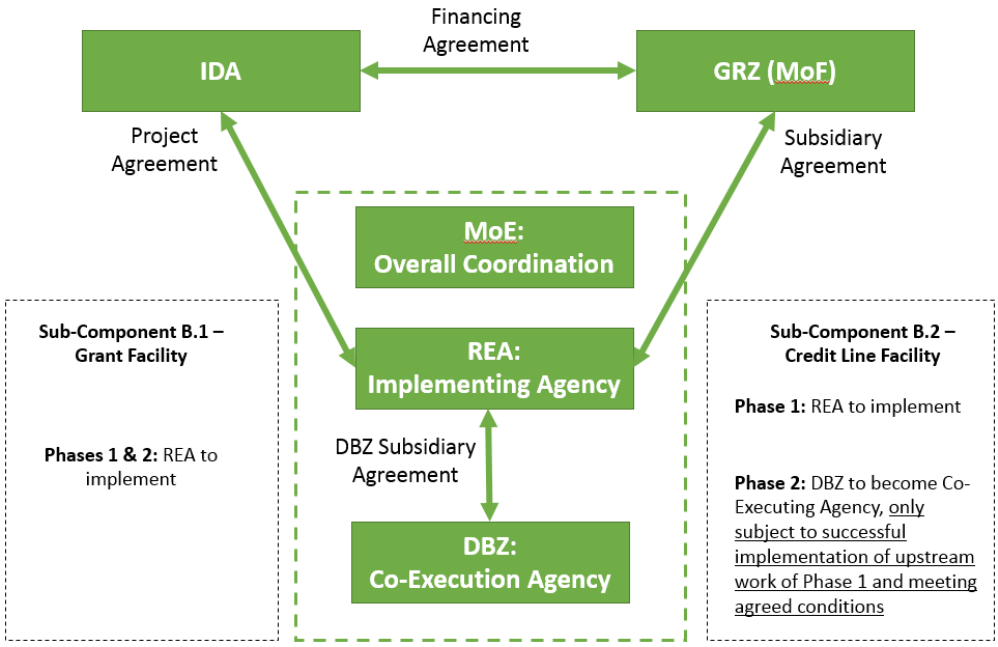
Figure 3. Project Implementation Agreements Structure: Component A - On Grid



B. Results Monitoring and Evaluation

51. REA's PIU will be responsible for monitoring the project's implementation progress and the status of the results monitoring indicators. The results monitoring data related to the grid-extension activities will be collected by ZESCO's PIU and shared with REA on a monthly basis. The off-grid related monitoring data and the customer connection data will be provided to REA by private off-grid service providers, the DBZ, and/or other implementation partners and consultants as appropriate and will be incorporated by REA in its quarterly update reports once the data has been verified for accuracy. Other relevant information and demographic data will be collected by REA's monitoring and evaluation (M&E) team based on national administrative data sources and other project-specific data collected by REA and ZESCO staff as needed. The outputs of the TA activities will also be collected and documented by REA's PIU, based on the list of output indicators specified in the project's Results Framework. A quarterly implementation status report will be prepared by REA and shared with the GRZ, project partners, and the World Bank. The implementation progress and results monitoring data collected by REA's PIU will inform the joint evaluation of project performance by the GRZ, the implementing agencies, and the World Bank during regular supervision missions, at midterm, and at project closing.

Figure 4. Project Implementation Agreements Structure: Component B - Off Grid



C. Sustainability

52. There are several factors, described in the following paragraphs, that affect sustainability, many of which the project—in conjunction with other efforts in the sector—is aiming to address.

53. **Policy framework.** The approved REMP provides an overall policy framework for Zambia's electrification of schools, health centers, police stations, markets, and other public facilities in more than 1,200 RGCs. The GRZ's aim is to reach 90 percent electrification in urban areas and 51 percent electrification in rural areas by 2030. Achieving the 51 percent rural connectivity rate requires providing more than 90,000 rural household connections annually. The rate of electrification of rural households and MSEs in Zambia (on-grid or off-grid) has been far less than this number. Furthermore, because the majority of rural households are outside the catchment areas of the existing or future electrified RGCs, reaching the 51 percent rural electrification target will require additional planning and concerted efforts both within, as well as outside the RGC-related rural household electrification efforts (as recognized in the REMP). It is therefore incumbent on the MoE, REA, and other government agencies to ensure that the pace of rural electrification is significantly improved by facilitating on-grid household connections in rural population centers and by removing barriers to private sector participation in the off-grid segment of rural electrification efforts.

54. **Improved effectiveness of REA.** REA's mandate is to facilitate rural electrification and increase the electricity access rate in rural areas. REA is responsible for resource mobilization and promotion of private sector participation to narrow the financing gap for rural electrification programs. For REA to succeed in facilitating rural electrification, several enabling factors need to be in place. These include (a) robust government policy for rural electrification; (b) sound strategy and road map for implementation;

(c) clear understanding of the roles and responsibilities of REA and other key players in rural electrification; (d) reliable, adequate, and steady sources of funding; (e) technical capacity at REA to handle various on-grid and off-grid rural electrification options; and (f) program, project, and fund management capacity at REA. While some elements of these requirements are already in place to some extent, there is still a need for careful reexamination and updating of the goals and objectives of the rural electrification program, streamlining the flow of REF resources to REA, and ensuring the requisite means and capacity at REA for the effective achievement of these objectives. Assessing the efficiency of the flow and application of funds and other REF operational arrangements is also important. Proper addressing of these needs will be a key requirement for the sustainability of the rural electrification program and the related investment in Zambia.

55. **Availability of sufficient electricity supply.** The average long-term demand growth in Zambia is estimated at about 100 MW per year. Based on ZESCO's projections, mining and large industrial customers would require at least an additional 715 MW of available supply in the foreseeable future. For the growing rural connectivity, the estimated grid-based rural power demand will be about 620 MW by 2030. For ZESCO to serve its customers, especially in the high economic growth areas of Lusaka and Copperbelt, and to respond to the country's rural electrification agenda, the timely commissioning of new generation projects, and the cross-border power trade with other members of the Southern African Power Pool that will augment ZESCO's installed capacity in the coming five years, will be crucial. The GRZ has been focusing on addressing this challenge through facilitating investments in a number of new power plants that, for the near to medium term, should provide sufficient power generation capacity.

56. **Financial viability of ZESCO.** Historically, ZESCO's financial performance was adversely affected by various factors, including low electricity tariffs and high payroll costs. Most recently, ZESCO's financial performance has worsened due to a surge in emergency power imports in 2015 and 2016. To strengthen its financial position and sector financial sustainability, on May 10, 2017, ERB approved a gradual tariff increase by about 75 percent, with 50 percent increase effective May 15, 2017 and further 25 percent increase effective September 1, 2017. With the same decision, ERB has set clear key performance indicators (KPIs) focusing on quality of service, cash management, customer service, and staff productivity. This tariff increase is approved bearing in mind the ongoing Cost of Service Study (CoSS) to be completed by end-2017 that would set up a basis for tariff reforms and the development of a Medium Term Tariff Policy, which GRZ has committed to implement going forward. The GRZ's intention to move to cost-recovery tariffs is being supported by development partners through a series of development policy operations currently under preparation. The World Bank is expected to scale up its involvement through its continuous sector dialogue, other IDA-financed energy sector projects, and the monitoring of ZESCO's financial situation during the implementation of this project. The World Bank Group plans to carry out a comprehensive sector assessment that would contribute to the GRZ's thinking on sector reforms by identifying the principal challenges that the Zambian power sector faces and outlining forward-looking policy alternatives for GRZ to consider. These will be complemented by a number of parallel activities that are planned to be carried out by development partners, primarily the IMF and AfDB. The World Bank Group agreed to coordinate its suggestions on reforms with GRZ and these partners to ensure these are aligned to be supported by the AfDB-funded energy policy support operation. In the near future, it is expected that ZESCO's financial position would be viable with reasonable hydrology, timely addition of new generation capacities, and increased tariff with no adverse effect on the electricity demand growth. It should be noted that keeping tariffs at or near cost-reflective

levels will be a key factor in maintaining ZESCO's financial viability, particularly in light of the potentially costlier rural electrification grid extensions and associated capital expenditures.

57. **Maintenance of rural power infrastructure.** Financial constraints, long transmission/distribution lines in rural areas, low rural population density (hence low concentration of customers and long distances to travel before reaching customers), and lower-than-expected rural revenue generation may hamper proper maintenance of the grid extensions and associated network infrastructure in rural areas. This could adversely affect the sustainability of the project's rural connectivity results. Along with strengthening of ZESCO's financial viability, it would be important for ZESCO to plan and administer an efficient rural customer service and asset protection and maintenance operation that would minimize its operating costs in rural areas and increase its operational efficiency and revenue collection. The project will provide analytical support to lay the foundation for such customer service and maintenance plan.

58. **Off-grid electrification.** Technical sustainability of mini-grids relies on the engagement of the various stakeholders, in addition to the operator, including the communities and local authorities. Long-term viability will build on a sound design together with suitable capacity building for relevant stakeholders as part of the TA provided by the project. This will support the continued availability of appropriately trained local technicians and operators for maintenance. Additionally, progress in communications and remote monitoring can be used to supervise the operation of the components and assist the local staff with preventive maintenance activities. For stand-alone systems, emphasis will be placed on ensuring high quality of equipment and services. Financing will be provided only to companies selling products in compliance with quality standards (such as Lighting Global and International Electrotechnical Commission) as well appropriate product guarantees and after-sales services.

D. Role of Partners

59. SIDA has, in principle, committed to co-finance the project with a contribution of up to US$7 million that will go toward the OBA subcomponent and activities that shall lay the basis for enhanced public and private investment in electrification. The proposed co-financing builds upon the existing partnership between the World Bank and SIDA on access expansion in Zambia. Under the ongoing Electricity Access for Low-Income Households in Zambia (P146636), funded by the GPOBA with proceeds from SIDA, over 22,000 low-income households have connected to the ZESCO grid. This aligns with the SIDA strategy document for Zambia, 'The Results Strategy for Sweden's International Development Corporation in Zambia 2013–2017' in which activities that support increased access to secure and sustainable energy for households, public services and businesses are expected to contribute to increased employment opportunities in rural and peri-urban areas and opportunities to start and run productive businesses.

60. Furthermore, in March 2016, SIDA launched Power Africa: BGFZ, aiming to bring basic energy access to up to 1 million Zambians and accelerate private sector growth in clean energy generation and distribution in the country. The BGFZ is expected to operate over 2016–2020, with a funding level of SEK 200 million (approximately €21 million). As a first round of procurement under the BGFZ, the Swedish Embassy in Lusaka invited private energy service providers to submit offers to provide modern, renewable, off-grid energy connections (energy service subscriptions). The BGFZ initiative has attracted substantial interest from the private sector, confirming that the access agenda in Zambia can be attractive for crowding-in the private sector, subject to resolving a number of crucially important

obstacles and improving the enabling environment. The project design is substantially informed and guided by both the EU-funded analysis and SIDA practical experience.

61. REA has been in dialogue with the CP community to explore areas in which its operational model could be enhanced. A comprehensive review of REA's operations was carried out under the Technical Assistance Facility for SE4ALL funded by the EU. [42] The review confirmed the need for shifting of the REA operational model from a developing to a facilitating role; clarifying the roles and responsibilities between REA, ZESCO, and private developers; and enhancing the REF financing model to be administered and managed by REA.

62. The scope of the IDP for the DBZ will be coordinated with the AfDB to avoid duplication of effort. The AfDB has signed a credit line with the DBZ under which the AfDB will provide TA to the DBZ in the following areas (a) credit risk assessment for MSEs; (b) risk management; (c) environmental and social due diligence; and (d) strengthening the DBZ's capacity to advise MSEs. The IDP will provide due diligence assistance tailored specifically to the solar energy sector and in areas such as loan pricing and foreign exchange risk management not covered by the AfDB. In addition, as a potential FI for phase 2 off-grid subprojects, the DBZ will need additional specialized capacity building under the IDP, including training on safeguard principles and operationalization of the Environmental and Social Management Framework (ESMF) and the Resettlement Policy Framework (RPF) in the operations manual prepared for the DBZ, to ensure its capacity meet the World Bank's minimum requirements under OP/BP 10.00.

V. KEY RISKS

A. Overall Risk Rating and Explanation of Key Risks

63. The overall project risk rating is substantial. Key risks are discussed in the following paragraphs.

Technical design. This risk is considered substantial. For the on-grid component, the implementation and funds flow arrangements require that there is close coordination between REA and ZESCO. Disruptions in the relationship and working arrangements between the two could lead to implementation delays. The project will help mitigate the risk through a range of measures. REA / ZESCO coordination is expected to be partially mitigated by having DoE play a coordinating role and equipping it with a staff position of the project coordinator and mandating regular and frequent coordination meetings. In addition, the PMC will support REA with contract management, including verification of work carried out by ZESCO. For the off-grid component, the project intends to test and pilot new approaches to electrification with an emphasis on private sector participation. A substantial level of private sector interest in off-grid electrification in Zambia has been confirmed by early experience under the SIDA-funded BGFZ program and further confirmed by discussions and consultations carried out with potential private developers during project preparation. However, SIDA experience has also revealed that there are a number of regulatory/institutional impediments to scaling up private sector-led off-grid electrification that need to be addressed and, therefore, the actual uptake will only be confirmed once the upstream work is carried out. The off-grid component reduces REA's implementation role and tilts this toward that of a facilitator of rural electrification, as agreed with both REA and the MoE. Extensive

[42] *ES-0059: EU-TAF Mission: Policy Support to Improve the Enabling Environment of the Zambian Energy Sector, Draft Final Report - Part 2: Rural Electrification,* February 2017.

TA activities are contemplated under the project including a detailed assessment of successful experience elsewhere, substantial involvement of the World Bank and IFC teams in helping designing the off-grid component, and development of appropriate detailed procedures and rules for the off-grid component activities. Nevertheless, while the project, through its TA component, will undertake the necessary assessments, capacity building and analytical work to support implementation of the on-grid and off-grid components, the risk remains substantial.

64. **Institutional capacity for implementation and sustainability.** The risk related to the institutional capacity for implementation and sustainability is considered substantial. While for the on-grid component ZESCO has significant experience in undertaking grid extensions and connecting consumers to the grid, this does not apply for REA with respect to the scope of the off-grid component. REA will therefore engage a consulting firm in a PMC role to support project management, including carrying out supervision of contracts. Over the longer run, this capacity will be gradually transferred to REA. Component C will also fund an assessment and recommendation to increase sustainability of the financial mechanism for rural electrification, including the REF. Sustainability shall depend on the extent to which (a) the TA component outputs are internalized by counterparts; and (b) the REF becomes fully functional.

65. **Fiduciary risk.** This risk is rated substantial. The overall FM risk rating of the project is substantial because there are significant deficiencies in the internal controls at REA, including (a) lack of a risk register and risk management manual; (b) inadequate enforcement of ethical values and commitment to competence; (c) inadequate management of tangible fixed assets; (d) the Internal Audit Department not being fully staffed and the audit committee chairperson not being an independent member; and (e) lack of regular supplier and contractor reconciliation. Specific measures to address these deficiencies will be reflected in an FM Action Plan to be developed and adopted by REA. The FM risk rating is, therefore, expected to be reduced to moderate after the risk mitigation measures have been undertaken. The procurement risk rating for both REA and ZESCO is deemed moderate.

66. **Climate and disaster risks.** A climate and disaster risk screening has been completed for the proposed project. Zambia is facing increased frequency of extreme weather events, notably droughts and floods. In addition, the temperature in Zambia is expected to increase by 1.2–3.4° Celsius by 2060. In the context of the project, two minor risks were identified. First, increased hot days may affect the output of the solar PV panels. The project will ensure that the equipment can maintain sufficient output even on hot days. The second risk is the increased frequency of flooding, which may affect the sites where generation units of the mini-grid will be installed. The team has confirmed that the overall climate risk to the project's outcomes is low with regard to these hazards. Risks will be addressed through proper design, operation, and maintenance of the investments. All civil works and distribution systems (lines, poles, and so on) will be designed to resist high temperatures and wind effects, building on strong international and proven national standards. Ample attention will be given to the maintenance of the solar PV systems, including aeration of the battery house and the cleaning of solar panels to remove dust and enable them to operate at an optimum efficiency.

VI. APPRAISAL SUMMARY

A. Economic and Financial Analysis

67. **Rationale for public sector financing.** The GRZ has set electrification targets of 90 percent for urban areas and 51 percent for rural areas by 2030, requiring major investments in both on-grid and off-grid solutions. Grid electricity access in rural areas is generally considered to be financially unviable for utilities like ZESCO, due to the high costs of the grid extension to these areas as well as limited revenue prospects from low-income consumers. Therefore, public funding is needed to reduce the financial burden of ZESCO in expanding the grid network to rural customers. Development of off-grid solutions in Zambia is facing two major bottlenecks (a) lack of affordable working capital for off-grid providers; and (b) lack of a supporting regulatory environment and financial mechanisms for mini-grid development. Therefore, private investment in this subsector is considered to be high-risk and sometimes unviable. Public funding is, therefore, needed to provide affordable working capital for providers of off-grid solutions, as well as to buy down capital investment cost of mini-grids. Thus, public sector funding is being used in an effort to crowd-in the private sector.

68. **Value added by the World Bank's support.** The World Bank is well-positioned to support Zambia in its endeavor to accelerate electricity access. The World Bank Group has supported off-grid solution development in other Sub-Saharan African countries as well as Lighting Africa/Lighting Global programs to support the market development of off-grid energy products. Lessons and technical expertise from these existing operations can be used for the benefit of the project. The World Bank has also supported Zambia in increasing on-grid and off-grid access to electricity services through the IAES Project and the GPOBA-funded connection subsidy projects; thus, the proposed project builds on these experiences.

69. **Project economic analysis.** An economic analysis has been carried out to assess the economic viability of the project using standard cost-benefit methodology. It confirms the economic viability of the project, with an economic internal rate of return (EIRR) of 16 percent and a net present value (NPV) of approximately US$15.6 million. The EIRR and NPV by components are presented in Annex 4. The economic viability is further enhanced by including greenhouse gas (GHG) abatement benefits (see table 4). A sensitivity analysis, which simulated 10 percent increase in capital cost, cost of electricity service, or discount rate, confirmed that EIRR will remain above 14.5 percent and NPV above US$13.9 million. It is noted that the analysis for the off-grid component is based on a number of assumptions, which may change as the system configuration and geographical scope is finalized. Further details are provided in annex 4.

Table 4: Summary of Economic Analysis

	EIRR (%)	NPV (at 6.6% discount rate)
Without GHG	16.0	US$15,558,238
With GHG	18.8	US$19,550,599

70. **Project financial analysis.** The financial analysis assessed (a) the financial viability of the on-grid component to ZESCO; (b) the level of capital subsidy required to make mini-grid investments commercially attractive; and (c) the financial viability of the proposed Loan Facility. With the current level of tariffs, the on-grid component will result in a marginal financial loss to ZESCO, given that its

revenues from a new customer (at US$62.9 per year) are insufficient to cover the corresponding recurring costs (US$78.7 per year). Subject to approval of the current tariff application, the on-grid component is estimated to incur an average annual loss of US$385,920 (below 0.3 percent of ZESCO's annual net revenues). However, this loss will be more than compensated by increased revenue from other customer segments, notably commercial and mining. If the planned tariff adjustment is not approved, the annual loss would increase to US$809,065.

71. Financial analysis of mini-grid development suggests that mini-grids will require a capital subsidy of 75–80 percent to allow private developers to earn approximately 15 percent financial returns. These figures will be refined as the actual system configurations and costs are identified. Financial analysis of the proposed Loan Facility demonstrates its viability with an NPV of US$1.5 million (if repayment is in U.S. dollar) and US$0.9 million (if repayment is in Zambian kwacha).

72. **ZESCO's financial analysis.** ZESCO's profitability has recently deteriorated due to the depreciating local currency as well as a surge in costly emergency power imports in 2015–2016. While the gross profit margin decreased moderately from 72 percent (2012) to 63 percent (2015), the pretax profit margin decreased sharply from 2014 to 2015, from 13 percent to 0.3 percent, largely due to the currency depreciation resulting in higher bad debt provisions and increasing finance costs from U.S. dollar-denominated debts.

73. ZESCO's financial ratios also show overall deterioration in liquidity, largely due to the Zambian kwacha depreciation and consequent revaluation of ZESCO liabilities, most of which are in U.S. dollar. From 2012 to 2015, the current ratio dropped sharply from 1.50 to 1.08, while the debt-to-equity and debt-to-asset ratios increased from 0.72 to 1.76 and 0.26 to 0.47, respectively. The most striking deterioration is shown in the interest coverage ratio, dropping from 41.22 (2012) to 1.39 (2015), flagging ZESCO's liquidity risk.

74. With full implementation of both mining and non-mining tariff increases in 2017 and subject to sufficient hydrology, ZESCO's revenues are expected to increase by 20 percent in 2017[43] and 29 percent in 2018, which would improve the net profit margin to double digits (16–23 percent) for the next five years. Yet, as capital expenditures in generation, transmission, and distribution are expected, ZESCO needs to keep targeting operational efficiency and maintain profitability to meet debt obligations.

B. Technical

75. ZESCO has strong technical capacity in terms of extending the distribution network and providing connections. It has also worked with REA in past projects to do so in rural areas. ZESCO often works with subcontractors on various projects and has established mechanisms for supervision. However, in the last two projects with the World Bank, the need for ZESCO to enhance its contract management and supervision skills was identified as an area of focus. The project will build on past efforts to strengthen ZESCO's ability to effectively manage and supervise the expected works.

[43] Reflecting the two-step implementation (a 50 percent increase in May, an additional 25 percent increase in September) during the year.

76. Additionally, ZESCO will need to develop its technical ability to deploy lower-cost electrification options that may be identified under the TA component in readiness for implementing adopted policies. Currently, ZESCO's distribution network typically operates at 33 kV and 11 kV with 0.4 kV lines for direct supply to consumers typically at 240 V. Some consumers (such as mills) are supplied at 400 V. Technical specifications used by ZESCO require consumers to be located no further than 30 m from the 400 V lines and 400 V lines are limited to 0.5–1 km lengths based on the expected load on the line. This implies that connections beyond this range of existing supply points (or transformers) require additional MV lines.

77. Due to Zambia's geographical position and relatively high solar irradiation,[44] it is expected that mini-grids to be developed in the selected rural localities through the OGESSP will be based mainly on solar PV. Solar and solar-hybrid mini-grids can deliver up to medium-tier electricity services (Tiers 2 to 5), distributing electricity on LV alternate current or direct current grids. As costs of solar PV modules have decreased in the last few years, many solar mini-grids today are designed for high solar energy fraction. They are also well suited to cover the demand of larger income generation uses such as mills, welding, shops, water pumping, and telecom towers. The solar and solar-hybrid mini-grid market segment is increasingly attractive for private project developers due to the reduction in prices for PV modules and a positive outlook for decreasing the cost of other main components, such as batteries and power electronics. Typically, a solar mini-grid consists of PV modules, electronic converters, supervisory control, switchgear and protection equipment, batteries, a distribution grid, and metering and protection equipment to each connection. To ensure cost-effectiveness, some developers include high efficiency appliances as part of their service offer. This makes more economic sense than over-sizing the generation capacity and using less efficient appliances. It also ensures end-of-life management of old equipment that, in remote areas, may create an environmental issue.

78. The Loan Facility will only support companies that sell quality verified systems, as determined by the International Electrotechnical Commission and Lighting Global Standards. These standards include lighting output and run time as well as high quality and durability in terms of physical ingress and water and battery protection.

C. Financial Management

79. An FM assessment of REA was completed in March 2017. The FM assessment concluded that the FM arrangements in place meet the World Bank's minimum requirements under OP/BP 10.00 and are adequate to provide, with reasonable assurance, accurate and timely information on the status of the project. However, the overall FM risk rating is substantial because there are significant deficiencies in the internal controls at REA, including (a) lack of a risk register and risk management manual; (b) inadequacies in communication and enforcement of ethical values and commitment to competence; (c) inadequate management of tangible fixed assets; (d) the Internal Audit Department not being fully staffed and the audit committee chairperson not being an independent member; and (e) lack of regular supplier and contractor reconciliation. Specific measures to address these deficiencies will be reflected in an FM Action Plan to be developed and adopted by REA. The FM risk rating is, therefore, expected to be reduced to Moderate after the risk mitigation measures have been undertaken. Therefore, it is recommended that the FM Action Plan include (a) assigning or hiring a qualified and experienced accountant for the project; (b) conducting training for both accounting and audit staff of REA in World

[44] The country has an average solar insolation of 5.5 kWh/m^2/day, with an average 3,000 hours of sunshine per year.

Bank FM and disbursement procedures; and (c) developing and adopting a Project Operations Manual (POM), including updating REA's finance and accounting manual to include the World Bank's FM and disbursement guidelines. In addition, membership of the audit committee should be reconstituted to include an independent chairperson.

D. Procurement

80. A procurement risk assessment of REA and ZESCO has been carried out. The procurement risk rating for both is deemed moderate. A Project Procurement Strategy for Development using the short form template has been prepared. Based on the forgoing analysis in the PPSD, procurement approach and methods for all components will follow standard approaches, as well as approved selection methods and market approach options in the regulations. No activity is envisaged to involve departure from policy thresholds or need of additional oversight or OPRC review levels. From the information gathered through the market analysis, there is likely to be no serious supply market risk or competition risk, provided that the delivery model takes into account incentive mechanisms including appropriate risk allocation and security arrangements. Both REA and ZESCO have recent experience working with the World Bank and applying related policies and procedures using the World Bank's 'Guidelines: Procurement of Goods, Works, and Non-Consulting Services under IBRD Loans and IDA Credits and Grants by World Bank Borrowers' (January 2011 and revised July 1, 2014) and 'Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits and Grants by World Bank Borrowers (January 2011 and revised on July 1, 2014). Procurement for the proposed project will be carried out in accordance with the World Bank Procurement Regulations for IPF Borrowers (Borrowers Regulations), July 2016, and the provisions stipulated in the Financing Agreement, including the Bank's Anti-Corruption Guidelines. . REA and ZESCO will endeavor to ensure that the procurement activities are packaged and prepared in such a way that they expedite implementation and allow value for money through enhanced competition, economy, and enhanced functional use. To mitigate implementation delays, both REA and ZESCO will maintain PIUs with adequately qualified and competent staff, who will have the responsibility of planning implementation and supervision of the project.

81. From the procurement standpoint, implementation of OBA activities under Subcomponent A.1. will be implemented using a results-based approach, with payments linked to attainment of results based on pre-agreed targets or indicators (for example, number of connections), which will be verified by an IVA. The procurement from the proceeds of funds earned by the GRZ from attainment of results will be based on use of open national bidding and or open international bidding procurement of the GRZ as provided in the Public Procurement Act, 2008, Act. No.12 of 2008, as amended by the Public Procurement (Amendment) Act, 2011, Act No. 15 of 2011, and the Public Procurement Regulations, 2011, Statutory Instrument No. 63 of 2011 (the 'Regulations'), provided, however, that such procedure shall be modified to make them acceptable to the World Bank. The procurement will be further modified to include provisions for World Bank fraud and anticorruption policies and the right of the World Bank to audit and inspection. An option of the GRZ, particularly for large contracts (that is, international competitive bidding and large consulting and non-consulting assignments), is that it may use the provisions of the World Bank's Procurement Regulations for IPF Borrowers dated July 2016.

82. A draft Procurement Plan for the first 18 months of project implementation has been prepared. The Procurement Plan will be updated by REA and ZESCO on an annual or on an as-needed basis to

reflect actual project implementation needs. More details on the Procurement Plan are provided in annex 2.

E. Social (including Safeguards)

83. The project safeguards category is 'B' as the type of interventions foreseen will not have major impacts on the population or the environment. No physical displacement is anticipated due to the nature of the project. However, small amounts of land may be required under Component A (for the stations/poles and/or LV transmission lines) or Component B (for mini-grid solar arrays) and may involve land acquisition and limited change in land use (permanent or temporary). The Involuntary Resettlement (OP/BP 4.12) safeguard policy is therefore triggered to address any adverse impacts of the potential land acquisition that may cause loss of assets.

84. **Safeguard instrument.** Because the sites and beneficiary areas have not yet been defined, an RPF has been prepared by ZESCO and REA to include the guidelines and procedures for compensation and/or resettlement. These would be applied in the event should future activities require land acquisition or involuntary resettlement or cause losses of assets or loss of access to livelihoods or assets and resources, taking into account gender differences in land or assets access, control and use, and the resulting losses for both women and men. In case any land acquisition or compensation becomes necessary, the cost would be covered by the GRZ. Construction works will not begin on a subproject location until any required land acquisition, relocation, or compensation has been completed.

85. **Disclosure.** The RPF was disclosed in-country and by the World Bank on May 11, 2017. The RPF will guide the preparation of any Resettlement Action Plans (RAPs), if and when necessary.

86. **Labor influx.** Implementation of the contracts for both on-grid and off-grid components may require contractors to mobilize skilled and unskilled labor to project sites and establish labor and resource supply camps, thus resulting in labor influx into beneficiary communities. While the numbers of outside workers expected to be needed for such installations, especially for the off-grid sites, are expected to be small, bringing in outside workers and setting up temporary work camps could create some social risk to local communities, including the potential for gender-based violence, sex trafficking, and child abuse. The project will be mindful of this risk and take appropriate measures to prevent and address the negative consequences by incorporating obligations into contracts; working with local governments, public employees, and relevant community-based and nongovernmental organizations familiar with these issues; adopting and enforcing a code of conduct for the workers and educating them as well as the affected communities on proper conduct; building capacity among contractors, ZESCO, REA, the DBZ, and mini-grid developers to address these issues; and rigorously monitoring these issues and reporting on them.

87. **Capacity and training.** For capacity on safeguards, both ZESCO and REA have environmental and social units and have some experience in implementing the World Bank's safeguard policies. The DBZ is in the process of forming a new four-person environmental and social assessment unit and has a policy manual on environmental, health, and social safeguards for its project lending. However, experience with other World Bank-funded projects indicates that ZESCO, REA, and the DBZ will need additional safeguards resources to provide adequate stakeholder engagement and monitoring of and reporting on social issues for this project, given the number of projects and their likely geographic dispersal. In

addition, these agencies' capacity should be further enhanced through training on the specific safeguards issues that might emerge, including labor influx, as well as how these issues may have gender differences and implications. Capacity enhancement support will be provided, under Subcomponent B.2 and Component C, to ensure that the three organizations implement, monitor, and provide regular reporting on stakeholder engagement activities and grievance redress mechanisms. In addition, as a potential FI for phase 2 off-grid subprojects, the DBZ will need additional capacity building under the TA activities planned for phase 1, including training on safeguard principles and operationalization of the ESMF and RPF in the operations manual prepared for the DBZ. Also, the DBZ's phase 2 participation can only be initiated after a proper safeguard assessment is carried out, which ensures that the DBZ's institutional arrangement and capacity meet the World Bank's minimum requirements under OP/BP 10.00.

88. **Project-level grievance redress mechanisms**. REA will be responsible for reporting on beneficiary feedback. Grievance redress mechanisms (described in more detail in the safeguard instruments) will be established at all project sites; monitored by ZESCO, REA, and the DBZ; and included in any Environmental and Social Impact Assessments (ESIAs) and RAPs produced as needed for subprojects. Additional measures, including a field beneficiary feedback survey and cell phone surveys could be implemented by REA as part of the M&E efforts under the project. The mechanism will benefit from the remote control technology currently used in solar technologies and mini-grids. Solar companies and operators benefitting from project financing, as well as ZESCO and REA, will be required to maintain a customer database that provides customer contacts and basic profiles along with commercial information.

89. **Gender.** Twenty-seven percent of all households in Zambia are headed by women and 41 percent of MSEs are owned by women (Central Statistics Office of Zambia). However, female-headed households and female-owned MSEs frequently lack the capacity to pay for connection costs or face additional obstacles in accessing electricity from the grid such as lack of knowledge about subsidy programs or of ability to apply for a connection. To connect female-headed households and female-owned MSEs in and rural areas, the project will provide subsidies so that low-income women can pay for the connection; conduct outreach and consumer education activities, aimed at informing and assisting women and vulnerable groups in the connection fee subsidy application process and inform consumers of the benefits of solar lighting products and educate them on the characteristics of good quality products; provide adequate training in meter reading for women so that they will use electricity efficiently; and build capacity among developers so that they will understand and take into account the different situation and needs of women and men. The project's communication and consumer awareness raising campaigns will be designed and delivered in a gender-sensitive manner and target women, who may have less access to communication media, by using channels that women are more likely to use, tailoring messages in ways that will be accessible to women (who may be illiterate), and conducting communication and outreach activities at places and times convenient for women. The gender-targeted activities will be monitored and assessed through a set of intermediate outcome indicators included in the project's Results Framework. Other output and process gender-related indicators will be included in the POM.

F. Environment (including Safeguards)

90. The project safeguard category is 'B' as the type of interventions foreseen will not have major impacts on the population or the environment. The Environmental Assessment Policy (OP/BP 4.01) is triggered. As a result, an ESMF has been prepared, and was consulted upon and disclosed in-country and by the World Bank on May 11, 2017. The proposed project is intended to generate positive environment benefits (including GHG emission reductions) mainly derived from the switch of power generation from a fossil fuel source (isolated grids with diesel generators) and from the fuel-burning lighting devices like kerosene lamps, oil lamps, gas lamps, and candle used in rural areas to a renewable source (solar energy).

91. While the project interventions bear some environmental and health safety risks, no significant and/or irreversible adverse environmental and social issues are expected. The potential impacts on local environment of the project will be small and limited to the disposal of lead acid or nickel-cadmium batteries. Those impacts are expected to be local, site specific, and easily manageable. Preparation of ESIAs, Environmental and Social Management Plans (ESMPs), or other safeguard documents prepared for the World Bank or for the Borrower for on-grid or off-grid subprojects will include screening for potential social and environmental risks of adverse impacts due to labor influx, including the establishment of work camps. Mitigation and monitoring of any labor influx-related risks that are identified will be addressed in the ESIAs, ESMPs, contractor ESMPs, codes of conduct, and related monitoring and supervision plans.

92. The policy on natural habitats (OP/BP 4.04) has been triggered as the project will involve linear activities such as grid extension and intensification that are likely to cut across ecologically sensitive areas and natural habitats.

93. The policy on forests (OP/BP 4.36) has been triggered as linear activities such as grid extension and reinforcement, construction of off-grid facilities, and installation may require vegetation clearance. The extent of vegetation loss is, however, minimal as construction activities will be restricted to the way leave and project footprint.

94. The Physical Cultural Resources Policy (OP/BP 4.11) has not been triggered by the project. However, the project will implement a 'chance finds' procedure in the event of discovery of cultural resources at project sites. The eligibility criteria for investment projects will ensure that no investments are selected in areas with a cultural heritage potential.

95. The World Bank supervision teams will include environmental and social safeguard experts. Regular monitoring reports on the implementation of environmental and social safeguards provisions will be provided to the World Bank for approval. These reports will be verified during project supervision missions, which will include environmental and social safeguard experts.

G. Other Safeguard Policies (if applicable)

96. No other safeguard policies are triggered for the project.

H. World Bank Grievance Redress

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

VII. RESULTS FRAMEWORK AND MONITORING

Results Framework
COUNTRY : Zambia
Electricity Service Access Project

Project Development Objectives

The project development objective is to increase electricity access in Zambia's targeted rural areas.

Project Development Objective Indicators

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
Name: People provided with new or improved electricity service		Number	0.00	114400.00	Quarterly	Quarterly Report	REA/ZESCO
Description: Grid-connected households multiplied by household size of 5.2 (based on average rural household size stated in Central Statistics Office (2016): 2015 Living Conditions Monitoring Survey Key Findings							

Intermediate Results Indicators

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
Name: People provided with access to electricity services		Number	0.00	114400.00	Quarterly	Quarterly Report	ZESCO/REA

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
under the project by household connections (grid or off-grid)							
Female-headed households provided with access to electricity services under the project (grid)		Number	0.00	4400.00	Quarterly	Quarterly Report. Female-headed households to be identified through submitted applications for grid connections.	ZESCO/REA
Description: Grid-connected households multiplied by household size of 5.2 (based average rural household size stated in Central Statistics Office (2016): 2015 Living Conditions Monitoring Survey Key Findings							
Name: MSEs provided with access to electricity services under the project (grid)		Number	0.00	1000.00	Quarterly	Quarterly Report	ZESCO/REA
Description: Number of micro and small-scale enterprises that the project provides new or improved access to grid-connected electricity							
Name: Distribution lines constructed or rehabilitated under the project		Kilometers	0.00	550.00	Quarterly	Quarterly Report	ZESCO/REA
Description: The length of distribution lines constructed under the project							
Name: Off-Grid Smart		Text	N/A	OGSSP	Quarterly	Quarterly Report	REA

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
Subsidy Program (OGESSP) piloted				piloted with procurement and award completed			
Description: "Adopted" means REA's management endorsement of the final design of the OGESSP. "Established" means that OGESSP has been made accessible to potential operators for application. "Piloted" means that at least one application for the Program has been reviewed and the Program has awarded grant to at least one operator.							
Name: Satisfactory Implementation of the Institutional Development Plan (IDP) for DBZ confirmed by independent reviewer		Yes/No	N	Y	Quarterly	Quarterly Report	REA/DBZ
Description: External evaluation is required to determine whether the implementation of the IDP is satisfactory or not. The evaluation criteria will be developed during the project implementation.							
Name: Loan Facility operationalized		Text	N/A	Loan Facility Operationalized	Quarterly	Quarterly Report	DBZ/REA
Description: "Designed" means DBZ's and REA's management endorsement of the final design of the Load Facility. "Operationalized" means that the at least one application for the Loan Facility has been reviewed and the Facility has committed a loan to at least one recipient.							

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
Name: Geospatial Master Plan developed and publicly consulted		Yes/No	N	Y	Quarterly	Quarterly Report	DOE/REA
Description: "Developed" means a final draft in a quality ready for public consultation							
Name: National Electrification Strategy developed and publicly consulted		Yes/No	N	Y			
Description: "Developed" means a final draft in a quality ready for public consultation.							
Name: Number of people trained in sector policy and technical aspects		Number	0.00	25.00	Quarterly	Quarterly Report	REA/ZESCO/DOE/DBZ
Description: Number of people trained in subjects that contribute to the development outcome							
Name: Percentage of grievances registered related to delivery of Project benefits that are actually addressed		Percentage	0.00	100.00	Quarterly	Quarterly Report	REA
Description: The indicator measures the level of Project responsiveness to potential grievances filed at an individual level, including resulting from environmental and							

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
social impacts.							

Target Values

Project Development Objective Indicators

Indicator Name	Baseline	YR1	YR2	YR3	YR4	End Target
People provided with new or improved electricity service	0.00	5200.00	26000.00	52000.00	78000.00	114400.00

Intermediate Results Indicators

Indicator Name	Baseline	YR1	YR2	YR3	YR4	End Target
People provided with access to electricity services under the project by household connections (grid or off-grid)	0.00	5200.00	26000.00	52000.00	78000.00	114400.00
Female-headed households provided with access to electricity services under the project (grid)	0.00	200.00	1000.00	2000.00	3000.00	4400.00
MSEs provided with access to electricity services under the project (grid)	0.00	0.00	250.00	500.00	750.00	1000.00
Distribution lines constructed or rehabilitated under the project	0.00	0.00	150.00	300.00	450.00	550.00
Off-Grid Smart Subsidy Program (OGESSP) piloted	N/A	N/A	OGSSP designed	OGSSP adopted by REA and established	OGSSP piloted with procurement and award completed	OGSSP piloted with procurement and award

Indicator Name	Baseline	YR1	YR2	YR3	YR4	End Target
						completed
Satisfactory Implementation of the Institutional Development Plan (IDP) for DBZ confirmed by independent reviewer	N	N	N	Y	Y	Y
Loan Facility operationalized	N/A	N/A	N/A	Loan Facility designed	Loan Facility Operationalized	Loan Facility Operationalized
Geospatial Master Plan developed and publicly consulted	N	N	N	Y	Y	Y
National Electrification Strategy developed and publicly consulted	N	N	N	N	N	Y
Number of people trained in sector policy and technical aspects	0.00	5.00	10.00	15.00	20.00	25.00
Percentage of grievances registered related to delivery of Project benefits that are actually addressed	0.00	100.00	100.00	100.00	100.00	100.00

ANNEX 1: DETAILED PROJECT DESCRIPTION

COUNTRY: Zambia
Electricity Service Access Project

Component A: On-grid Electricity Access Expansion (SDR 17.3 million (US$23.7 million equivalent), of which IDA SDR 11.6 million (US$15.9 million equivalent), Expected SIDA/GPOBA Trust Fund SDR 3.3 million (US$4.5 million equivalent), Consumers SDR 0.4 million (US$0.6 million equivalent) and REA/ZESCO SDR 2.0 million (US$2.7 million equivalent)).

1. This component will provide funding to REA for works to be carried out by ZESCO for on-grid connections in rural areas to connect about 22,000 low-income households and 1,000 MSEs to the ZESCO network. It will also finance strengthening of the grid network and extension of the distribution network to handle the new last mile connections. The component will be implemented through two subcomponents.

Subcomponent A.1. - Expanding New Electricity Connections for Low-income Households through OBA-type Financing

2. This subcomponent will use output-based financing to partially subsidize the cost of installation of new connections for low-income households and MSEs. The progress of this subcomponent will be subject to the grid being able to handle new connections further to the investments being made under Subcomponent A.2. Areas that do not require network reinforcements or MV grid extension will be prioritized for connections during project implementation.

3. **Types and cost of connections to be financed.** The subcomponent will finance two types of connections based on the type of housing structure:

- **Standard connection**. For permanent structures, standard connections will include the drop wire from a supply line (up to 30 m) to the meter box, a single-phase pre-payment meter, and three energy saving light-emitting diode (LED) bulbs.

- **Enhanced connection.** This connection is primarily for structures with thatched roofs that cannot be safely wired and will include the drop wire from a supply line (up to 30 m) to the meter box, a single-phase pre-payment meter, a ready board, and one energy saving LED bulb.

4. According to the standard ZESCO and utility practice in Sub-Saharan Africa, households and MSEs are required to have a lightning arrester, earth rod, and circuit breaker before a connection can be made, which is estimated to cost approximately US$39 per connection. This is also expected to further develop the market for electrical services and products in rural areas. Table 1.1 provides the estimated material cost of installing standard and enhanced connections.

Table 1.1. Connection Cost Estimates at Appraisal (in US$)

	Standard	Enhanced
30 m of 10 mm duplex cable	90	90
Pre-payment meter	50	50
Labor	42	42
LED	9	3
Ready board, lightning rod, circuit breaker, and accessories		56
Total	**191**	**241**

5. **Connection fees.** The current regulated connection fees for residential customers are in three categories as shown in table 1.2.

Table 1.2. ZESCO Connection Fees for Residential and Commercial Consumers up to 15 kVA and within 30 m of an existing MV Line

Customer Category	Capital Contribution Fee Residential (ZMW)/connection	Capital Contribution Fee Commercial (ZMW)/connection
Demarcated areas (areas with existing plans for services, such as roads, power lines, water, and communication)	769	2,404
Un-demarcated areas (unplanned settlements with no proper plans for services)	1,709	2,404
Low-density areas (high-cost townships with individual plots > 1,500 m^2)	2,800	2,404

6. The connection fees are approved by the ERB, and ZESCO can only charge its customers the maximum as stipulated above, unless the ERB approves the revised connection fees. The project will target customers in both the demarcated and un-demarcated areas, although the majority of rural areas are un-demarcated. The current connection fees are not sufficient to cover the connection costs, and hence additional costs must be absorbed by ZESCO. The project will reimburse ZESCO in U.S. dollar per the actual cost of the connections.

7. **Electricity tariffs.** ZESCO's tariffs fall under the following four main tariff groups:

- Metered Residential - switched to prepaid meters
- Commercial Tariffs - switched to prepaid meters;
- Social Services Tariffs - remain on postpaid meters, some switch over to pre-paid meters;
- Maximum Demand Tariffs - remain on postpaid meters.

8. It is generally agreed that the current tariffs are not cost reflective but it is expected that a proposed tariff increase will come into force in the coming months. The ERB is currently conducting a Cost of Service Study which will help devise a way to move toward cost reflective tariffs.

9. ZESCO has carried out a major switch to prepaid meters to reduce commercial losses, and now has 682,874 residential, commercial, and some social connections on prepaid meters. Only 5,402 residential and 4,115 commercial customers remain to be transferred to prepaid meters. Larger social institutions have requested to remain on the post-paid system which ZESCO permits, and maximum demand customers will not be transferred.

10. **Subsidy scheme.** To enable ZESCO to connect rural households and MSEs to the network, the project will subsidize part of the cost of connections and the connection fee to be paid by consumers. It is expected that approximately 10 percent of households with grass thatched roofs will require ready boards[45] in rural areas. Given the generally low-income status of the target beneficiaries, it will not be possible to charge consumers extra for the ready boards. Table 1.3 shows the fee structure and reimbursement to ZESCO that is proposed for consumers connected under the scheme.

Table 1.3. Subsidy Scheme

Type of Connection	Consumer Share of Connection Fee (in ZMW)	OBA Subsidy Reimbursement to ZESCO (in US$)
Household connections with ready boards for houses with thatched roofs	250 (US$26)	215
Household connections for permanent structures	250 (US$26)	165
Commercial connections (MSEs)	769 (US$81)	110

11. **Outputs, reimbursement mechanism, overall cost, and subsidy estimates.** The outputs under the project are grid supplied, standard, and enhanced electricity connections for households and MSEs in rural areas of Zambia. REA will contract an IVA under Component 3 to verify that working connections have been provided in the target areas with electricity supply. The IVA will prepare output verification reports, which will be cleared by REA and a no objection provided by the World Bank before payment. ZESCO will then be eligible for 100 percent reimbursement of the agreed subsidy amounts. The outputs, subsidies, and consumer payments expected under the project are as shown in table 1.4.

Table 1.4. Outputs, Subsidy Funding, and Consumer Payments under Subcomponent A.1

Connection Type	Total Connections (Number)	Cost per Connection (US$)	Subsidy per Connection (US$)	Total Subsidy Funding (US$)	Consumer Payment per Connection (US$)	Total Consumer Payment (US$)
Standard household	20,000	191	165	3,300,000	26	520,000
Enhanced household	2,000	241	215	430,000	26	52,000
Standard (MSEs)	1,000	191	110	110,000	81	81,000
Unallocated for additional connections and/or any change in connection fee				2,160,000		
Total	23,000			6,000,000		653,000

45 A ready board is a distribution board that acts as a termination for the incoming supply from the utility. The ready board comes complete with circuit breakers, socket outlets and a light; this effectively forms a starter pack for new household wiring system.

12. **Basis for setting the user contribution**. Under the previous IAES and OBA projects, the consumer contribution was set at ZMW 150 per standard and ZMW 250 per enhanced connection. Since the appraisal of the OBA project, the kwacha has depreciated by 100 percent and there has been inflation in Zambia. Furthermore, the Connection Fee Subsidy Program in Zambia has stalled due to unavailability of funds. Although no formal WTP studies have been undertaken, discussions with ZESCO, REA, consultants, and informal feedback from potential consumers in the targeted areas generally indicate that the consumer contribution should be increased to ZMW 250. The justification for the increase includes the following: (a) depreciation of the Zambian kwacha and inflation since the last fee was set; (b) rural households will be equipped with ready boards that were previously charged at ZMW 250; (c) options for consumers to save toward the connection fee using mobile money and/or a deferred payment mechanism to be set up by ZESCO; (d) adequate consumer marketing and awareness to be rolled out by REA; (e) overall consumer contribution to the subcomponent will be 12 percent thereby harnessing user fees toward capital expenditure costs; and (f) users willing to pay ZMW 250 are more likely to consume greater volumes of energy, which will increase the overall project viability. In the event that the consumer contribution is found to be unaffordable, a revised fee structure will be discussed with the PSC.

Subcomponent A.2. - Extension and Strengthening of the Grid Network for New connections

13. **Project works.** ZESCO's distribution network is typically operated at 33 kV and 11 kV with 400 V lines for direct supply to final consumers typically at 240 V except for higher consumers (such as mills) who may be supplied at 400 V. Technical specifications used by ZESCO require consumers to be located no further than 30 m from the 400 V lines and 400 V lines are limited to 0.5 km–1 km lengths (depending on the load on the line). This implies that connections beyond this range of existing supply points (or transformers) require additional high voltage (HV) lines (33 kV and 11 kV). The works will largely consist of construction of HV distribution lines, installation of distribution transformers, and construction of MV/LV distribution lines (400 V/230 V). REA will engage a consultancy firm in a PMC role to support REA in project management, including supervision and payments to ZESCO, which will be made subject to submission of the supporting documentation and verification reports from the PMC. The PMC may also support REA in assessing subproject implementation plans and in reviewing the quality of upstream works carried out to facilitate the connections.

14. **REA and ZESCO'S contribution.** The contribution of US$2.7 million by REA and ZESCO has been assessed in staff time and internal resources needed to implement the project.

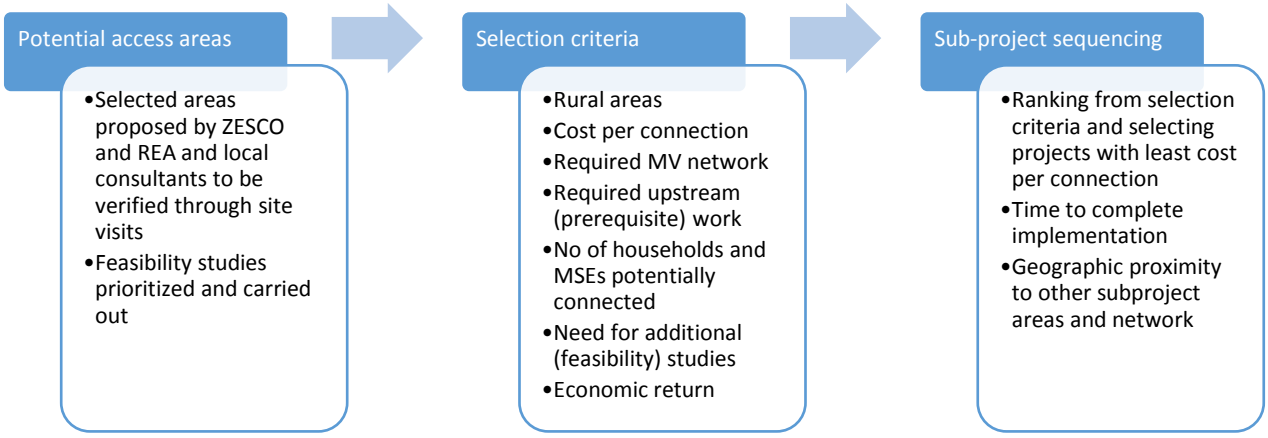
15. In the initial scoping, 36 potential areas have been identified with varying costs per connection requiring an investment of approximately US$14.4 million in network reinforcement and extensions to reach approximately 23,000 connections.

16. **Target areas and site selection.** REA and ZESCO will jointly agree on target areas where investments are to be made using the following criteria:

- Geographic targeting of townships in rural areas that REA is mandated to serve that is, excludes urban areas defined as city and municipal councils in the Local Government Act.[46] Note that any sub-areas within these excluded councils that are determined as rural by REA and ZESCO may be eligible for funding subject to endorsement of the PSC
- Highest population reached by the network with least investment cost, as determined by assessment of investments needed and demand analysis
- Local distribution network must have the capacity to handle the planned number of new connections after planned investments in grid strengthening
- Customers to be connected to the network are willing and able to pay the subsidized connection fee of ZMW 250 for household and ZMW 769 for MSE connections
- Overall project economic rate of return
- The project will not finance subproject areas being supported by other CPs, for example, Lusaka is being funded by the EU and parts of Southern division by KfW. This also allows other provinces to benefit from efforts to increase access

17. Investments will be selected by generally using the approach illustrated in figure 1.1.

Figure 1.1. Proposed framework for Project Identification, Selection, and Sequencing



Potential Project Areas

18. In preparing the project, potential target areas were identified jointly with REA and ZESCO based on an internal assessment of survey data maintained by both organizations. The data was used to inform the broad project design and the economic and financial analyses. However, it will need to be further verified and the final project areas agreed to between REA and ZESCO during implementation. The potential areas were identified in a broad geographical scope covering most of the country's provinces

[46] Areas excluded under the project are the city councils of Lusaka Urban, Ndola Urban, Kitwe, and Livingstone, and the municipal councils of Chingola, Mufulira Mufulira, Luanshya, Kalulushi, Kabwe, Chililabombwe, Kasama, Chipata, Mongu, Solwezi, Mansa, Choma, Mazabuka, and Mbala.

(Northern, North Western, Luapula, Muchinga, Copperbelt [Ndola], Eastern, Western, Southern, and Central). In several parts, REA has extended infrastructure to serve public facilities (such as schools, clinics, and so on), and the project will finance extensions/reinforcements to reach households and MSEs.

19. An initial list of 195 project focus areas was received from ZESCO and REA with over 44,000 total potential connections. The areas proposed by ZESCO and REA have been selected to minimize the extent of work required before additional connections. After verification, areas that may require additional feasibility or engineering will be ranked lower than areas that do not need additional engineering. A team of locally based consultants added six more areas in the district of Mkushi based on a feasibility study carried out for ZESCO with KfW funding, increasing the potential connections to approximately 47,800. These projects were evaluated against the selection framework.

20. Nearly 32 projects did not fit the rural area description and an additional two areas were already included in the scope of works by KfW. These were excluded from further evaluation. The outstanding sites cover 36 districts in all provinces with 74 percent in the northern division of ZESCO.

Table 1.5. Distribution of Project Areas and Number of Households

	Households	MSEs	Areas
Central	3,815	452	7
Copperbelt	1,114	132	3
Eastern	4,728	716	10
Luapula	5,890	698	22
Muchinga	9,540	1,130	54
Northern	5,771	684	38
North Western	3,132	372	30
Southern	810	96	1
Western	607	72	2
Total	**35,407**	**4,352**	**167**

21. Therefore, the potential project activities cover 167 areas with approximately 40,000 potential connections. An initial verification of a sampled number of areas showed that the estimates are largely accurate and even underestimated by approximately 10 percent. Assuming an aggregate uptake rate of 58 percent of the original number of potential connections for both households and MSEs, the project estimates to establish approximately 23,000 connections. As ZESCO has been experiencing challenges with MSE connections, a conservative uptake rate for MSE connections was used with a target of 1,000 MSE connections out of the total target.

22. For these 167 target areas, initial estimates show that 550 km of lines (400 V–33k V) and 234 distribution transformers are required. The distribution of investments is shown in table 1.6.

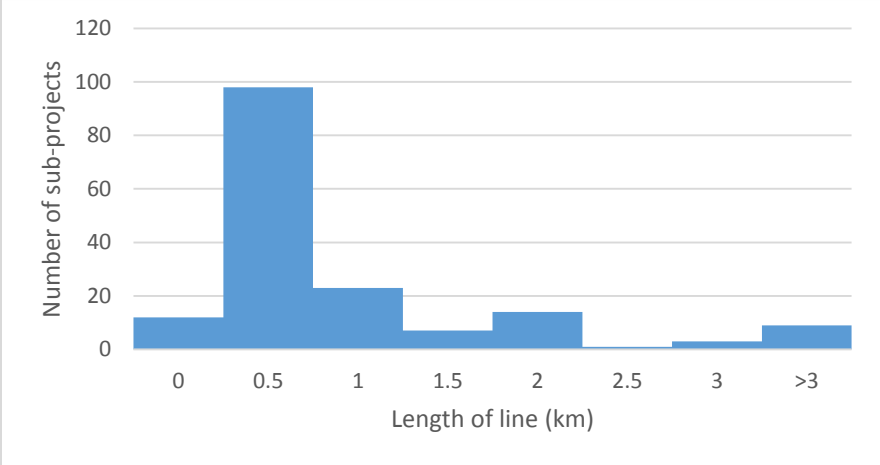
Table 1.6. Distribution of Required MV, HV Lines, and Transformers by Province

	11/33 kV lines (km)	400 V lines (km)	Transformers
Northern	**220.16**	**280.358**	**202**

	11/33 kV lines (km)	400 V lines (km)	Transformers
Copperbelt	2.8	6.15	6
Luapula	14.72	45.838	38
Muchinga	26.24	123.82	73
Northern	149.6	64.37	52
North Western	26.8	40.18	33
Southern	**6.024**	**43.5215**	**15**
Central	5.784	26.24	12
Eastern	0	12.3615	0
Southern	0.16	2.05	2
Western	0.08	2.87	1
Grand Total	**226.184**	**323.8795**	**217**

23. Subprojects selected by ZESCO and REA require minimal MV extension works. Approximately 65 percent of the subprojects require up to 0.5 km of MV extension and only one project area requires more than 3 km of extension works (figure 1.2). This reduces the costs and construction risks associated with the project.

Figure 1.2. Distribution of MV Network Extension Works in Project Areas[47]



24. Implementation will start with those areas that require minimal extension/reinforcement works and do not need feasibility studies. REA will urgently need to commission studies to determine sites that require feasibility studies using funds under the TA component. The feasibility studies will, among others, identify potential solutions to reduce connection costs. A summary of the proposed areas and investment costs based on REA and ZESCO data is presented in table 1.7. Additional project areas will be identified using the agreed criteria up to the limit of available funding.

[47] Staff calculations based on data from ZESCO and REA.

Table 1.7. Project Areas and Investment Cost Estimates Based on REA and ZESCO Data

Province	Standard Household	Enhanced Household	Commercial	Total Connections	Last mile Cost	Last mile Cost per Connection
	(Number)	(Number)	(Number)	(Number)	(US$, millions)	(US$)
Luapula	3,3067	118	178	3,663	1.46	397.80
Muchinga	5,459	189	293	5,941	3.02	507.59
Northern	3,303	114	173	3,590	5.40	1,503.13
North Western	1,798	62	94	1,954	1.37	703.35
Copperbelt	636	22	33	691	0.19	278.47
Eastern	1,398	1,398	179	2,975	0.19	63.67
Western	347	12	19	378	0.06	163.77
Southern	462	16	24	502	0.07	134.00
Central	2,179	77	113	2,369	0.72	305.03
	18,949	**2,008**	**1,106**	**22,063**	**12.48**	**565.51**
Upstream network reinforcement					1.87	
Total network extension and reinforcement				**22,063**	**14.35**	**650.34**

Component B - Off-grid Electricity Access Expansion (IDA SDR 4.3 million (US$5.9 million equivalent))

25. The least-cost option to provide electricity access for over 60 percent of the rural population is through off-grid solutions, mainly through mini-grid and stand-alone systems based on solar PV.[48] The Government has decided to pilot approaches for attracting private sector investment and participation into the off-grid energy sector, as there are neither any plans nor public funding available for electrification of households in these areas. The binding constraints for private sector participation have been the difficulties in accessing financing and a cumbersome and unclear regulatory regime.[49] This component will, therefore, fund upstream activities to enhance the enabling environment and the piloting of two financial mechanisms:[50] (a) a Smart Grant Subsidy Facility and (b) a Loan Facility, to support private sector-led electrification of rural communities through REA mini-grids and stand-alone solar systems. Both these mechanisms will be structured to leverage financing and participation from the private sector. The design of the financial mechanisms and upstream activities, which is in line with the recommendations of the World Bank's Africa Off-Grid Solar Strategic Directions based on regional experience in supporting the off-grid solar sector, will be refined based on the experience in these pilots and scaled up in future access programs.

[48] REMP and *http://electrification.energydata.info/*.
[49] Analysis of off-grid solar in Zambia and suitable market-based options for scale-up, study ongoing 2017; Se4ALL EU: Policy Support to Improve the Enabling Environment of the Zambian Energy Sector, 2017; and Developing Mini-grids in Zambia: How to Build Sustainable and Scalable Business Models? Practical Action 2016.
[50] Several financing mechanism options were considered during the design stage, including a Loan Facility, equity fund, guarantee mechanism and different type of grants. The description and assessment of the financing mechanism option is in annex 6.

Subcomponent B.1. - Off-Grid Electrification Smart Subsidy Program

26. This subcomponent will fund upstream work to create an enabling environment to support private sector-led off-grid electrification and activities aimed at designing, establishing, and piloting an OGESSP. The OGESSP is expected to provide partial grant subsidies to support the development of private sector led mini-grids that may be complemented with stand-alone solar systems.[51] Locations will be selected in accordance with the geospatial plans to be developed under the NES.

27. The first phase will include upstream work[52] to create an enabling environment to support private sector-led off-grid electrification, identify sites, and design the OGESSP in close consultation and collaboration with both public sector agencies and private sector developers. The upstream work is expected to be carried out during the first 18 months of the project and include the following activities:

(a) **Site selection and collection of market information.** Potential sites will be identified through the least-cost assessment using geospatial information and other data. The identified sites shall be representative of the Zambian market to facilitate future scale-up. For this, the existing geospatial least-cost electrification platform,[53] developed by IFC and the World Bank, will be further refined, detailed, and used. Pre-feasibility/market assessment work will also be carried out for potential sites, which will include demand estimates, willingness and ability to pay assessments, customer segmentation, and so on. A final list of the most promising sites will be established taking into consideration the GRZ's priorities and the profile of sites that would be most attractive to private developers. Site prioritization criteria is expected to include (i) off-grid energy technologies are the least-cost electrification option given the expected level of energy service appropriate to meet demand; (ii) main grid is not expected to reach the area within the next seven to ten years; and (iii) higher population density and sufficient potential demand, including electricity to be used for economic/business activities and social service institutions.

(b) **Regulatory framework review and recommendations.** To ensure that a suitable regulatory framework, under which private sector-led off-grid energy access projects can be developed exists, the following activities will be carried out: (i) reviewing the legal and regulatory framework and providing recommendations; (ii) documenting the requirement and administrative procedures for licenses and permits necessary to operate as a private off-grid energy service provider; and (iii) supporting the relevant authorities to streamline requirements and administrative procedures and develop light-handed regulations, where appropriate.

(c) **Design of the OGESSP, development of operational procedures and standard legal documents.** This activity includes the design of the OGESSP, including the type and level of subsidies to be provided. It is expected that the private partners would co-finance, construct, operate, and maintain the electrification infrastructure for a minimum fixed

[51] The final the decision on types of off-grid solutions (mini-grid and/or stand-alone system) to be supported will be based on outcome of the geospatial least-cost electrification plan, further consultations with private and public actors (for example, ERB) and the development of the NES.
[52] The upstream work will potential be supported by IFC, subject to mobilization of funding from other sources.
[53] Available through the World Bank's http://electrification.energydata.info/project.

period (for example ten years). The activity also includes the development of operational procedures and standardized tendering documents and agreements to both reduce transaction costs by eliminating the one-off development and negotiation process that typically increases development time lines for projects, and also ensure a fair and bankable allocation of risks between the Government and the private sector partner. The agreements will include quality, service, and safety standards (for example, distribution grid standards and grid compatibility, allowed frequency, and duration of unplanned interruptions at the end user level). The agreement will also include provisions dealing with the unexpected case in which the national grid is extended into the same rural locality. The arrangements and the standards and provisions included in the agreement will depend on the size of the installed generation capacity and the outcome of the consultation with public and private stakeholders.

28. Private developers were consulted during the project preparation representing both large international companies and smaller innovators who are active in the mini-grid sector in the region and are currently exploring business expansion opportunities in Zambia. These confirmed the private sector interest. The initial stage of implementation of the SIDA-supported Power Africa: BGFZ[54] has further confirmed the private sector's interest in the off-grid energy electrification.

29. In the second phase, REA will pilot the OGESSP with private operators, selected through a competitive selection process, to provide energy services to households, public facilities, and MSEs in the selected rural localities. Proposals will be assessed against a number of criteria, such as financing, number and service tiers of electricity connections, economic and financial viability of business plans, and experience in providing rural services. The generation systems are expected to combine solar PV, battery storage, and thermal units as a back-up option and will supply energy to end users through distribution networks and service drop, providing them with an agreed level (expected to be Tier 3–4) of energy service. In addition, in certain instances, the private operator could serve households with stand-along solar system technologies (expected to be Tier 2) where the required service level falls below the specified tier for which mini-grids are the best solution. REA will monitor the implementation progress of the developer during both during construction and operation to ensure compliance with the terms of the agreement. It is expected that the subsidy will cover the viability gap (the difference between cost of providing connection and what consumers are willing/able to pay for it). This will be further defined during the design of the OGESSP in phase 1.

Subcomponent B.2. - Off-Grid Loan Facility

30. This subcomponent will set up a Loan Facility for eligible borrowers, which would include companies importing and selling solar equipment, developers of mini-grids and e-developers of mini-grids and end users of solar equipment, such as agribusinesses. The objective is to address access to finance constraints in Zambia to accelerate growth of the off-grid electrification market.

[54] The BGFZ focuses on the lower tiers (Tier 1–2). The OGESSP will complement the BGFZ and initially focus on rural locations requiring higher Tiers 3–4. Further, the OGESSP focuses on developing local institutional arrangements and capacity to implement the program.

31. It is expected that the DBZ[55] will act as the principal FI for the credit line. The project has been structured under the assumption that the DBZ would lend directly to eligible borrowers (retail option). This is currently considered the most likely structure to succeed. However, the option to lend through one or more commercial banks (wholesale option) has been preserved in case this turns out to be the preferred choice at the completion of phase 1. Moreover, if the DBZ acts as retail lender, it will be required to disseminate data on the performance of this credit line to commercial banks to facilitate the future entry of commercial banks into this market. The DBZ has been selected as the FI for the following main reasons: (a) the DBZ has a mandate to facilitate growth of new economic areas, such as off-grid solar power; (b) the DBZ lends to SMEs and has extended loans to ZESCO and REA in the energy sector; (c) government borrowing is currently crowding out commercial bank lending to the private sector; (d) lessons learned from other projects, including Ethiopia suggest that development banks are more effective in the early stages of market development, and commercial banks are the last entrants to such markets; and (e) the small size of the Loan Facility does not interest commercial banks sufficiently for them to move into a new sector and play the role of principal FI.

32. This subcomponent will be implemented in two phases. The first phase will include (a) implementation of an IDP for the DBZ to raise its capacity and skillset in key areas; (b) design of the Loan Facility structure,[56] fund flow arrangements and loan terms, including whether the DBZ will act as wholesale or retail lender; (c) selection of commercial banks if the DBZ acts as wholesale lender; and (d) development of the operations manual including safeguard principles and operationalization of the ESMF and the RPF, development of standards legal agreements and operating policies and procedures for the Loan Facility, including eligible borrowers, exposure limits, permitted loan products, currencies, tenors, amortization and interest rate terms, and standard loan covenants. The IDP will include the following components: (a) strengthening credit risk assessment of solar energy companies and projects; (b) implementation of a risk-based loan pricing model; (c) strengthening foreign exchange risk management; and (d) environmental and social due diligence on off-grid solar energy projects. The objectives of the IDP are for the DBZ to achieve financial sustainability, and operate with improved governance,[57] policies, and systems. Annex 5 describes the IDP and Loan Facility options in more detail.

33. Completion of this phase will be signaled by IDA's appraisal and no-objection on all necessary arrangements, including operations manual, standard legal agreement and meeting the World Bank Policy on Financial Intermediary Lending (OP 10.00) requirements. At the completion of phase 1 the disbursement conditions for phase 2 will be lifted. This is expected to be completed by early midterm, at which point the second phase (operational phase) will commence.[58]

[55] The project is structured on the assumption that the DBZ will lend directly to solar companies (retail option). However, the wholesale option or selecting an alternative principal FI is preserved and a final decision will be taken based on the results of the IDP at the end of phase 1. The DBZ has previously provided loans to two mini-grids under the UNDP/GEF-funded Renewable Energy Based Isolated Mini-Grids in Zambia Project (see annex 6 for details).
[56] The design of the Loan Facility and loan terms will be developed in close consultation with both public and private sector
[57] As part of the IDP, the governance and ownership structure will be reviewed and appropriate measures (to be jointly developed and aligned with the AfDB-supported project) will be recommended. Resolution of this issue will become a part of the disbursement condition to move to the second phase. In addition, the credit line terms will require the DBZ to perform 'Know Your Customer' due diligence and disclose borrower ownership. The project will also require a 'no objection' right to review the first few transactions. The AfDB takes the same approach with its credit line.
[58] If loan facilities take longer than expected to finalize or other condition are not met, funds from Subcomponent B.2 phase 2 will be reallocated to the on-grid component.

34. The flexibility for the DBZ to act as a wholesale lender through commercial banks or as a retail lender has been preserved until phase 1 for the following reasons: (a) phase 1 will last approximately two years and during that time the financial sector conditions will change, the DBZ's strategy may evolve, and the results of the TA to the DBZ will help inform the decision on the optimal role for the DBZ; (b) the MoF has been considering moving the DBZ to a wholesale model in its SME lending; (c) two local commercial banks have expressed interest in the retail lending role which would add commercial lending expertise and lay the foundation for scaling up lending in any subsequent World Bank operation; and (d) this pilot project may better inform the design of subsequent operations.

35. The second phase will begin with the operationalization of the credit line. Solar companies and mini-grid developers have expressed a strong need for debt financing in both U.S. dollar and Zambian kwacha, including working capital lines and long-term finance for mini-grids. It is, therefore, expected that the DBZ will offer short-, medium-, and long-term loans in U.S. dollar and kwacha[59] either directly to eligible borrowers or through commercial lenders as determined in phase 1.

36. In accordance with World Bank Policy on Financial Intermediary Lending (OP 10.00) the interest rates charged to eligible borrowers will cover all costs (that is, cost of funds, administrative costs, risks, and a small profit incentive for taking credit risk). The Loan Facility will only support companies that sell quality verified systems, as determined by the International Electrotechnical Commission and Lighting Global specifications. To support the market for stand-alone system, the Loan Facility will be complemented with support for developing the regulatory and quality assurance environment (funded under phase 1 of Subcomponent B.1), supporting governments to mainstream off-grid PV into sector planning and consumer awareness activities, informing of the benefits of solar lighting products, and educating on the characteristics of good quality products (funded under phase 1 of Component C). Annex 5 describes the IDP and Loan Facility options in more detail.

Component C - Capacity Building and Project Implementation Support (SDR 5.3 million (US$7.2 million equivalent), of which IDA SDR 3.4 million (US$4.7 million equivalent) and Expected SIDA/GPOBA Trust Fund SDR 1.8 million (US$ 2.5 million equivalent)).

37. This component will finance TA to the GRZ to (a) ensure that the project reaches its objective of enhancing and improving the enabling environment needed for a substantially scaled up electrification effort; and (b) support effective project implementation.

38. TA will include (a) diagnostic and analytical activities that shall lead to the development of the NES[60] and the geospatial planning tool; (b) outreach and consumer education activities aimed at informing and assisting consumers (focusing on women and vulnerable groups) in the connection fee subsidy application process, informing of the benefits of solar lighting products and educating on the

[59] The final decision on loan terms and currencies, to be provided, will be taken in phase 1.

[60] The NES is expected to be based on a geospatial electrification planning platform, building on the existing Off-grid Energy Market Opportunities tool (*http://offgrid.energydata.info*). The NES would include an updated Master Plan and Investments Prospectus to support a systematically staged and coordinated electrification rollout program. Development of the NES would require a comprehensive assessment of the existing REF and preparation, discussion, and adoption of recommendations aiming to increase sustainability of financial mechanism for rural electrification, including for on- and off-grid subsidies. It will also require development of feasibility studies for grid extension and network reinforcement and recommendations for a Code of Practice for low-cost electrification schemes.

characteristics of good quality products; (c) services of the PMC and the IVA; and (d) capacity building to key government institutions (DoE, ZESCO, REA), solar companies, and PFIs to assist them to efficiently fulfill their functions under the project.

39. The detailed description of TA activities are as follows:[61]

(a) **Outreach and consumer education with special focus on women and vulnerable groups.** REA will undertake marketing/communication of the project in collaboration with ZESCO. Specific activities include (i) initiating outreach and promotion activities to ensure that all the potential new customers are duly informed about the subsidy program and informing the benefits of solar lighting products, educating on the characteristics of good quality products, with particular focus on women and other disadvantaged groups; (ii) assisting the applicants in preparing and submitting the service applications to ZESCO (iii) posting of announcements in local communities; (iv) media announcements; and (v) posters in REA and ZESCO customer service offices throughout the country. The communication consultant will have a specific focus on customer groups deemed likely to be unaware of the Connection Fee Subsidy Program and those who are likely to need assistance to participate in the program, placing particular focus on reaching out to women, as women tend to face specific forms of exclusion. These programs will be developed and rolled out by REA with support from consultants and in partnership with local nongovernmental organizations (NGOs) that are active in this area

(b) **Project management and independent verification.** REA will engage a consultancy firm to serve as the PMC to support REA in project management, including carrying out project implementation supervision. The PMC will also be responsible for training REA staff and transferring project management and project implementation/supervision capacity to REA. The PMC may also support REA in assessing subproject implementation plans and in reviewing the quality of upstream works carried out to facilitate the connections. An IVA will be contracted by REA to independently verify outputs/connections and prepare output verification reports that will document the number, location, and types of connections made; the number of beneficiaries in each household broken down by gender (Male/Female); the quality of the connections; and their compliance with the agreed specifications and safety standards. Based on these findings, the IVA will recommend payment of the corresponding subsidy to ZESCO.

(c) **Capacity building.** This activity will provide capacity building for the key government institutions (ZESCO, REA, DoE, ERB, and DBZ), solar companies, mini-grid developers, and PFIs to assist them to efficiently fulfill their functions under the project, including:

- **Geospatial-based electrification planning platform.** This will consist of developing a high-resolution geospatial data electrification platform with long-term electricity demand forecasts and algorithmic least-cost optimization of grid and off-grid electricity systems. The platform will provide cost estimates of supply options, such as grid extension (MV network(s) and LV access), mini-grid, and stand-alone systems

[61] Preparation of the terms of reference for different activities are ongoing.

for achieving Zambia's target of universal access. The development of such a platform will be associated with identifying and implementing organizational arrangements, as well as building robust capacity to maintain a national power sector Geographic Information System database and to replicate the geospatial electrification planning exercise in the future.

- **NES, including Electrification Master Plan and Investment Prospectus.** This will include the development of an Electrification Master Plan and Investment Prospectus based on the data from the geospatial least-cost electrification platform encompassing grid and off-grid access delivery modalities and technology choices, deployment of cost-effective renewable energy supply, where appropriate, and the corresponding sector-wide investment and operating cost requirements. The Electrification Master Plan and Investment Prospectus will be the building blocks of a systematically staged and coordinated electrification rollout program to scale up electricity access at the national level. The NES will be developed through extensive consultation with all relevant stakeholders, including local government, communities, and private sector.

- **Development of recommendations to increase sustainability of financial mechanisms for rural electrification.** This activity will assess the current financial mechanisms for rural electrification, including the REF, managed by REA and provide recommendation on how to increase their effectiveness and sustainability.

- **Feasibility studies for grid extension and network reinforcement.** Technical feasibility studies will be carried out for subprojects and for the proposed upcoming electrification program. These feasibility studies will help ensure that the investments in network strengthening and extension are adequately planned and that the envisaged number of connections can indeed be achieved during the duration of the project. Some consultancy may also be needed to ascertain the economic rates of return and ensure that the project activities target the most financially viable areas as defined by the maximum number of connections with the least investment cost.

- **Code of Practice for low cost electrification schemes.** This activity will support the ERB in the development of a Code of Practice for low-cost electrification technologies and capacity-building support to the network planning department at ZESCO in the application of these technologies.

- **M&E**. REA's M&E team will be responsible for the effective monitoring of the project based on the project's final design and its agreed-upon results monitoring indicators. To assist REA's M&E Department to be more effective in its efforts, the M&E TA will consist of two parts. First, there will be training for REA's M&E team. This activity will support training of REA's M&E staff on general project monitoring and dissemination of good practices in general, and the monitoring and reporting requirements of the project in particular. The M&E TA will facilitate REA's preparation of regular monitoring reports based on the results monitoring table; and dissemination of the

project progress status both online and in a document format to be shared with the World Bank and other stakeholders. Second, there will be support for the development of tools for adequate monitoring and reporting and dissemination of results. This subcomponent will include procurement of software tools to facilitate and strengthen REA's online dissemination of rural electrification results, data and statistics, and implementation progress in rural electrification. This subcomponent could include hiring of external consultants for data collection and/or analysis and reporting, development of an interactive online database of REA's ongoing or completed rural electrification projects, and the number of rural households/MSEs and/or other types of connections achieved on the field, and other relevant information.

ANNEX 2: IMPLEMENTATION ARRANGEMENTS

COUNTRY: Zambia
Electricity Service Access Project

Project Institutional and Implementation Arrangements Design

Institutional Set up

1. The project will be implemented over five years. Given the slow pace of increasing access in rural areas, the GRZ requested to focus the project investment components on rural areas. Therefore, given the institutional mandate of REA, the overall fiduciary responsibility for the project will be vested in REA. The overall policy guidance and regular oversight and coordination over the project implementation will be carried out by the PSC chaired by the MoE and comprising representatives of REA, ZESCO, DBZ, and other relevant ministries and government institutions, such as the Ministries of Finance, Ministry of National Development Planning, and the ERB, as deemed appropriate by the GRZ. The DoE of the MoE will serve as the Secretariat of the PSC and will be staffed with an electrification coordinator reporting to the director of DoE and funded from the project.

2. The key institutional actors in the electrification sector include (a) the MoE, which is responsible for sector policy, planning, and coordination through its DoE; (b) ZESCO, the national vertically integrated electricity utility, which, among other things, is responsible for electrification and access expansion efforts in urban areas; (c) REA, mandated to administer and manage the REF, develop plans for grid and off-grid rural electrification and monitor project implementation, and expand access to electricity in rural areas; and (d) the ERB, with a mandate covering the regulation of the entire energy sector, and with responsibilities that include licensing, review and approval of power tariffs, and enforcement of quality and service standards. The key legislation acts forming and regulating the energy sector policy and regulatory environment is reflected in table 2.1

Table 2.1 Key Legislations and Policies in the Electricity Sector in Zambia

Electricity Act	1995, amended in 2003 and 2009	Set the legal framework for electricity sector
Energy Regulation Act	1995, amended in 2003 and 2009	Establishes and defines the role of the ERB
National Energy Policy	1994, revised in 2008	Sets policy direction of energy sector
Zambezi River Authority Act	1987	Established the Zambezi River Authority
National Policy on Climate Change	2017	Establishes Zambia's response to climate change and roles of relevant authorities

3. The credit will be to the GRZ, through the MoF, which will, by a subsidiary grant agreement, on-grant it on to REA. As the PIA, REA, will manage the project on behalf of the GRZ and, in this regard, it will account for the deposits and withdrawals and perform the audits and provide financial reports in accordance with the World Bank rules and guidelines. REA will monitor the utilization of the project resources by each co-executing agency (ZESCO and DBZ), including itself and provide expenditure

projections. It will provide progress reports, including the Midterm Review Report, and the Implementation Completion and Results Report. It will also coordinate the project's overall procurement function, and prepare and revise the Procurement Plans. REA will liaise closely with all other involved co-executing entities to provide procurement guidance where necessary and ensure adherence to the procurement guidelines. A Project Agreement between REA and IDA will capture these obligations and responsibilities. Implementation of specific activities under the project components will need close involvement of ZESCO and the DBZ and, therefore, these institutions will be co-executing agencies for specific component activities and correspondingly will assign dedicated project coordinators and PIUs responsible for the implementation of their respective on-grid and off-grid component activities.

4. **REA.** REA was established according to the Rural Electrification Act No. 20 of 2003 enacted by the Parliament of the Republic of Zambia. The Act mandated REA, among other things, to administer and manage the REF, develop plans for grid and off-grid rural electrification and monitor their implementation; mobilize funds to support rural electrification, encourage private sector participation in rural electrification through provision of subsides, competitive bidding and community mobilization, finance project preparation studies for rural electrification; and recommend suitable policies to the Government. REA has experience in managing World Bank-funded projects, having previously managed the IDA credit for the IAES Project. The recent assessment concluded that the FM arrangements are in place to meet the World Bank's minimum requirements under OP/BP10.00 and are adequate to provide, with reasonable assurance, accurate and timely information on the status of the project. However, the overall risk rating is Substantial and requires addressing deficiencies related to REA internal controls. Correspondingly, an FM Action Plan will be developed and adopted by REA. To further mitigate fiduciary risks, REA will engage a consulting firm in a PMC role to support it in project management, including carrying out supervision of contracts due to REA's capacity constraints. Over the longer run, this capacity will be gradually transferred to REA.

5. REA will establish a PIU, headed by the REA technical director and supported by a project manager, and will comprise a rural electrification engineer, an electrification PPP specialist, a safeguards specialist, an accountant, and a procurement specialist. The project manager, accountant, and procurement specialist will be funded by the project while, the rural electrification engineer, electrification PPP specialist, and safeguards specialist will be selected from the pool of existing REA staff and assigned to work solely on the project. REA's PIU will be responsible for overseeing the overall project implementation, including the on-grid, off-grid, and TA components.

6. **MoE/DoE.** The MoE through its DoE will be responsible for the coordination and supervision of the project. The DoE will serve as the Secretariat of the PSC and through its electrification coordinator, will be responsible for coordination of the project implementation, liaising with other government institutions, monitoring of the performance of all actors, and enforcing the adherence to the project implementation schedule. The PSC will need to be established not later than 30 days after the effectiveness date. The DoE will also provide quality assurance on the TA activities related to upstream policy (for example, NES) and regulatory work and outputs under the Components B and C, while REA will carry out fiduciary functions such as procurement, FM, and environmental and social safeguards. The DoE will also be responsible for mitigating the risks of disjointed implementation and/or delays and will, therefore, form a joint project coordination team with regularly scheduled meetings to ensure smooth and timely implementation progress and address any issues that may cause delays in project implementation or disbursements.

7. **ZESCO.** ZESCO will be a co-executing entity of activities under the Component A—On-grid Electricity Access Expansion—and will lead Component A activities through a dedicated PIU. REA will enter into a co-executing agreement with ZESCO, which will specify commitments, roles and responsibilities of REA and ZESCO. Component subprojects will be identified jointly by REA and ZESCO, with REA providing grant financing for ZESCO to implement the identified projects. The activities under the Subcomponent A.1. will be implemented using a results based approach, payments will be linked to attainment of results based on pre-agreed targets and indicators (for example, number of connections), which will be verified by IVA. It is expected that some input activities, such as electrification goods and equipment and minor works will be procured. The procurement from the proceeds of funds earned by the GRZ from attainment of results, such as number of connections and so on, will be based on use of open national bidding and/or open international bidding procurement of the GRZ as provided in the Public Procurement Act, 2008, Act. No.12 of 2008, as amended by the Public Procurement (Amendment) Act, 2011, Act No. 15 of 2011 , and the Public Procurement Regulations, 2011, Statutory Instrument No. 63 of 2011 (the 'Regulations'), provided, however, such procedure shall be modified to make them acceptable to the World Bank. The procurement will be further modified to include provisions for the World Bank's policies on corrupt and fraudulent practices and the right of the World Bank to audit and inspection. ZESCO will follow the approved procurement procedures and report back to REA. REA will be responsible for verifying the works carried out by ZESCO (through the PMC for on-grid works and the IVA for off-grid results) and will provide funding to ZESCO according to the terms of the co-executing agreement, including advances to commence works and subsequent payments against verification by REA that the works have been carried out to the required standards. REA's funding will be deposited to ZESCO's operating account and will be replenished monthly based on the budget estimates and documentation submitted by ZESCO.

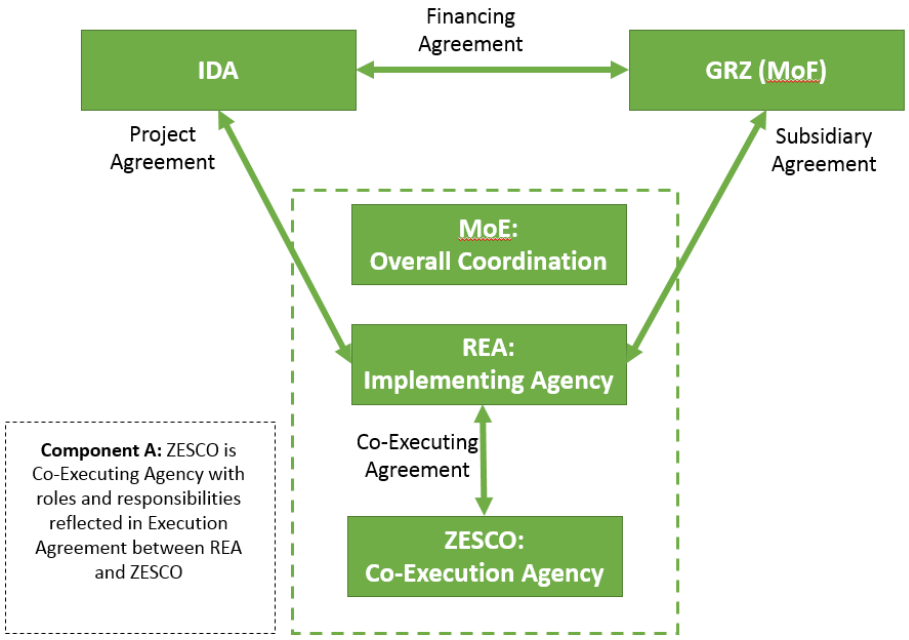
8. **DBZ.** REA will have overall responsibility for the implementation of the Component B activities. However, Subcomponent B.2. Loan Facility phase 2 activities (that is, managing operationalized credit line) will be delegated to the DBZ, once the conditions for implementation of the second phase are met. To enable it, REA will enter into a subsidiary agreement with the DBZ for implementing the subcomponent activities. The DBZ will also have safeguard oversight responsibilities, for which it will receive appropriate capacity building under the TA activities planned for phase 1. However, the DBZ's phase 2 participation can only be initiated after a proper safeguard assessment is carried out which ensures that the arrangement and capacity meet the World Bank's minimum requirements under OP/BP10.00 and OP/BP 4.01. Similar to the on-grid implementation arrangements, the implementation of the off-grid component will support the evolution of REA's role toward becoming a facilitator for electrification efforts in rural areas.

Project Funds Flow Arrangements

9. The IDA project funds are expected to be transferred by the GRZ to REA on a grant basis. REA will open a Designated Account (DA) in U.S. dollars to be replenished on a regular basis following agreed arrangements with IDA and reflected in the Project Agreement. For the purpose of implementing activities under Component A, ZESCO will open two operating accounts (OAs): one in U.S. dollars and another in Zambian kwacha. REA will deposit an initial advance from the DA to ZESCO's OA according to the agreed project implementation plan up to the agreed threshold to be reflected in the Project Agreements and the REA-ZESCO execution agreement. ZESCO's OA will be replenished from the DA on a monthly basis, subject to submission of the supporting documentation and verification reports from the

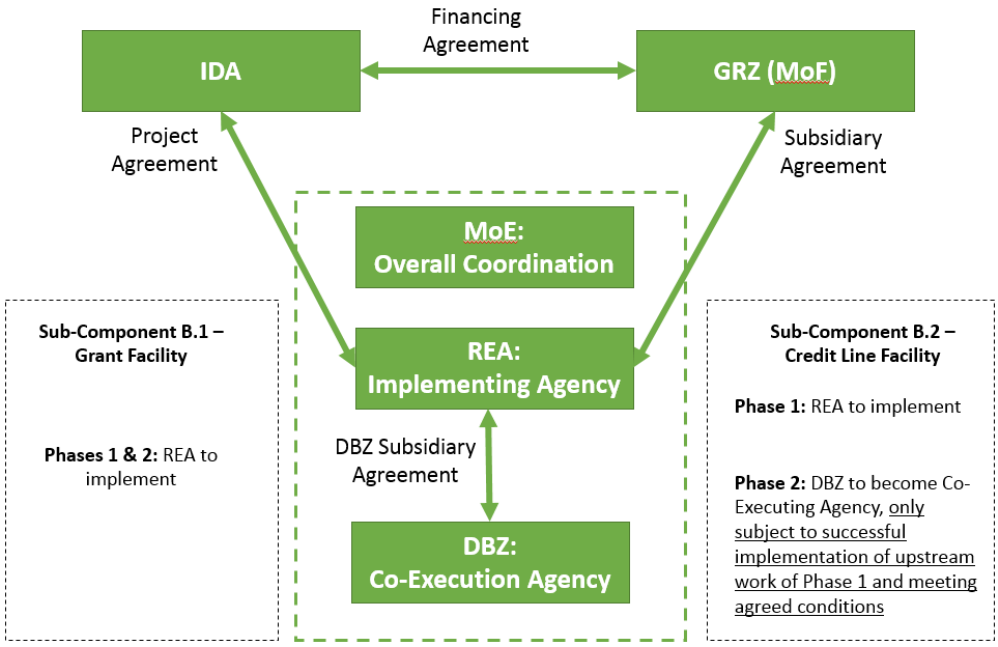
PMC and IVA. Similarly, for Subcomponent B.2. activities, the DBZ will open OAs, where REA will deposit an advance and will replenish as agreed and reflected in the project legal documents and the REA-DBZ execution agreement. These arrangements will be reflected in the POM,[62] to be adopted by REA before the project's effectiveness—in consultation with the MoE/DoE, ZESCO and the DBZ, and cleared by the World Bank.

Figure 2.1. Project Implementation Agreements Structure: Component A - On Grid



[62] Preparation of the POM is ongoing.

Figure 2.2. Project Implementation Agreements Structure: Component B - Off Grid



Financial Management

10. An FM assessment of REA was carried out in March 2017 in accordance with the FM manual for World Bank-Financed Investment Operations, issued by the Financial Management Sector Board on March 1, 2010 and the Operational Risk Assessment Framework Financial Management Draft Interim Guidance Note issued by the Africa Region Financial Management Unit on September 30, 2010. The objective of the FM assessments was to determine whether the FM arrangements (a) were capable of correctly and completely recording all transactions and balances relating to the project; (b) would facilitate the preparation of regular, accurate, reliable, and timely financial statements; (c) would safeguard the project's entity assets; and (d) would be subject to auditing arrangements acceptable to the World Bank.

11. The conclusion of the assessment was that the FM arrangements, in place at REA, meet the World Bank's minimum requirements under OP/BP 10.00 and are, therefore, with reasonable assurance, adequate to provide accurate and timely information on the status of the project as required by the World Bank. The overall FM residual risk rating of the project is substantial because there are significant deficiencies in the internal controls at REA that include (a) lack of a risk register and risk management manual; (b) inadequacies in communication and enforcement of ethical values and commitment to competence; (c) inadequate management of tangible fixed assets; (d) the Internal Audit Department not being fully staffed and the audit committee chairperson not being an independent member; and (e) lack of regular supplier and contractor reconciliation. Specific measures to address these deficiencies will be reflected in an FM Action Plan to be developed and adopted by REA. The FM risk rating is, therefore, expected to be reduced to moderate after the risk mitigation measures have been undertaken. Therefore, it is recommended that (a) a qualified and experienced accountant be assigned to the project; (b) training of both accounting and audit staff of REA in World Bank FM and disbursement

procedures takes place; and (c) a POM, that includes an update of REA's finance and accounting manual to include the World Bank's FM and disbursement guidelines, be prepared. In addition, membership of the audit committee should be reconstituted to include an independent chairperson.

Risk Assessment and Mitigation Measures

12. The overall FM residual risk rating is assessed as Substantial. Table 2.2 summarizes the risks identified, the risk rating, and mitigating measures, if any.

Table 2.2. Risk Assessment and Mitigation Measures

Risk	Initial Risk Rating	Risk Mitigating Measures	Residual Risk Rating
Inherent Risk			
Country level Lack of accountability; poor enforcement and compliance with existing regulations/procedures; and lack of, and lukewarm implementation of auditors' recommendations; and the lack of sanctions for offenders.	**S**	• The Government is implementing a Public FM reform agenda supported by CPs which includes the implementation of the Integrated Financial Management Information System which is being rolled out to all Ministries, Provinces and Spending Agency (MPSAs) to improve on the accountability and control environment in the MPSAs.	**S**
Entity level Lacks adequate experience with implementing World Bank or donor-assisted projects and therefore, has limited familiarity with the requirements.	**M**	• The project has two accountants who have experience with World Bank-financed projects, though their performance was inadequate • Accounting staff at REA will be trained in FM and disbursement arrangements in IDA-assisted projects.	**M**
Project level The nature, size, and design of the project.	**M**	• The activities to be funded by the project are identified and the flow of funds has been clearly worked out. Additional financial staff training on World Bank fiduciary requirements will be provided to FM staff at REA (and for ZESCO and the DBZ as necessary).	**M**
Overall inherent risk	**M**		**M**
Control Risks			
Budgeting	**M**	n.a.	**M**
Accounting REA uses Pastel SAGE accounting software, but does not produce separate project ledger accounts.	**S**	• The accounting system is to be upgraded to produce separate project ledger accounts.	**M**
Internal control Weak control environment resulting from poor enforcement of existing financial regulations; inadequate management oversight, and	**S**	• The finance and accounting manual to be updated to include the World Bank's FM and disbursement guidelines. • Revamp the audit committee to have an independent chairperson.	**S**

Risk	Initial Risk Rating	Risk Mitigating Measures	Residual Risk Rating
inadequate internal audit function.		• Both accounting staff and internal auditors to undergo FM and disbursement training for internal auditors in World Bank-funded projects	
Funds flow • Delays at the BoZ may affect the smooth flow of funds to REA.	**S**	• The BoZ to be sensitized to ensure that no undue delays are experienced in transferring the funds.	**S**
Financial reporting • Untimely submission of the financial reports due to these reports being produced manually outside the computerized Pastel SAGE. • Inaccurate accounting figures produced manually.	**S**	• Pastel SAGE accounting software to be upgraded to produce separate project ledger accounts. • The quarterly financial reports formats and contents and the reporting timetables will be agreed with REA in advance (by project effectiveness).	**M**
Auditing Unacceptable audit and untimely submission of the audit reports and lack of follow up on audit findings.	**S**	• The Auditor General who has the country's constitutional mandate to audit all funds, will carry out the audits • The audit will be based on agreed terms of reference that will specify the approach, scope, and timing of the audit. • As part of supervision ensure that planning for the audit is started early.	**S**
Overall control risk	**S**		**S**
Overall risk rating	**S**		**S**

Note: H =High, S = Substantial, M =Moderate, L =Low.

Budgeting Arrangements

13. Budget preparation and monitoring will follow REA's procedures as stipulated in the finance and accounting manual, to be updated to include the World Bank's procedures and also as part of the POM.

Staffing

14. REA has a Finance Department headed by the director of finance and deputized by a chief accountant, accountant, accountant - financial reporting, and management accountant who are assisted by an assistant accountant. Both the director of finance and chief accountant have experience in World-Bank funded projects, having been in charge of finances of the IAES Project (P077452) that closed on June 30, 2015. However, this arrangement is not adequate for the project. Therefore, it is recommended that REA assigns a qualified and experienced accountant to be in charge of the project's FM. The Finance Department staff, including the project accountant to be assigned, will need to be trained in the World Bank's FM and disbursement procedures before project effectiveness.

Internal Controls and Internal Audit

15. REA will apply the procedures as stipulated in the existing finance and accounting manual, to be

updated to include the World Bank's FM and disbursement guidelines. REA has also an Internal Audit Department that is staffed only by the chief internal auditor and an assistant internal auditor with only business management skills and no technical specialty. Furthermore, the management letters for the years ending December 31, 2013, 2014, and 2015 highlighted a lot of internal controls deficiencies that included (a) the lack of a register and risk management manual; (b) inadequacies in communication and enforcement of ethical values and commitment to competence; (c) inadequate management of tangible fixed assets; (d) the Internal Audit Department not being fully staffed and the audit committee chairperson not being an independent member; and (e) the lack of regular supplier and contractor reconciliation. Therefore, it is recommended that all internal audit staff receive training in World Bank FM and disbursement procedures on a continuous basis.

FM Manuals

16. The project will require REA to update the current finance and accounting manual to include the World Bank's FM and disbursement arrangements as part of the POM by effectiveness.

Information Systems

17. REA will use its existing Pastel SAGE accounting software that will need upgrading so that it can produce separate project ledgers.

Accounting Basis

18. The project will use cash basis accounting in line with International Public Sector Accounting Standards.

Financial Reporting Arrangements

19. The project will submit quarterly interim financial reports (IFRs) in a format agreed with the World Bank within 45 days of the end of each calendar quarter.

20. REA will prepare annual accounts within three months after the end of the financial year in accordance with accounting standards acceptable to the World Bank. REA will be responsible for ensuring that the reports are audited and submitted to the World Bank within six months after the end of the financial year.

Auditing Arrangements

21. The project's financial statements will be audited by the Office of the Auditor General, the supreme audit institution in Zambia, which may contract acceptable private audit firms to conduct the audits on their behalf. All audits should be carried out in accordance with International Standards on Auditing. The terms of reference for audits of the project have been agreed with REA. Audit reports, together with management letters, should be submitted to the World Bank within six months after the close of the year. Audit reports will be publically disclosed by the World Bank in accordance with the World Bank's disclosure policy.

22. Both REA and ZESCO will also submit their entities' annual audited financial statements to the

World Bank annually.

Table 2.3. FM Action Plan

No.	Action	Date Due By	Responsible
1	Train accountants and internal auditors in the World Bank's FM and disbursement procedures	Continuously during the life of the project	IDA
2	Develop a POM, including updating the finance and accounting manual to include the World Bank's FM and procurement procedures	Effectiveness condition	REA

Disbursements

Disbursement Table

23. The following table specifies the categories of Eligible Expenditures, the allocations of the amounts of the Financing to each Category, and the percentage of expenditures to be financed for Eligible Expenditures in each Category:

Category	Amount of the Financing Allocated (expressed in SDR)	Percentage of Expenditures to be Financed (inclusive of Taxes)
(1) Goods, works, non-consulting services, Operating Costs, Training and consulting services for the Project (except for those covered under Categories (2), (3) and (4) below)	14,600,000	100%
(2) On-grid Connections under Part 1(a) of the Project	1,100,000	100%
(3) Partial Grant Subsidies under Part 2(a)(ii) of the Project	2,200,000	100%
(4) Credit Lines under Part 2(b)(ii) of the Project	1,500,000	100%
TOTAL AMOUNT	19,400,000	

Flow of Funds and Disbursement Arrangements

24. GRZ agreed transfer IDA project funds to REA on a grant basis. REA's DA in U.S. dollars will be replenished on a regular basis following agreed arrangements with IDA. For the purposes of implementing activities under Component A, ZESCO will open two OAs: one in U.S. dollars and another in Zambian kwacha. Similarly, for Subcomponent B.2. activities, the DBZ will open OAs, where REA will deposit an advance and will replenish as agreed. The details of funds flow management arrangements will be reflected in the POM.

25. The project will use the transaction-based method of disbursements using statements of expenditure. Other methods of disbursing to be used in the project will include reimbursements, direct payments, and use of special commitments (such as letters of credit). Further details will be provided in the disbursement letter.

Procurement

26. **Institutional arrangement for procurement.** REA will be the overall implementing and coordinating agency of the project. A PIU will be established at both REA and ZESCO with adequately qualified and experienced staff to implement the components for which each agency will be responsible over. Each agency will have its own procurement and FM staff.

27. **Applicable procurement regulation.** Procurement for the proposed project will be carried out in accordance with the World Bank Procurement Regulations for IPF Borrowers (Borrowers Regulations), July 2016, and the provisions stipulated in the Financing Agreement, including the Bank's Anti-Corruption Guidelines.

28. Applicable legal and regulatory framework for procurement of goods, civil works, and non-consultant services to be followed for request for proposals or requests for bids (national bidding) will be the open national bidding procedure set forth in the Public Procurement Act, 2008, Act. No.12 of 2008, as amended by the Public Procurement (Amendment) Act, 2011, Act No. 15 of 2011, and the Public Procurement Regulations, 2011, Statutory Instrument No. 63 of 2011 (the 'Regulations'); provided, however, that this procedure is subject to the provisions of the World Bank's New Procurement Framework (NPF) as provided for in the World Bank's Procurement Framework - Procurement Regulations for IPF Borrowers applicable to 'procurement in IPF Goods, Works, Non-consulting, and Consulting Services', dated July 2016 and the additional provisions in the following paragraphs.

29. **Project Procurement Strategy for Development** has been prepared, using the short form template. Based on the PPSD analysis, the procurement approach and methods will involve open competition and/or use of new procurement techniques. The procurement approach and methods for all components will follow approved selection methods and market approach options in the regulations. No activity is envisaged to involve departure from policy thresholds or need additional oversight or OPRC review levels. From the information gathered, there is likely to be no serious supply market risk as well as competition risk provided that delivery model takes into account some incentive mechanism including appropriate risk allocation and security arrangements.

30. **Eligibility.** Eligibility to participate in a procurement process and to be awarded an IDA-financed contract will be as defined under section I of the Procurement Guidelines. Accordingly, no bidder or potential bidder will be declared ineligible for contracts financed by IDA for reasons other than those provided in section I of the Procurement Guidelines. No restriction based on the nationality of bidders and/or the origin of goods shall apply, and foreign bidders will be allowed to participate in National Competitive Bidding with no restrictive conditions such as, but not limited to, mandatory partnering or subcontracting with national entities.

31. **Domestic preference.** No margins of preference of any sort will be applied in the bid evaluation.

32. **Bidding documents.** Procuring entities must use bidding documents acceptable to IDA.

33. **Bid validity.** An extension of bid validity, if justified by exceptional circumstances, may be requested in accordance with appendix 1 of the Procurement Guidelines. A corresponding extension of any bid guarantee will be required in all cases of extension of bid validity. A bidder may refuse a request for the extension of bid validity without forfeiting its bid guarantee.

34. **Qualification.** The qualification criteria will be clearly specified in the bidding documents. All criteria so specified, and only such specified criteria, will be used to determine whether a bidder is qualified. Qualification will be assessed on a 'pass or fail' basis and merit points will not be used. The assessment will be based entirely on the bidder's or prospective bidder's capability and resources to effectively perform the contract, taking into account objective and measurable factors, including the contractor's; (a) relevant general and specific experience; (b) satisfactory past performance; (c) successful completion of similar contracts over a given period; (d) financial position; and (e) where relevant, construction capability and/or manufacturing facilities.

35. Prequalification procedures and documents acceptable to IDA must be used for large, complex, and/or specialized works. The information that was used to prequalify bidders, including their current commitments, will be verified at the time the contract is awarded, along with the bidder's capability with respect to personnel and equipment. Where pre-qualification is not used, the qualification of the successful bidder will be verified after being recommended for the contract using the qualification criteria stated in the bidding documents.

36. **Bid evaluation**. All bid evaluation criteria, other than the price, must be quantifiable in monetary terms. Merit points will not be used, and no minimum point or percentage value will be assigned to the evaluation criteria or significance of price in the bid evaluation. No negotiations will be permitted.

37. **Guarantees.** Guarantees must be in the format specified in the bidding documents, must be valid for the period specified in the bidding documents, and must be submitted when and as specified in the bidding documents.

38. **Cost estimates.** Detailed cost estimates will be confidential and will not be disclosed to prospective bidders. No bids will be rejected on the basis of comparison with the cost estimates without IDA's prior written concurrence.

39. **Rejection of bids and re-bidding.** No bid will be rejected solely because it falls outside of a predetermined price range or exceeds the estimated cost. All bids (or the sole bid if only one bid is received) will not be rejected, the procurement process will not be cancelled, and new bids will not be solicited without IDA's prior written concurrence.

40. **Fraud and corruption.** In accordance with the Procurement Guidelines, each bidding document and contract will include provisions stating IDA's policy to sanction firms or individuals found to have engaged in fraud and corruption as set forth in the Procurement Guidelines.

41. **Inspection and audit rights.** In accordance with the Procurement Guidelines, each bidding document and contract will include provisions stating IDA's policy with respect to the inspection and audit of accounts, records, and other documents relating to the submission of bids and contract performance.

42. **Procurement risk assessment.** A procurement risk assessment of REA and ZESCO to implement the proposed project has been carried out. The overall procurement risk rating for both is deemed 'moderate'. The risk is expected to be reduced to 'low' after implementation of the risk mitigation measures indicated in the following paragraphs. Both REA and ZESCO, with adequately qualified and experienced staff to implement the components, will be responsible. REA and ZESCO have in the past 10 years successfully implemented two energy projects funded by the World Bank. Over this time, REA in particular, being the relatively new institution, has improved its institutional capacity and arrangements such that it now has a full complement of staff to meet its institutional mandate. ZESCO on the other hand, has, over many years, demonstrated its capacity to implement various capital projects. The World Bank notes, though, that allocation of the right staff from within the institution, at the outset, is critical to the proper and effective implementation of projects that ZESCO undertakes. ZESCO should also use staff with proven track records to implement and provide oversight to project teams while at the same time fusing in new and less experienced staff in interest of capacity building. In the last two projects, the need for realism in cost estimation was noted and so too was the need for ZESCO to enhance its contract management and supervision skills particularly, of the TA and design and supervision consultants hired by ZESCO. This is critical to the adequate and timely supervision and decision making during contract implementation and project management.

43. Both REA and ZESCO will be implementing projects using the World Bank's NPF for the first time and so, though they have had familiarity with the implementation of projects funded by the World Bank using the 'Guidelines: Procurement of Goods, Works, and Non-Consulting Services under IBRD Loans and IDA Credits and Grants by World Bank Borrowers' (January 2011 and revised on July 1, 2014) and 'Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits and Grants by World Bank Borrowers (January 2011 and revised on July 1, 2014), the two institutions are yet to implement a project using the NPF. Consequently, there will be need for staff, charged with implementation responsibility, to be trained in and become familiar with the procedures under the Procurement Regulations for IPF Borrowers, dated July 2016. To this end the World Bank will need to arrange suitable training early in the life of the project.

44. The following main procurement-related risks are identified:

(a) National issue public institutions in Zambia, based on the provisions of the Public Procurement Act No 12 of 2008 and as amended in 2011, do not have an independent functioning administrative system for handling of complaints and resolution of disputes during tendering or for contract management.

(b) Few qualified suppliers/contractors in the market—limited competition needs security of supply at a good price in the energy sector.

(c) Limited capacity of the REA and ZESCO staff on application of the NPF - Procurement Regulations for IPF Borrowers, dated July 2016 and in contract management.

(d) Risk of assignment of staff with inadequate experience in the PIUs.

(e) Lengthy government approval processes particularly, of draft contracts by the office of the Attorney General in the Ministry of Justice.

(f) Poor verification and/or review of the adequacy of bidders' qualifications to carry out contracts by carrying out due diligence of bidders' qualification information.

(g) Cost estimates have sometimes been quite divergent with the resulting amounts recommended for contract awards leading to approval delays and budget constraints in procurement that both ZESCO and REA have carried, indicating the need for diligent cost estimates formulation.

45. The following mitigation measures are proposed:

(a) The Zambia Public Procurement Authority (ZPPA) should, in the long term, amend the Public Procurement Act No 12 of 2008 and as amended in 2011, to include an independent functioning administrative system for handling of complaints and resolution of disputes during tendering or for contract management.

(b) Consider wider advertising particularly, in international media, such as the United Nations Development Business online magazine and by allowing sufficient time for bid preparation and submission to enhance participation, economy, and value for money.

(c) The World Bank should carry out procurement training for PIU staff in the World Bank's NPF Procurement Regulations for IPF Borrowers, dated July 2016.

(d) The World Bank should request for assurance and review the adequacy of the qualifications and experience of staff that REA and ZESCO will assign to the PIUs to implement the project, including dedicated/assigned procurement specialist.

(e) The ZPPA, the Ministry of Justice/MoF and Ministry of National Development Planning should, as a short-term and administrative measure, consider (i) adopting service standards for review of documents by public instructions involved in procurement, including review and clearances of draft contracts by the Attorney General's Office; and (ii) amending, as a long-term measure, the Public Procurement (Amendment) Act such that

only contracts that do not use approved GRZ National Standard Bidding Documents /World Bank Standard Biding Documents, all of which include standard contracts templates, would require review by the Attorney General's Office.

(f) All bid evaluations and reports should include requirements and information supporting the fact that due diligence in bidders' qualification and ability to successfully execute contracts has been carried out.

(g) The project management unit will also develop a contract management system to ensure that all contracts under the project are effectively and efficiently managed; this will include the tracking of key contract milestones and performance indicators, as well as capturing all procurement and contract records.

(h) Both ZESCO and REA to pay more attention to planning, budgeting, and cost estimation and use regional and international information as needed.

46. **Procurement methods.** Table 2.4 and the subsequent paragraphs describe the various procurement methods to be used for activities financed by the proposed IDA credit at the appraisal stage.

Table 2.4. Thresholds for Procurement Methods and Prior Review - Goods and Works

Procurement Category & Selection arrangement	Selection Methods and Arrangements	Market Approach					Contract Value for Selection (US$)
		Open	Limited	Direct	International	National	
1. Goods	Request for proposals	√	√	X	√	√	≥2,000,000 for international ≥ 100,000 < 2,000,000 national < 100,000 national - request for quotations
	Request for bids	√	√	X	√	√	
	Request for quotations	√	√	X	√	√	
	Direct Selection	X	X	√	X	X	
	United Nations agencies	According to paragraphs 6.47 and 6.48 of the NPF					
2. Civil Works	Request for proposals	√	√	X	√	√	≥ 15,000,000 for international ≥ 300,000 < 15,000,000 national < 300,000 national - request for quotations
	Request for bids	√	√	X	√	√	
	Request for quotations	√	√	X	√	√	
	Direct selection	X	X	√	X	X	
	United Nations agencies	According to paragraphs 6.47 and 6.48 of the NPF					
	PPPs	√	√	√	√	√	
	Commercial practices	According to acceptable commercial procurement practices as will be defined in the Project Implementation Manual					

3. Consultant Services	Quality- and Cost-Based Selection	√	X	X	√	√	≥ 300,000 for international, < 300,000 national
	Selection under a Fixed Budget	√	X	X	√	√	
	Least-Cost selection	√	X	X	√	√	
	Quality-Based Selection	√	X	X	√	√	
	Selection based on the Consultants' Qualification	√	X	X	√	√	
	Direct Selection	X	X	√	X	X	
	Individual consultant Selection	√	√	√	X	X	
	NGOs - for RAP implementation	√	√	√	√	√	
4. Non-Consultant Services	Request for proposals	√	√	X	√	√	≥ 2,000,000 for international ≥ 100,000 < 2,000,000 national < 100,000 national - request for quotations
	Request for bids	√	√	X	√	√	
	Request for quotations	√	√	X	√	√	
	Direct Selection	X	X	√	X	X	
	PPPs	√	√	√	√	√	
	NGOs - for RAP implementation	According to paragraphs 6.47 and 6.48 of the NPF					

47. **Prequalification.** None anticipated. Though bid packages that would aggregate requirements are necessary, bidding, evaluation, and contract award will largely be on an individual lot basis, whose individual contract sum and complexity may not require prequalification.

48. **Proposed procedures for community-driven development components (according to paragraph 6.52 and 6.53 of the Procurement Regulations for IPF Borrowers).** The use of community-driven development may be used for implementation of some aspects of the RAPs.

49. **POM/procurement manual.** A procurement manual will be prepared as part of the Project Operational Manual. It will be used by ZESCO to guide implementation of procurement activities under the project. The Procurement Plan will also form part of the Project Operational Manual.

50. **Other special procurement arrangements.** The use of NGOs is anticipated for implementation of environmental and social safeguards/RAPs implementation.

51. The terms of reference for all consultancy contracts, as well as all Single-Source Selections, irrespective of the contract value, will be subject to prior review.

52. A short list of consultants will be in accordance with the provisions of the NPF clause 7.17 not less than five and not more than eight. Exceptions are also as governed by this same clause.

53. **Any other special selection arrangements.** None

54. **Procurement of goods.** Procurement of goods will include equipment, motor vehicles, computers and accessories, and so on.

55. **Procurement of non-consulting services**. This may include hiring a company to deliver non-consulting services on the field, such as aerial mapping/surveys, and so on for the development of the NES and grid extension.

56. **Procurement of consulting services (firms and individuals).** Procurement of consulting services will be carried out in accordance with the World Bank Procurement Regulation for Investment Project Financing Borrowers. Activities to be financed include individual consultants to fulfil the role of the PIU, TA, and so on.

57. **Frequency of procurement supervision.** In addition to the prior review to be carried out by the World Bank, supervision missions will be undertaken at least once per year. Approximately 20 percent of procurement packages not subject to the World Bank's prior review will be examined ex post on an annual basis.

Procurement Post Reviews (PPRs) and Independent Post Reviews (IPRs) by the World Bank

58. Based on the assessed agency implementation risk for procurement, which is Moderate, the World Bank will carry out PPRs or IPRs on a sample of 10 percent of all completed contracts in the Procurement Plan that have not been subject of prior review by the World Bank. Based on a continuing assessment of risk, the sample size will be reduced as risk mitigation measures are successfully implemented. Based on assessed risk, 'High Risk' will represent a sample size of 20 percent; 'Substantial Risk' will represent a sample size of 15 percent, 'Moderate Risk' 10 percent, and 'Low Risk' 5 percent. The World Bank will inform REA, ZESCO, MoF, and Ministry of National Development Planning (MNDP) of the outcomes of the PPR/IPR exercises, which may also result in revisions to the prior review and Open National Bidding thresholds.

59. **Procurement Plan**. A Procurement Plan for the first 18 months has been prepared and will be updated by REA and ZESCO on an annual or as needed basis to reflect actual project implementation needs. Updating of the Procurement Plan will be done supported by updates of the annual work plan and budget. The process will be led by REA.

60. The Procurement Plan will be prepared according to the World Bank's 'Template for A Summarized (abbreviated) Procurement Plan' and will be updated, as required, at least once a year throughout the life of the project. REA and ZESCO will, for the sake of implementation, also prepare the detailed Procurement Plan which includes all the key implementation milestones.

Environmental and Social (including safeguards)

61. The project has an Environmental Assessment Category of 'B'. Overall, the potential impacts of

the project are expected to be localized, site-specific, and easily manageable. No large-scale, irreversible impacts are foreseen.

62. As the specific subprojects are not yet clearly defined and the exact sites of the proposed investments are not yet known, an ESMF and a RPF have been prepared and disclosed in-country and by the World Bank on May 11, 2017.

63. The potential adverse impacts are those associated with the proposed grid extensions and distribution systems in rural areas. These impacts are typically modest and relatively easy to manage through good engineering and construction practices.

64. The ESMF is designed to ensure that the environmental and social issues associated with this program are adequately analyzed and understood, and that all associated adverse impacts are identified through screening, and are effectively mitigated and monitored. Any resettlements associated with the grid extensions are expected to be minimal due to the rural nature of project target areas. Nevertheless, each investment supported by the project must comply with the applicable provisions of both the RPF and ESMF, for which appropriate procedures will be incorporated in the POM.

65. The project will likely have significant environment benefits (including GHG emission reductions) mainly through switching from fossil fuel generation sources (isolated grids running with diesel generators) and fuel-run lighting devices (such as kerosene lamps, oil lamps, gas lamps, and candles) to a renewable source (solar energy). Although the project interventions bear some environmental and health safety risks, no significant and/or irreversible adverse environmental and social issues are expected. The potential impacts on local environment of the project would be very small and limited to the disposal of lead acid or nickel-cadmium batteries used. These are expected to be local, site-specific, and easily manageable.

66. No physical displacement is anticipated due to the nature of the project. However, small amounts of land may be required by Component A (for the stations/poles and/or LV transmission lines), or Component B (for mini-grid solar arrays), and may involve land acquisition and limited change in land use (permanent or temporary). The Involuntary Resettlement (OP/BP 4.12) safeguard policy is therefore triggered to address any adverse impacts of the potential land acquisition which may cause loss of assets.

67. With regard to positive impacts, the project will reduce differences in electricity services available to rural households, some of which have never had electricity services, to improve opportunities for rural socioeconomic development. Productive uses will be encouraged through electricity from mini-grids and individual solar systems.

68. Environmental and social safeguards experts will be part of the PIUs at ZESCO and REA and will take responsibility for overseeing compliance of all components with the guidelines, including gender differences, established under the ESMF and the RPF in accordance with national and World Bank policies and procedures. The DBZ is in the process of forming a new four-person environmental and social assessment unit and is expected to receive capacity building in safeguards under phase 1 of Component B off-grid activities. ZESCO has some experience implementing World Bank-financed projects, but the resource levels and capacity of ZESCO, REA, and the DBZ will need strengthening, which

can be done through hiring additional environmental and social specialists to provide the needed resources for implementation and supervision of safeguards work. The staff at ZESCO, REA, and the DBZ will also be trained in World Bank Group's safeguards policies, including reporting on safeguards-related activities, resettlement and compensation, and grievance redress management. In addition, as a potential FI for phase 2 off-grid subprojects, the DBZ will need additional capacity building under the TA activities planned for Component B phase 1, including training on safeguard principles and operationalization of the ESMF and the RPF in the operations manual prepared for the DBZ. Also, DBZ phase 2 participation can only be initiated after a proper safeguard assessment is carried out which ensures that the DBZ's institutional arrangement and capacity meet the World Bank's minimum requirements under OP/BP10.00. The World Bank supervision teams will include environmental and social safeguard specialists with experience in addressing gender considerations. Regular quarterly monitoring reports on the implementation of environmental, social safeguards, and gender provisions will be provided to the World Bank for approval. These reports will be verified during project supervision missions, which will include environmental, social safeguards, and gender specialists. At the national level, REA will be in charge of external M&E of safeguards.

Monitoring and Evaluation

69. REA and ZESCO have developed reasonable M&E capabilities from working on other World Bank projects, and will further strengthen their capacity for project performance and results monitoring as needed. M&E will be based on administrative data sources and other project-specific data collected by REA and ZESCO staff as needed. Their baseline indicators developed by REA and ZESCO are drawn from existing organizational data and project preparation studies. The results of the M&E activities will be fed back into the implementation process to inform decisions for improved implementation.

ANNEX 3: IMPLEMENTATION SUPPORT PLAN

COUNTRY: Zambia
Electricity Service Access Project

Strategy and Approach for Implementation Support

1. The strategy for implementation support was developed based on the nature of the project and its risk profile. Its aim is to make implementation support to the client more flexible, efficient, and focused on the risk mitigation measures defined in the project risk summary.

2. **Implementation capacity.** The PIA—REA–will form a PIU, headed by the REA technical director, reporting directly to REA chief executive officer (CEO). REA's PIU project implementation capacity is limited and therefore, to address its capacity gaps, the PIU will be supported by a competitively selected firm to serve as the PMC. REA's PIU will be responsible for overseeing the overall project implementation, including the on-grid, off-grid, and TA components.

3. For the on-grid electrification activities, REA and ZESCO have agreed to form a joint project coordination team with regularly scheduled meetings to ensure smooth and timely implementation progress and address any issues that may cause delays in project implementation or disbursements. ZESCO will vest the project implementation responsibility with the existing PIU that has implementation experience of the previous IAES Project and is currently implementing the GPOBA-supported project. Capacity-related project activities, such as ensuring training programs for PIU staff would be best addressed jointly by the PIU and management teams of each institution. The direct involvement of REA and ZESCO's managements (and those of the DoE, ERB, and the DBZ as appropriate) will facilitate the identification of the right staff and relevant training areas in line with REA and ZESCO's respective performance improvement needs and objectives of this project.

4. The first phase of Component B.2 will include implementation of an IDP for the DBZ to raise its capability and skill set in key areas. The IDP will include the following components: (a) strengthening credit risk assessment of solar energy companies and projects; (b) implementation of a risk-based loan pricing model; (c) strengthening foreign exchange risk management; and (d) environmental and social due diligence on off-grid solar energy projects. Also, as a potential FI for phase 2 off-grid subprojects, DBZ will need additional capacity building under the TA activities planned for Component B phase 1, including training on safeguard principles and operationalization of the ESMF and RPF in the DBZ operations manual, to ensure that the DBZ's institutional arrangement and capacity meet the World Bank's minimum requirements under OP/BP 10.00 to enable it to participate in phase 2.

5. **FM.** The objective of the FM supervision is to ensure the continued adequacy of the Borrower's FM arrangements, compliance with relevant legal covenants of the financing agreement, and that the funds are used only for the purposes for which the funds were intended, with due regard to economy and efficiency. FM supervision will be carried out using the risk based model. The FM risk for the project has been assessed as Substantial. In line with the substantial risk, FM supervision intensity will be four field visits per year in the first year of operations, thereafter, to be reduced to two visits per year. In the

interim, supervision will be by desk reviews of the financial component of the unaudited quarterly IFRs.

6. **Procurement.** Implementation support for procurement will include (a) providing training to REA and ZESCO PIU staff; (b) reviewing procurement documents and providing timely feedback to the PIU procurement specialists; (c) providing detailed guidance on the World Bank's procurement guidelines to the procurement specialists who have focused on ensuring procurement readiness of first year contracts; and (d) monitoring procurement progress against the detailed Procurement Plans of REA and ZESCO, respectively, which will be updated every six months (or as required) to reflect project implementation needs and improvements in institutional capacity.

7. **Safeguards.** In terms of capacity on safeguards, both ZESCO and REA have environmental and social units and have some experience in implementing the World Bank's safeguards policies. The DBZ is in the process of forming a new four-person environmental and social assessment unit and has a policy manual on environmental, health, and social safeguards for its project lending. However, experience with other World Bank-funded projects indicate that ZESCO, REA, and the DBZ will need additional safeguards resources to provide adequate stakeholder engagement, and monitoring of and reporting on social issues for this project, given the number of projects and their likely geographic dispersal. In addition, the agencies' capacity should be further enhanced through training on the specific safeguards issues that might emerge in this solar project, including labor influx, as well as how these issues may have gender differences and implications. Additional support should be provided to ensure that the three organizations implement, monitor, and provide regular reporting on stakeholder engagement activities and grievance redress mechanisms. As a potential FI for phase 2 off-grid subprojects, the DBZ will need additional capacity building under the TA activities planned for Component B phase 1, including training on safeguard principles and operationalization of the ESMF and the RPF in the DBZ operations manual. Also, the DBZ phase 2 participation can only be initiated after a proper safeguard assessment is carried out which ensures that the DBZ's institutional arrangement and capacity meet the World Bank's minimum requirements under OP/BP 10.00. This institutional capacity enhancement will be provided under the Subcomponent B.2 and Component C. The World Bank's supervision teams will include environmental and social safeguard experts. Regular monitoring reports on the implementation of environmental and social safeguards provisions will be provided to the World Bank for approval. These reports will be verified during project supervision missions, which will include environmental and social safeguard experts.

Table 3.1. Implementation Support Plan

Time	Focus	Skills Needed	Resource Estimate	Partner Role
First 12 months	(a) Institutional capacity enhancement at the project level to strengthen project implementation systems (b) Technical advice to support project implementation (c) Implementation of environmental and social safeguards and	Technical and procurement expertise Safeguards; FM/Procurement	US$150,000[a]	Close coordination and supervision of implementation activities between REA and ZESCO is required to ensure smooth contracting and contract management

Time	Focus	Skills Needed	Resource Estimate	Partner Role
	FM/Procurement system for PIUs			
12–60 months	Technical supervision Safeguards supervision M&E supervision Procurement and FM supervision	Power Engineer Private sector development specialist Task team leader Safeguards specialist M&E specialist Procurement/FM specialists	US$600,000	Close coordination and supervision of implementation activities between REA and ZESCO is required to ensure smooth contracting and contract management

Note: a. Supervision missions will be combined and aligned with supervision of other energy projects, hence providing cost-sharing benefits.

Table 3.2. Skills Mix Required

Skills Needed	Number of Staff Weeks	Number of Trips	Comments
• Project Management (Task leader) • Power Engineer • Off-grid/solar • Social • Private Sector Development Specialist • Economic/Financial Analyst • Monitoring • Procurement • Financial Management • Energy Specialist • Administrative Support	7–10 weeks per year across the team	• 2 per year • 2 per year • 1 per year • In Lusaka • 2 per year • 2 per year • 2 per year • In Lusaka • In Lusaka • In Lusaka • In Lusaka	To be adjusted annually depending on available budget

ANNEX 4: DETAILED FINANCIAL AND ECONOMIC ANALYSIS

Economic Analysis

1. The project aims to increase access to electricity services in targeted areas through on-grid and off-grid technologies. Economic analysis has been undertaken for each component, which is summarized in Table 4.1.

Table 4.1 Summary of Economic Analysis by Component

	EIRR (%)	NPV (at 6.6% discount rate)
Project	18.8	US$19,550,599
- Component A (On-grid)	21.0	US$16,415,537
- Sub Component B1 (Smart Off-Grid Subsidy Program /Mini-grid)	8.3	US$707,894
- Sub Component B2 (Loan Facility / SHS)	103.5	US$2,427,169

Note: the analysis includes global environmental benefits from the avoided greenhouse gas emission.

On-grid Component

2. The on-grid component will finance grid extension investments, as well as a connection subsidy scheme to reduce the barrier of connection fees. The main cost item is capital investment for grid extension and intensification, which will largely consist of construction of HV distribution lines (33 kV and 11 kV), installation of distribution transformers, and construction of MV/LV distribution lines (400/230 V). The cost items also include capital investment for making user connections, operation and maintenance (O&M) cost, and cost of electricity services. Taxes and duties are excluded from the analysis.

3. The benefit will arise as households and institutional users newly acquire access to electricity services. The WTP has been derived from a study[63] that carried out a socioeconomic survey to randomly selected 233 households and 38 small businesses in the Central and Eastern Province in Zambia. The estimated WTP of a residential user is at ZMW 1.37per kWh (which is approximately US$0.137per kWh at the current exchange rate) based on contingent valuation method, (that is, structured interviews to potential electricity users) and is an average of different levels of services (for example, for basic lighting, radio, television, and cooking). Annual power consumption by a household and a commercial user was also estimated in the same socioeconomic survey.

4. The discount rate has been determined based on the World Bank's internal guidance,[64] which recommends to use twice of the country's per capita GDP growth rate. Given the high volatility of Zambia's GDP due to its strong linkage with commodity price, average per capita GDP for the past 10 years has been used, which is found to be 3.3 percent. Therefore, the discount rate of 6.6 percent is

[63] ESB International (Electricity Supply Board). 2015. Feasibility Study for the Project "Sustainable Electricity Supply Southern Division", commissioned by the Government of Germany.
[64] OPSPQ (Operations Policy and Quality). 2016. *Discounting Costs and Benefits in Economic Analysis of World Bank Projects*.

used. Other assumptions employed in the analysis are summarized in table 4.2.

Table 4.2. Summary of Cost and Benefit Items included in Economic Analysis of On-grid Component

Item	Assumption
Costs	
Grid intensification investment	US$14.35 million (including ZESCO and REA in-kind contributions)
Connection cost	US$191 per household connection, US$241 for commercial users
O&M (OPEX)	2% of capital expenditure (CAPEX)
Electricity services	US$0.05 /kWh[a]
Tax and duties	25%
Benefits	
Number of newly connected users	23,000 (22,000 households and 1,000 MSEs)
Monthly consumption by a user	84 kWh/month for residential, 202 kWh for commercial users, growing at 2% a year
WTP	US$0.00137/kWh for a residential user and US$0.00127/kWh for a commercial user
Economic life	20 years
Discount rate	6.6%
GHG avoidance	0.625 tCO_2/connection (based on the World Bank's draft GHG guidance)
Social cost of carbon	Ascending from US$30/$tCO_2$ to US$65/$tCO_2$ in 2040, according to the World Bank's internal guidance

Source: Trimble, Chris; Kojima, Masami; Perez Arroyo, Ines; Mohammadzadeh, Farah. 2016. *Financial Viability of Electricity Sectors in Sub-Saharan Africa: Quasi-Fiscal Deficits and Hidden Costs*. Policy Research Working Paper No. 7788. World Bank. US$0.05 per kWh is the Operational Expense (OPEX) of electricity services, including cost of power purchase, ZESCO's own generation, fuel, staff, labor, maintenance expenses, and taxes.

5. Based on these assumptions, the EIRR is estimated to be 18.8 percent and NPV at US$19,550,599.

Off-grid Component

6. **SHSs.** The retail price of a typical SHS in Zambia is approximately US$200, to be paid by cash or by the PayGo scheme. Although the volume of off-grid product sales is not directly under the project's control, it is assumed that the credit line of US$2.5 million will at least result in the sales of 12,500 units of various off-grid products, such as SHSs. An SHS is capable of providing basic electricity services, such as lighting, radio, and phone charging. In a recent survey[65] in southern Zambia, the average monthly lighting expenditure by a household was found to be ZMW 69.41 or US$6.9. Given that the SHS will replace most of the lighting expenditure, this lighting expenditure can be considered as a conservative, lower-end estimate of the customer WTP or the economic benefit resulting from a unit of SHS per month. This translates into economic benefit of US$83.3 per year for a household. Other assumptions are summarized in table 4.3.

7. The EIRR of the SHS sales is estimated to be 103.5 percent and NPV at US$2.6 million. The figures demonstrate high economic viability, thanks to relatively low cost of SHSs and large benefits

[65] ESB International. 2015.

from GHG abatement. Although the retail price of SHS may be higher in rural areas due to higher distribution and marketing cost, it is unlikely to change the strong economic viability of SHS for households.

Table 4.3. Summary of Cost and Benefit Items included in Economic Analysis of SHS

Item	Assumption
Costs	
Unit price of an off-grid product	US$200
Sales of off-grid products	12,500 units over 5 years
O&M (OPEX)	1% of the value of sales
Benefits	
WTP	US$6.9 per month
Economic life	5 years
Discount rate	6.6%
GHG avoidance	0.625 tCO2/connection (based on the World Bank's draft GHG guidance)
Social cost of carbon	Ascending from US$30/tCO2 to US$65/tCO2 in 2040, according to the World Bank's internal guidance

8. **Mini-grids.** The project will also support development of mini-grid systems, whose geographical scope and specifications will be finalized at an early stage of the project implementation. For analytical purposes, it is assumed that five 60 kW mini-grid systems will be built and operated, each system connecting 440 customers. Assumptions on the system size, number of households, and cost figures have been derived from mini-grids already operational in Zambia, as well as equivalent mini-grids in Kenya and Niger. Key assumptions used are summarized in table 4.4.

Table 4.4. Assumptions Used for Economic Analysis of Off-grid Component (mini-grid)

Item	Assumption (per system)
Costs	
Capital investment (CAPEX)	US$800,000 per system, based on actual mini-grid operating in Zambia
OPEX	Regular operations and maintenance: 1% of CAPEX Battery replacement: US$80,000 every 8 years Inverter and charge controller replacement: US$30,000 every 10 years
Number of mini-grid systems	5
Benefits	
Number of connections	400 households and 40 social/commercial users per system
WTP	US$12.6/month per household US$45.7/month per social/commercial user
Economic life	30 years
Discount rate	6.6%
GHG avoidance	0.625 tCO2/connection (based on the World Bank's draft GHG guidance)
Social cost of carbon	Ascending from US$30/$tCO_2$ to US$65/$tCO_2$ in 2040, according to the World Bank's internal guidance

9. The WTP has been derived from the abovementioned ESB International's study in Southern Zambia. The ESB study estimated a household's WTP for basic lighting, radio, communication, and television services at US$12.6 per month using the contingent valuation method (that is, structured

interviews to potential users). Similarly, the average WTP of a small business user for productive use was estimated at US$45.7 per month. Based on these assumptions, five 60 kW solar mini-grid systems will result in an EIRR of 8.3 percent and an NPV of US$707,894.

10. These results indicate that the mini-grids can be economically viable, but the economic margin will be relatively thin. However, it should be noted that there are a range of unquantified benefits, including the local health benefit by reduced use for kerosene and candles and the demonstrative value of piloting a new approach to rural electricity access in Zambia. Considering these unquantified benefits, the project is considered to be economically justified.

11. As a part of the economic analysis, GHG accounting has been undertaken to quantify the global environmental benefit. Based on a draft guideline on GHG accounting for electricity access project, avoidance of 0.6275 tCo_2 per year per new electricity connection has been assumed. This reduction is primarily driven by the reduced use of lighting fuels such as kerosene and candles. In total, the project will result in net GHG avoidance of 380,604 tCO_2 through its economic life.

Financial Analysis

On-grid Component

12. Financial analysis for the on-grid component has been undertaken by assessing the cost and revenue flows on ZESCO. The cost items will include capital investment for grid extension and intensification, O&M expenses for the newly built portion of the grid, and the cost of electricity services. The connection cost for ZESCO is assumed to be 0, as it will be fully paid by the customer contribution and the project's connection subsidy. ZESCO's revenue will be the tariff paid by newly connected customers.

Table 4.5, Assumptions Used for Financial Analysis of On-grid Component

Item	Assumption
Cost	
Grid intensification investment	US$10.0 million (excluding in-kind contributions)
Connection cost	US$200 per connection (weighted average of household and commercial connection)
O&M (OPEX)	2% of CAPEX
Electricity services	US$0.05/kWh[a]
Revenue	
Number of new connections	23,000
Annual power consumption by a user	1,065 kWh (84 kWh/month for residential, 202 kWh for commercial users. 96%–4% mix assumed) growing at 2% a year
Tariff	Residential user: Energy Charge at US$0.015/kWh (lifeline tariff), Fixed monthly charge at US$3.19 Commercial User: US$0.054/kWh, Fixed monthly charge at US$9.64
Economic life	20 years
Discount Rate	6.6%

Source: Trimble, Chris; Kojima, Masami; Perez Arroyo, Ines; Mohammadzadeh, Farah. 2016. *Financial Viability of Electricity Sectors in Sub-Saharan Africa: Quasi-Fiscal Deficits and Hidden Costs*. Policy Research Working Paper No. 7788. World Bank

13. A typical new customer will consume 1,093 kWh per year and pay energy charge, as well as the fixed monthly charge. In March 2017, ZESCO proposed a new tariff which would increase all energy and fixed charges by 50 percent from May 2017 and another 25 percent from September 2017. Lifeline tariff is proposed to expand from 100 kWh per month to 300 kWh per month ceiling and is exempt from the increase of energy charge. Although the ERB is currently reviewing the proposal, the analysis assumes that this new tariff structure goes into effect as proposed. The change of lifeline tariff is summarized in table 4.6.

Table 4.6. Extract from ZESCO's Tariff Structure

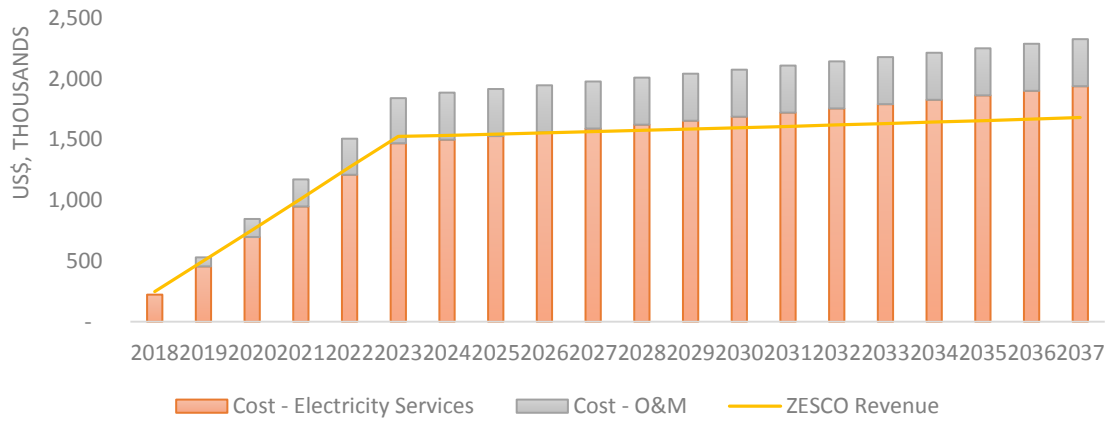
	Current (As of April 2017)	From September 2017
Scope of lifeline tariff	Up to 100 kWh per month	Up to 300 kWh per month
Lifeline energy charge (ZMW/kWh)	0.15	0.15
Lifeline fixed monthly charge (ZMW/kWh)	18.23	31.90
Commercial energy charge (ZMW/kWh)	0.31	0.54
Commercial energy charge fixed monthly charge (ZMW/kWh)	55.09	96.41

14. Assuming that 95 percent of new customers are residential users under lifeline tariff and 5 percent are commercial users under commercial tariff, average revenue from a new customer is US$62.9 per customer per year.

15. On the other hand, the capital investment for grid intensification will be granted from REA, and the cost of user connections will be shared between the user and connection subsidy from REA. Therefore, ZESCO will bear no capital investment cost. However, ZESCO will bear O&M cost of the assets, as well as cost of electricity service at US$0.05 per kWh. These translate into an average cost of US$78.5 to ZESCO per customer per year.

16. With these assumptions, the project will incur financial loss to ZESCO. This is largely because ZESCO's revenue from a new customer (US$62.9 per year) is insufficient to cover the recurring cost (US$78.5) to serve the same customer. Over 20 years, it is estimated that ZESCO will incur average loss of US$385,935 per year. Figure 4.1 illustrates the comparison of cost and revenue incurred by the project to ZESCO.

Figure 4.1. The On-grid Component's Cost and Revenue Flows



Source: World Bank analysis

17. Connecting low-consumption rural customers is often financially unviable, due to the low level of revenue generation by the customers and high cost of extending the grid. Therefore, it is important that ZESCO strengthens its overall financial sustainability to compensate for the loss incurred by connecting low-consumption users.

18. As a reference, ZESCO's average annual loss from the on-grid component would be US$809,065 if the proposed new tariff does not take effect. From the financial standpoint, the proposed tariff increase significantly improves the financial viability of connecting low-consumption users to the grid. However, it needs to be carefully observed how the new tariff will affect new users' appetite to apply for grid connection.

Off-grid Component

19. **SHSs.** A financial analysis has been carried out to assess the financial return for a solar company that uses the Loan Facility, as well as its impact on the volume of sales. As the detailed financial position of solar companies is not known, a hypothetical solar company was assumed for analytical purpose. It is assumed that the company will borrow US$500,000 from the Loan Facility with repayment obligation in either U.S. dollars or Zambian kwacha. The company will use the capital to import a bulk quantity of SHSs and sell them to users under the PayGo scheme. The cash balance at the end of each year will be recycled for a new batch of product imports for the first three years and to repay the loan in the last two years. Table 4.7 summarizes the assumptions used.

Table 4.7 Assumptions Used for Financial Analysis of the Loan Facility

Item	Assumption
Cost of an SHS	US$150 (bulk import price)
PayGo terms	US$10/month over 24 months (US$120 per year)
Working capital loan	US$500,000, interest rate at 7%, payback period of 5 years
Discount rate	10%

20. The analysis revealed that the company will be able to sell 7,307 units of SHSs over five years using the capital from the Loan Facility. The NPV of net cash flow is estimated at US$1.5 million. As the revolving credit line can be used for multiple cycles of product imports, it allows the company to replenish its inventory under a short cycle even when revenue collection takes two years under the PayGo scheme. It is noted, however, that the analysis assumes a constant exchange rate and no major demand constraint, due to the complexity of modeling these risks. In reality, the solar company is exposed to foreign exchange risk as its revenue is in Zambian kwacha and its repayment obligation is in U.S. dollars.

21. The Loan Facility could be designed to be repaid in Zambian kwacha. Under such an arrangement, the DBZ will take the foreign exchange risk and require higher interest rate to compensate for the risk premium (for example, 20 percent). With such Zambian kwacha repayment loans, the sales are expected to be 6,272 units, with an NPV of US$927,000. These reflect less cash balance due to the higher interest rate. Despite lower returns, solar companies may still prefer such loans to avoid exposure foreign exchange risk.

22. **Mini-grid.** Based on the experience in Zambia, mini-grid is unlikely to be financially viable on a purely commercial basis. A part of the initial investment cost needs to be brought down by public finance to allow private operators to recover the remaining investment cost and operating cost, as well as sufficient financial return. For analytical purposes, 60 kW solar mini-grid connecting 440 users is assumed—as with the economic analysis. It is also assumed that the users will be paying a tariff at the WTP level identified in a recent off-grid market assessment; US$7.0 per month per household and US$20 per month per social/commercial user. The users who cannot afford the tariff or are too remote to connect will be provided with SHSs. This hybrid approach improves the financial viability of the mini-grid and provides greater incentive for the private sector to participate. Depending on the level of subsidy provided to CAPEX, the financial rate of return for private developer will differ. The variation is summarized in table 4.8.

Table 4.8. Variation of Financial Return for a Standard Mini-grid System with the Level of Subsidy

Level of Subsidy to CAPEX (%)	FIRR (%)	NPV (US$, millions)
70	12	42,127
75	15	81,898
80	20	121,668

23. Based on these assumptions, the CAPEX subsidy at the level of 75–80 percent is likely to allow private developers to earn approximately 15 percent of return, which is typically a threshold for private developers to participate. These figures will change as the actual system configurations and costs are identified.

Financial Analysis of ZESCO

24. Given that the on-grid component will incur a level of financial loss to ZESCO, a financial analysis of ZESCO has been undertaken to assess the impact of the project on ZESCO's financial performance. Its financial viability is key to the feasibility of the project and expansion of grid-base electricity access in general.

25. ZESCO's financial performance has deteriorated due to the depreciating local currency as well as a surge in emergency power imports in 2015 and 2016, due to lack of hydro generation from a prolonged drought. As shown in table 4.9, while the gross profit margin remained relatively stable at the range of 63–72 percent for 2012–2015, the pretax profit margin decreased sharply to almost 0 percent in 2015 because of net operating and non-operating losses from, largely, higher bad debt provision and higher U.S. dollar-denominated finance costs.

Table 4.9. ZESCO's Financial Performance, 2012–2015 (ZMW, millions)

Income Statement Items & Profitability Ratios	2012	2013	2013[a] (9 months)	2014	2015
Revenue	2,614	3,025	2,362	4,318	6,426
Cost of sales	(720)	(909)	(775)	(1,400)	(2,385)
Gross profit	1,894	2,116	1,587	2,918	4,040
Gross profit margin (%)	72	70	67	68	63
Other operating gains and losses (Amortization of capital grants and contribution + other income − provision for bad debt − marketing and administration expenses)	1,056	1,191	(775)	(1,548)	(1,113)
Operating income	2,950	3,307	812	1,369	2,927
Operating profit margin (%)	113	109	34	32	46
Non-Operating Losses (Bad debt + finance cost + other expenses)	(627)	(659)	(552)	(796)	(2,907)
Profit before tax	429	532	260	573	20
Pre-tax profit margin (%)	16	18	11	13	0.3
Profit after tax	307	312	451[b]	323	868[c]
Net profit margin (%)	12	10	19	7	14
Financial Ratios					
Current Ratio (Current assets/current liabilities)	1.50	2.06	2.02	1.51	1.08
Debt to equity	0.72	0.66	0.76	1.40	1.76
Debt to asset	0.26	0.27	0.30	0.37	0.47
Interest coverage (EBIT[d]/interest expenses)	41.22	34.91	17.05	12.54	1.39

Source: ZESCO's Financial Statements, 2012–2015.
Note: a. The financial year for ZESCO has changed in 2013 from April–March to January–December. In 2013, ZESCO issued two sets of financial statements covering April 2012 to March 2013 and April 2013 to December 2013 (nine months).
b. The difference between profit before tax and profit after tax in 2013 (nine months) due to deferred income tax.
c. The difference between profit before tax and profit after tax in 2015 was largely due to reconciliation of permanent difference in tax recording.
d. Earnings before interest and tax.

26. The financial ratios in table 4.9 show the overall deterioration in ZESCO's financial performance. From 2012 to 2015, the current ratio dropped sharply from 1.50 to 1.08, while the debt-to-equity and debt-to-asset ratios increased from 72 percent to 176 percent and 26 percent to 47 percent, respectively. The recent financial deterioration is largely due to the kwacha depreciation and consequent revaluation of ZESCO's liabilities, most of which are in U.S. dollars. The most striking

deterioration is shown in the interest coverage ratio, which dropped from 41.22 (2012) to 1.39 (2015), flagging the liquidity risk of ZESCO.

27. Going forward, ZESCO's financial performance for the five years from 2017 is projected using the latest financial model. Under the base case scenario, the following assumptions are made:

(a) **Retail tariff.** As proposed by ZESCO, the non-mining retail tariffs in 2017 will increase by 75 percent, with exception of the lifeline energy charge. The newly proposed tariff schedule is expected to increase ZESCO's revenue significantly; most non-mining consumers (making up 23 percent of ZESCO's total revenue) would pay 75 percent uniformly more for the same consumption, while residential consumers (making up 17 percent of ZESCO's total revenue) would experience a wide degree of bill changes.[66] The team's calculation shows that ZESCO's aggregate non-mining retail revenue would increase by 18 percent in 2017 (due to incremental implementation in midyear) and by 43 percent from 2018, compared to 2016, provided that demand growth would not be adversely affected by the tariff increase.

(b) **Bulk supply tariff.** ZESCO's 2017 tariff proposal indicates the mining tariffs to increase to a uniform level of US$0.09.3 per kWh, effective January 1, 2017. Thereafter, the mining tariffs are likely to be adjusted once a Cost of Service Study is finalized. In the latest financial model, the full implementation of the 2017 mining tariff increase would increase ZESCO's mining revenue by 20 percent in 2017, compared to 2016. The implementation of the proposed mining tariff increase appears less certain than non-mining tariff increases, as the mining contracts have been subject to bilateral negotiations for the longer term. For this analysis, both mining and non-mining tariffs are assumed to increase as proposed in 2017 and stay at the same level for the next five years.

(c) Hydrology is assumed to be normal (historical average) for the five years from 2017 to 2021.

28. Key projected financial ratios are summarized in table 4.10.

Table 4.10. ZESCO's Projected Financial Performance (base scenario)

	2017	2018	2019	2020	2021
Revenue (ZMW, millions)	8,711	9,559	9,864	10,299	10,746
Operating Income (ZMW, millions)	3,636	3,820	3,248	2,848	2,897
Operating Profit Margin (%)	42	40	33	28	27
Net Profit (ZMW, millions)	1,961	2,024	1,713	1,526	1,736
Net Profit Margin (%)	23	21	17	15	16
Financial Indicators					
Receivable days (Days)	62	59	59	59	60
Payable days (Days)	76	66	44	42	43

[66] It is estimated that 2017 tariff adjustment would increase bills for residential users consuming 30 kWh monthly by 60 percent, 50 kWh by 53 percent, 100 kWh by 41 percent, and 150 kWh by 12 percent, compared to the current tariff schedule. Those who consume 200–350 kWh per month would enjoy some degree of bill reduction. The residential bill for 300 kWh monthly consumption would reduce farthest, by about 19 percent.

Current ratio	1.47	1.73	1.97	1.66	1.18
Debt service coverage ratio	1.63	1.56	1.48	1.55	1.76
Cash balance before escrow (US$, millions)	359	462	454	294	128
Cash balance after escrow (US$, millions)	182	295	287	127	(39)

29. In the projection, revenue is expected to increase with increased tariffs and continued growth in sales, while the operating profit margin is expected to decrease with faster growth in the cost of supply. The cash conversion cycle is likely to be moderate. It is expected that approximately US$177 million (as of December 2015 from ZESCO management report; amount fluctuates depending on the size of ZESCO's foreign debt obligation of each year) shall be kept in an escrow account to service foreign debt obligation. The balance is expected to reduce as ZESCO makes debt obligations, yet it may increase as ZESCO is likely to finance new investments. Keeping the escrow amount constant for the analysis, ZESCO's cash flow after escrow would remain positive until 2021 when it may turn negative.

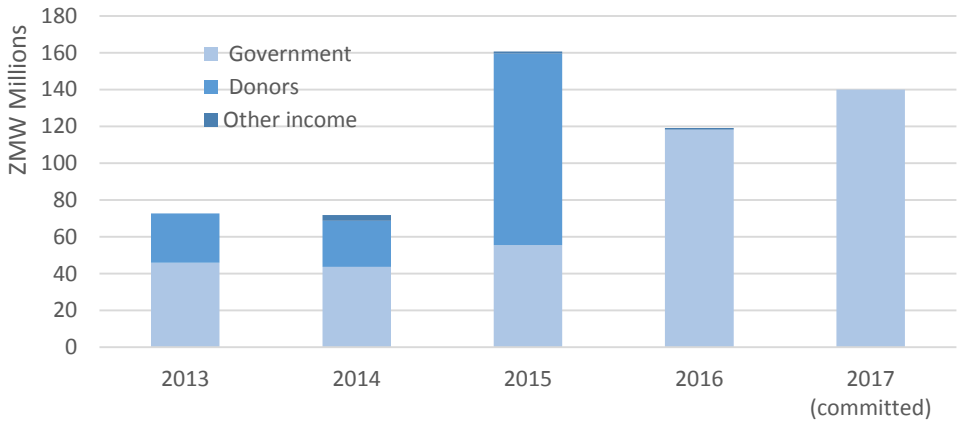
30. Overall, ZESCO's financial position would be viable under the assumption of sufficient hydro generation; full dispatch of new capacities operating on time (for example, Maamba coal power plant); and the increased tariffs in 2017 with no adverse effect on the electricity demand growth. The loss from the on-grid component is projected to be below 0.3 percent of the total net profit each year, under the assumption that ZESCO's proposed tariff increase will take place in 2017. Therefore, the impact of the on-grid component on ZESCO's profit and cash flow should be minimal. However, ZESCO would need to continue to improve efficiency in operation and increase profitability to resolve the liquidity issue.

Financial Analysis of REA and REF

31. REA and the REF have been established by Zambia's Rural Electrification Act in 2003. The REF is a public fund to pool resources to invest on rural electrification, administered and managed by REA. Although they do not generate their own revenue, their financial sustainability has important implications for the GRZ's efforts to improve electricity access.

32. Currently, the REF's source of revenue is the GRZ's budgetary allocation. The 2017 budgetary allocation for the REF is approximately US$14 million. As the REMP suggests the need for US$50 million to achieve REMP's electrification target, there is a significant gap between the investment needs and the available resources. The REF has historically received funding from CPs, including the Government of Sweden, EU, and the World Bank through the IAES Project, but there has been no donor funding in 2016. Although REA is in dialogue with several CPs for funding, the actual financial commitment is yet to be seen. The GRZ has doubled its funding to the REF in 2016, partially compensating for the lack of external funding. The composition of the REF's revenue is illustrated in figure 4.2.

Figure 4.2. Historical Scale of REF's Funding Endowment



Source: World Bank analysis based on communication with REA and REA Financial Statements 2014-2016.

33. The Rural Electrification Act states that the REF "shall consist of (a) such moneys as may be appropriated by Parliament for the purposes of the Fund; (b) all electricity levy collected; and (c) such monies as may be paid to the Fund by way of loans, grants or donations." The electricity levy is collected by ZESCO as a 3 percent government exercise duty and then paid to the Zambia Revenue Authority. As ZESCO's revenue in 2015 was approximately US$640 million, the scale of electricity levy is estimated at approximately ZMW 192 million (US$19.2 million). Despite the provision in the Rural Electrification Act, it appears that not all electricity levy collected is channeled into the REF.

34. The REF's current full reliance on the GRZ's budget allocation poses a challenge on predictability of resource availability and investment planning. Alternatively, the GRZ could earmark all collected electricity levy into the REF, as stipulated by the Rural Electrification Act. This will improve the resource predictability and transparency of the REF and increase the scale of the funding available. The GRZ could adjust the annual budget allocation to the REF depending on scale of electricity levy collected, as well as CP's financing commitment to the REF. It is also important that REA strengthens its operational efficiency and FM to effectively use the funding made available to the REF.

ANNEX 5: FINANCIAL INTERMEDIARY ASSESSMENT ON DEVELOPMENT BANK OF ZAMBIA

Summary

1. This FI Assessment has been prepared as part of preparation of the Zambia: Electricity Service Access Project (P162760) (The 'Project'). The objective of the review is to assess the financial performance, structure, and corporate governance of the FI—DBZ—with the aim of ensuring efficient implementation of the project and maximizing the possibility of sustainable results.

2. The analysis has been conducted based on publicly available documents, discussions with the DBZ senior management, and policy documents and data submitted by the DBZ to the March 2017 Environmental and Social Action Plan (ESAP) mission, including the DBZ's audited 2015 year-end accounts and the DBZ's unaudited 2016 management accounts.

3. The analysis finds that the DBZ could potentially act as a suitable FI for the project, subject to receiving TA under an IDP and reaching acceptable performance levels in key areas where significant deficiencies currently exist. These key areas are (a) credit risk assessment of solar energy companies; (b) design and implementation of a risk-based loan pricing system; (c) foreign exchange risk management; and (d) environmental and social due diligence on solar power projects. The proposed TA program or IDP will build on existing capacity enhancement projects that are already under implementation. The TA program will be complementary to TA already being offered to the DBZ by the AfDB, which signed a US$50 million credit line with them in the beginning of 2017, for SMEs primarily in the agriculture sector. The project includes the option for the DBZ to lend directly to solar energy projects (retail option) and the alternative for the DBZ to act as an apex lender with commercial bank intermediaries (wholesale option). The decision on whether the DBZ will act in a wholesale or retail capacity will be made during or following implementation of the IDP.

4. This annex provides a summary of the review that supports this conclusion. This assessment will be updated once the DBZ has completed the proposed TA program and thereafter annually to review the DBZ's performance as a FI.

Background on the Financial Sector

5. The domestic financial sector in Zambia continues to experience high interest rates and a severe shortage of liquidity. In 2015, an election year, the overall inflation rate jumped from a historical stable average of about 6 percent to 7 percent to a peak of about 22 percent. Food prices rose even more steeply. The exchange rate became more volatile and fell to around ZMW 15 per U.S. dollar in 2015. The Central Bank responded by tightening monetary policy considerably to stabilize the domestic currency. The exchange rate has consequently stabilized and strengthened to about ZMW 9 to ZMW 10 per U.S. dollar currently. Inflation has fallen back to historical levels of around 7 percent at the beginning of 2017. While the Central Bank remains cautious, interest rates have begun to fall in 2017. At the start of 2017, government bond yields were in the low 20s, and commercial bank lending rates were at around 35 percent. However, the Central Bank reduced the reserve requirement for commercial bank lending from 18 percent to 15.5 percent in February 2017. Commercial bank rates are expected to fall significantly soon. The banks price off the 91-day T-bill rate which fell from 22 percent to 14.25 percent in February 2017. Thus, according to Stanbic Bank in Lusaka, commercial bank rates are expected to fall

by similar amounts from around 35 percent previously to under 30 percent, as lower T-bill rates filter through to lending rates. However, commercial banks are still not lending significant amounts to private sector SMEs. They mainly buy government bonds with some lending to state-owned enterprises and government employees.

6. Loan tenors are limited and pose an issue for many borrowers. Currently, domestic currency loans have a maximum tenor of five years. U.S. dollar loans may be available with tenors up to about six years. The Central Bank is only providing short-term liquidity to the banks. Commercial bank collateral requirements also pose a barrier for many borrowers. Cash and marketable property have generally been required as collateral in the past. However, the recent introduction of a moveable asset collateral register will help relieve this constraint.

Justification for Selection of the DBZ

7. The DBZ has been selected as the FI for the following main reasons (a) the DBZ has a mandate to facilitate growth of new economic areas such as off-grid solar power; (b) the DBZ is lending to SMEs and has extended loans to ZESCO and REA in the energy sector; (c) government borrowing is currently crowding out commercial bank lending to the private sector; (d) lessons learned from other projects including Ethiopia suggest that development banks are more effective in the early stages of market development, and commercial banks are the last entrants to such markets; and (e) the small size of the Loan Facility does not interest commercial banks sufficiently for them to move into a new sector and play the role of principal FI.

DBZ Background

8. The GRZ established the DBZ in 1972 under the DBZ Act, in partnership with public sector financial institutions, the local private sector, and foreign institutions. The DBZ is classified as a Financial Business under the Banking and Financial Services Act (1994) as amended. Under the DBZ Act, the Government was to hold no more than 40 percent of its shares. However, over the years, the DBZ has been restructured several times. Recent capital injections took place in 2011, 2014, and 2015. As of the 2015 year-end, the GRZ is the majority shareholder with a 63.53 percent stake; the Export-Import Bank of India holds a 19.73 percent stake and the Development Bank of Southern Africa holds the remaining 9.44 percent.

9. The DBZ's mandate is to provide development finance and TA on a financially sustainable basis to promote development in Zambia, largely in line with the priorities of the Sixth National Development Plan. Its mission is to provide competitively priced, tailor-made financial, technical, and advisory solutions to viable local enterprises as a catalyst in economic development, while its vision is to be Zambia's preferred development finance partner. It has the following three strategic goals:

- To support investment capital formation in both the public and private sectors to galvanize growth, productivity, wealth creation, employment, and broad-based citizens' economic empowerment.
- To support infrastructure financing to catalyze economic activity and service delivery at both national and subnational levels.

- To provide policy advocacy and advice to the GRZ and other stakeholders in matters incidental to these two goals.

10. The DBZ's mandate is broad, and expanding. Its 2016–2018 strategic plan sets out a wide range of financial and advisory functions for providing short-, medium-, and long-term funding.

11. The DBZ does not function as a traditional development bank and has repositioned itself in recent years as an SME-lending institution. It lacks sufficient capital to undertake large-scale project finance and has only a limited wholesale function. It has moved into the retail space and provides loans, equity investments, and advisory services to SMEs. This addresses a market failure because the commercial banks are not currently actively financing SMEs. It provides co-financing and syndicated financing with commercial banks as well as some apex lending through smaller commercial banks and microfinance institutions. It has managed funds on behalf of the United Nations Industrial Development Organization (UNIDO). However, this arrangement ended in 2016. The DBZ borrows short term in kwacha from the National Pension Scheme. The DBZ currently has long-term credit lines in kwacha from the MoF's Rural Development Program and the AfDB and in U.S. dollars from the AfDB, China Development Bank, and Industrial Development Bank.

Review of Operations

12. By 2015, the DBZ had funded 76 projects (up from 65 by 2014), with an average loan size of ZMW 5.6 million, relatively large for SME lending in Zambia. The DBZ's loan portfolio of ZMW 555 million (2016, unaudited) is predominantly retail, with direct lending accounting for 95 percent of total loans. In addition, its equity investments of ZMW 116 million in 2016 were primarily for early-stage projects that could not attract private investment. However, DBZ remains a small player in the financial sector, and its loan book comprised only 1.5 percent of total financial sector lending in 2015.

13. The DBZ has been diversifying its portfolio in sector concentration. The direct lending portfolio (2015 annual report) was distributed between manufacturing (22 percent), financial services (18 percent), construction (14 percent), tourism (13 percent), agriculture (10 percent), agribusiness (9 percent), energy (6 percent), and other services (8 percent). These figures reflect a reduction in the portfolio concentration in the manufacturing and construction segments, which accounted for 49 percent of the total direct lending book in 2014 but for only 36 percent in 2015. In 2015, the DBZ disbursed ZMW 65.1 million, of which 27 percent was in construction, 23 percent in manufacturing, 19 percent in agro-processing, 15 percent in tourism, and 11 percent in agriculture.

14. The DBZ has several credit lines available in kwacha and U.S. dollars from the GRZ and donors, as shown in table 5.1. The credit lines from the AfDB were recently signed and are expected to be primarily used for agriculture and agribusiness.

Table 5.1. DBZ Credit Lines

Source	Amount	Interest Rate	Tenor (Years)	Comment
National Pension Scheme: 4 lines	ZMW 173 million	Floating rate based on BoZ policy rate	1 to 2	
MoF's Rural Finance Program	ZMW 25 million	Fixed 10%	12	Maturity 2026

AfDB	ZMW 248 million	Not determined yet	10	Not yet used
AfDB	US$25 million	Libor + spread	10	Not yet used
China Development Bank	US$30 million	Libor + 3%	10	Balance of US$20 million not used yet
Industrial Development Bank	US$20 million	Libor + 6.3%	7	Not used

15. The DBZ also manages funds on an off-balance sheet basis. The off-balance sheet managed fund under the Risk Replication Management Fund amounted to ZMW 3.1 million (or ZMW 2.45 million in June 2016). During 2015, two more loans, of ZMW 340 million, were approved under its off-balance sheet fund management.

16. The DBZ's foreign currency lending is high and accounted for a reported 20 percent of its direct lending in 2015. Most of these loans are to companies with dollar-based revenues. The DBZ has a policy to minimize the foreign exchange exposure of its borrowers. For importers who buy equipment priced in U.S. dollars but sell in Zambia, the DBZ can disburse dollars and book a kwacha loan. The DBZ is able to manage a certain amount of foreign exchange exposure due to concessional donor financing, and hedges its U.S. dollar-kwacha exposure subject to availability and cost of hedges from commercial banks and the Currency Exchange Fund (TCX), an international currency hedging facility.

17. After its last major restructuring, the DBZ pursued an aggressive expansion program in 2013–2015. However, this expansion slowed in 2016. The loan portfolio grew 8.6 percent in 2016 from ZMW 511 million in 2015 to ZMW 555 million in 2016 and is substantially under budget at the end of 2016. However, the DBZ did not have the internal skills and processes to support the expansion. Areas of weakness include due diligence, risk management, and monitoring, as acknowledged by the 2016–2018 strategic plan. A new investment policy with more prudent exposure guidelines was issued in 2015 and a new credit risk appraisal manual was issued in February 2016.

18. The DBZ emphasized funding for start-up enterprises, but these risky investments require particular credit skills. Without skills and experience in this sector, the DBZ made some poor lending and investment decisions. However, some of the start-ups have experienced delays in implementation but are still expected to be viable in the long term. Moreover, the tight economic conditions in 2015 and 2016 affected many projects, when interest rates more than doubled. This contributed to the poor SME portfolio performance. As an example, a poultry farm financed by the DBZ was hit by a combination of three adverse developments, higher interest rates, higher prices for imported feed, and lower demand from customers. It is possible that some of the SME portfolio may recover in 2017 as the economy stabilizes and interest rates fall.

Current Loan Pricing Policy

19. The DBZ does not yet price its loans consistently across its portfolio. It determines loan interest rates based on the funding cost in U.S. dollars or kwacha, plus a currency hedge cost (if applicable), plus a risk-based spread and an administrative cost spread. Some loans are fixed rate and some are floating rate based on the Monetary Policy Rate, the central bank reference rate. For example, the Monetary Policy Rate was recently reduced from 15.5 percent to 14 percent. The DBZ adds a spread, around 9 percent in 2016, to cover risk and costs. This resulted in a floating rate of about 23 percent, as of March

2017. Such rates, while lower than the commercial bank's lending rates, still represent a high real rate of interest, considering that domestic inflation fell to about 7 percent by the end of 2016.

20. The DBZ's risk premiums are derived by a simple manual process and are not based on detailed information and portfolio credit histories. They are not consistent across its portfolio. The DBZ needs to develop a more sophisticated loan pricing model, and this will be part of the TA described in paragraph 61, before implementation of the credit line.

21. The DBZ requires collateral of between 100 percent and 125 percent as security for its loans. The DBZ accepts property, fixed and moveable assets, and guarantees.

Profitability and Financial Position

22. Over the past seven years, the DBZ has generated profits. However, profitability has been decreasing, owing mainly to high operational costs and was close to zero in 2016. Table 5.2 summarizes the DBZ's profitability and financial position for 2014 to 2016 based on unaudited 2016 and audited 2015 and 2014 accounts. Interest income of ZMW 18.41 million (US$1.84 million equivalent) was 46 percent lower than the budget due mainly to lower than budgeted lending volumes. It was also much lower than the 2015 income of ZMW 36.91 million. However this was due to a large foreign exchange gain in 2015 which increased other income to ZMW 88.57 million.

Table 5.2. DBZ Financials for 2014–2016 (ZMW)

Profitability	2016 (unaudited)	2015 (audited)	2014 (audited)
	ZMW, millions	ZMW, millions	ZMW, millions
Net interest income	18.41	36.91	22.47
Other income	4.21	88.57	21.90
Total income	22.62	125.48	44.37
Operating expenses	(21.48)	(67.63)	(39.51)
Profit before tax	1.14	57.84	4.86
Profit After tax	1.02	40.93	2.90
Financial Position			
Total assets	960.6	712.71	613.04
Gross loans	555.0	—	—
Impairment	46.2	—	—
Net loans	508.8	526.52	469.26
Equity investments	116.2	186.19	143.78
Shareholders' equity	531.0	488.12	424.19
liabilities	291.9	224.59	188.85
Regulatory capital	444.30	—	—
Risk weighted assets	901.70	—	—
Capital Adequacy (%)	49	—	—

Financial Position and Capital Adequacy

23. A historical overview of the DBZ's assets demonstrates the volatility of the sector and the periodic need for recapitalizations. Total assets rose from ZMW 115.3 million in 2010 to ZMW 713 million in 2015 (audited) and to ZMW 961 million in 2016 (unaudited). The loan portfolio grew significantly from 2011 to 2015, but growth levelled off in 2016, at ZMW 555 million. The DBZ is underleveraged compared with typical commercial banks, with a capital adequacy ratio of 49 percent in 2016 (58 percent in 2015). Several credit lines available to the DBZ have not been used yet.

24. In January 2014, the BoZ increased the minimum primary capital requirements for nonbank financial institutions (NBFIs). The minimum requirement for development banks (that is, DBZ) increased the most, from ZMW 7.5 million to ZMW 750 million. However, because the DBZ was below this target in 2015 and 2016, with a primary capital of ZMW 371 million, a temporary waiver was granted and a series of progressively increasing targets was set each year from 2015 through 2018 with full compliance expected in December 2018. The GOZ further injected a ZMW 12 million of new capital in 2016. However, the DBZ will have to increase profitability in 2017 and 2018 to meet this target.

Portfolio Quality

25. The DBZ's portfolio risk is high, as reflected by rising nonperforming loans in its direct lending portfolio. About 25 percent of the DBZ's relatively new portfolio was impaired by December 2015 (90 days past due), and this figure has risen to 35 percent, as of March 2017. However, when factoring in the security provided by collateral, following International Financial Reporting accounting standards, the percentage of loans with an impairment allowance drops to 10 percent. The International Financial Reporting accounting guidelines require a 20 percent provision for loans with 90 to 120 days in arrears, 50 percent for 120 to 180 days in arrears, and 100 percent for over 180 days in arrears.

26. This high level of nonperforming loans demonstrates the high risk of SME lending. The high risk can be ascribed to a number of factors. The DBZ is exposed to significant concentration risk, as the bulk of its portfolio is in the SME sector, which is inherently risky. The expansion of the lending program from 2011 to 2015 suffered from bad timing, coinciding with macroeconomic turbulence in 2015 and 2016 when interest rates more than doubled. The DBZ did not have the skills required to lend to recent start-ups. However, the DBZ emphasized that because of the tight economic conditions, many projects still under implementation simply needed an extension of their grace period to enable them to complete implementation and start operations. This means that there may be room to work out problem loans and recover losses. Lessons learned from this experience will be incorporated into the IDP for the DBZ.

27. Recently, under the AfDB's TA program for the DBZ, five DBZ staff attended a week of training in South Africa on loan supervision and managing nonperforming loans. The AfDB is also providing training to strengthen the DBZ's SME advisory capacity and environmental due diligence.

28. A substantial proportion of the DBZ's portfolio has been restructured. The DBZ reported the restructuring of 22 loans amounting to about ZMW 132 million and US$10 million. It provided additional loans, extended grace periods, capitalized interest, and/or extended the availability period for these loans.

Regulation and Supervision

29. The DBZ and the other NBFIs are supervised by the NBFI supervision department of the BoZ. Monthly reporting requirements include income statement, balance sheet, portfolio distribution and impairment allowances, foreign currency and interest rate exposure, and liquidity gap analysis. Quarterly reporting includes cost of borrowing and credit market monitoring. The DBZ annual report is tabled at the National Assembly six months into the new year. The BoZ also conducts on-site inspections of the DBZ ideally annually. An on-site inspection was conducted in 2015. The Government maintains strong links with the DBZ. The GRZ shares are held by the MoF directly, and the MoF has Board representation.

30. The DBZ is audited by Deloitte and Touche. The financial accounts are prepared according to the International Financial Reporting Standards guidelines. The 2015 audit opinion was unqualified except for the issue of non-compliance with the new primary capital requirement as noted earlier. The DBZ expects to be in compliance by the end of 2018.

Corporate Governance

31. While the MoF consults regularly with the DBZ, it does not have a formal performance plan in place for the DBZ. Instead the DBZ's Board of Directors sets the objectives, which the DBZ then refines into departmental objectives. The Board is therefore fully responsible for setting the strategy and overseeing the day-to-day operations of the DBZ. The Board consists of seven members, four of whom are appointed by the GOZ through the MoF, and three of whom are appointed by the Development Bank of Southern Africa and the Export-Import Bank of India. One Board member directly represents the MoF. The selection process of Board members is not fully transparent. The Board meets quarterly. Members serve for a renewable term of three years and training is provided for them.

Organization Structure

32. The DBZ has an approved, budgeted staff complement of 75, but a number of positions are vacant. Currently, the DBZ employs 58 staff.

33. The DBZ's CEO has 13 people reporting to him, covering key operating areas, including the Chief Investment Officer, Chief Financial Officer, Head of Treasury, Head of Human Resources, Head of Information and Communication Technology, Chief Risk Officer (a new position), and Head of Post Evaluation and Economic Research.

34. The Head of Internal Audit, the Senior Stakeholder Relations Officer, and Senior Strategy Officer also report directly to the CEO. Five new dedicated units were established in 2015 to help address shortcomings in key operational areas, including due diligence, risk management, and loan monitoring. The Post Evaluation and Economic Research Unit was established in October 2015 to analyze and evaluate the World Bank's projects, determine causes of successes and failures, and conduct economic research.

35. The DBZ has one head office and one branch office. However, it also shares some offices with the National Savings and Credit Bank, one of the other NBFIs in Zambia, which has a branch network throughout Zambia, and provides retail banking services and takes deposits. This has assisted the DBZ to, some extent, in providing better coverage for SME lending.

Internal Audit

36. The Internal Audit Department is independent. It carries out its functions according to an annual audit plan developed each year in December and approved in January by the Audit and Risk Committee of the Board, to which the Internal Audit Department has independent access. The scope and schedule of internal audit work for each year is set out in an engagement memorandum. The department also has a tracking tool which records all audit findings and variances. An action plan to address identified issues is then agreed.

Policies and Guidelines

37. The DBZ operations are guided by the following policies and manuals:

(a) Investment Policy (2015). This covers eligible borrowers, and investees, exposure guidelines, financial instruments including guarantees, credit policy, SME lending guidelines, loan administration and reporting

(b) DBZ Credit Administration Manual (2016 update).

(c) Business Continuity Plan (2016).

(d) DBZ Risk Policy (2017).

(e) Monitoring of Projects under the Commercial Operation's Manual.

38. The risk policy covering operational and market risks has been recently developed and is not yet embedded in all departments and aspects of the DBZ's operations.

Management Information Systems

39. The Information and Communication Technology Department provides basic web and application services, a local area network, telephony, and security. Most of the management information system (MIS) functions are currently carried out manually and with the aid of spreadsheets.

40. However, the implementation of a new Enterprise Resource Planning System is under way. A feasibility study was carried out in 2015. An Indian information technology firm has been engaged to deliver this system by September 2017. It has already completed the mapping and data gathering phases and has commenced coding the new system. This will incorporate a new integrated MIS called NAVISION.

41. However, even after this system is delivered in September 2017, the DBZ will still need further development of interfaces between NAVISION and other stand-alone systems before it has a fully adequate MIS. The local area network system underwent an upgrade in 2016 to speed up network throughput.

DBZ's Experience with the Energy Sector

42. The DBZ has limited experience in the energy sector. Under a US$2 million revolving UNIDO facility, the DBZ extended a loan of US$500,000 to ZESCO for grid expansion, which has almost been paid off. The DBZ also extended a loan to REA for a mini-grid project, of which US$277,000 has been disbursed. The loan is currently in the grace period and has not yet been amortized. This project is reportedly suffering from delays and technical issues in the construction phase. The loans are off-balance sheet for the DBZ. The DBZ collects loan repayments on behalf of the donor. A biomass to power project was also planned under the UNIDO arrangement, but this project has not been implemented. Other than these two loans, the DBZ has no experience in the off-grid energy sector.

Description of the Credit Line

43. **Background.** The Electricity Service Access Project proposes an off-grid component that includes TA to the FI and a small pilot credit line for solar energy companies of about US$1 million. The November 2016 solar market assessment performed by Open Capital Advisors identified lack of finance as a key barrier to growth of the solar market in Zambia. The purpose of the credit line is to increase access to off-grid solar power. Eligible borrowers would include companies importing and selling solar equipment for household and productive uses, developers of mini-grids, and potentially larger end users of solar power, for example agribusinesses.

44. The DBZ has been identified as the FI for the credit line. The DBZ would most likely lend directly to eligible borrowers. However, the option for the DBZ to work as a wholesale bank through one or more commercial banks will also be preserved. The DBZ currently uses both these approaches with its other donor credit lines. The financing channel options considered and rationale for choosing the DBZ are set out in the following section.

45. In parallel with the credit line offered through the DBZ, a grant window would also be made available through REA to eligible mini-grid developers. The developers would likely first apply to REA for a grant to improve the viability of their business or project and then approach the DBZ for a loan to complete the financial plan. Borrowers with grants from other sources, such as the SIDA program offered by Sweden, would also be eligible to apply for a loan from the DBZ.

46. **Demand.** Solar companies and mini-grid developers have expressed a strong need for debt financing, including working capital lines, receivables financing, and long-term finance for mini-grids. Loans in both U.S. dollars and Zambian kwacha are needed. The DBZ has expressed a willingness to act as the principal FI. Two local banks have voiced an interest to participate as PFIs in an IDA-funded credit line scheme.

47. **Operational principles and pricing.** The DBZ will extend loans to borrowers either in U.S. dollars or in Zambian kwacha, and will manage the foreign exchange exposure associated with loans in Zambian kwacha. If commercial banks are involved as PFIs, their selection will be led by the MoF in phase 1 and based on a competitive tender process assessing the quality and capacity of short-listed institutions. The World Bank will provide the 'no-objection' to the selection based on OP 10.00 evaluation criteria.

48. The interest rate charged to the DBZ will be decided by the MoF in phase 1. The interest rates charged by the DBZ and any PFIs to project sponsors will cover all costs (that is, cost of funds, hedging costs, administrative costs, a spread to cover credit risk and liquidity mismatch risk, and a small profit

incentive). The interest rate to the final borrowers will be competitive according to market conditions applicable to solar energy companies and mini-grid projects.

49. **Loan terms for the solar energy market.** The DBZ is able to offer short-, medium-, and long-term loans in U.S. dollars and Zambian kwacha with terms broadly depending on the terms of its funding through various donor credit lines. Two main types of credits would be offered for solar companies:

(a) Loans in U.S. dollars principally for borrowers with U.S. dollar-denominated revenue or revenue associated with commodities with local prices linked to international U.S. dollar prices but also for solar equipment importers able to manage a dollar liability

(b) Loans in kwacha for borrowers with local currency revenues, for example, solar equipment distributors and mini-grid developers

50. The DBZ has a policy to minimize the foreign exchange exposure of its borrowers. For importers who buy equipment priced in U.S. dollars but sell in Zambia, the DBZ can disburse dollars and book a kwacha loan. The DBZ is able to manage a certain amount of foreign exchange exposure due to concessional donor financing and hedges its U.S. dollar-kwacha exposure subject to availability and cost of hedges from commercial banks and TCX, an international currency hedging facility.

51. The DBZ can offer a full range of loan tenors depending on the needs of its borrowers and typically up to about 15 years. Working capital loans for solar importers may be six months or one year revolving lines. Mini-grid developers will require long-term loans because the payback period may be 10 years or more even with some grant financing. Currently, the DBZ's risk premiums are derived by a simple manual process and are not based on detailed information and portfolio credit histories. The DBZ needs to develop a more sophisticated loan pricing model, and this will be part of the TA described in paragraph 61, before implementation of the credit line.

52. **Collateral requirements.** As with interest rates, collateral requirements will broadly be set in line with the DBZ's existing practice. The DBZ typically requires 125 percent collateral cover, and accepts marketable property, fixed and moveable assets, and personal guarantees.

53. Collateral requirements will pose issues for solar equipment companies and developers because they may be new entrants to Zambia or recent start-ups without substantial balance sheets. This issue may be mitigated in the following ways:

(a) Grants from REA (or other sources, such as SIDA) could be held as collateral, if the grantee requires a loan, and paid to the borrower once the loan has been repaid or incrementally as the loan is amortized.

(b) Other risk mitigating instruments could be used. For example, the AfDB offers the African Guarantee Facility, and has also signed a credit line recently with the DBZ.

Commercial Bank Involvement as PFIs

54. The local commercial banks are not lending any significant amounts to private sector SMEs and have not financed Zambian solar energy companies, which are often not fully commercial and do not

have long track records. The GRZ is running a very tight monetary policy and commercial bank rates are too high for most companies. These banks are mainly buying government bonds, with some lending to state-owned enterprises and government employees. However, commercial bank rates are expected to fall significantly soon.

55. The DBZ may lend directly to eligible borrowers, without commercial bank involvement. The credit line of US$1 million may be judged too small to support a more complex structure. However, the project includes the option for the DBZ to act in a wholesale capacity and lend through selected commercial banks. This decision will be taken during phase 1 of Subcomponent B.2. depending on the outcome of the IDP.

56. Four commercial banks with operations in Zambia have been consulted during project preparation, and two commercial banks, Stanbic and Zanaco, have continued to express interest in acting as PFIs, notwithstanding the small size of the credit line. They expect that lending rates will fall further, and together with grant windows for solar companies, this might allow commercial lending to be viable.

57. Stanbic is one of the strongest African-based commercial banks. Stanbic is interested in developing its off-grid energy business throughout Africa and has a new business strategy to grow this area. The credit line and most of the solar energy sector borrowers would be too small for Stanbic's corporate banking department. However, Stanbic, Lusaka, has a personal and business banking department that covers small business lending, and this department would be interested in managing the credit line.

58. Zanaco's largest shareholder is Rabo Bank (through an affiliate) with a 45.59 percent stake as of 2015. The GRZ owns 25 percent and there is a 26 percent local stock market float. Zanaco is interested in the solar energy market, especially in productive uses of electricity that would synergize with its agriculture sector lending. Zanaco was fairly hard hit by the recent macroeconomic instability but has emerged from a restructuring and downsizing in 2016 with a renewed appetite for growing its SME lending.

Details in the DBZ Operations Manual

59. The first phase will include the preparation of a DBZoperations manual, satisfactory fiduciary oversight arrangements, participation agreements, and a credible pipeline of initial investments. The operations manual will provide details on the following topics, among others: (a) design details (for example, on the flow of funds); (b) eligibility criteria for the international financial institutions and PFIs (for example, adequate profitability, capital, and portfolio quality; acceptable levels of loan collections; appropriate capacity; capacity to mobilize domestic resources; adequate managerial autonomy and commercially oriented governance; and appropriate prudential policies, administrative structure, and business procedures); (c) market efficiency issues (for example, macroeconomic environment, financial sector framework, interest rates, directed credit, and subsidies); (d) on-lending terms (including potential market distortions and determination of interest rates at all levels); and (e) M&E arrangements.

Lessons learned

60. This component has been designed based on the lessons learned and the experience gained from Lighting Africa in East African countries, especially Ethiopia, where a US$20 million Access to Finance Facility resulted in more than 750,000 quality-approved solar lanterns being imported and distributed by the private sector, providing access to about 3.9 million people.

TA to the DBZ - The IDP

61. Before implementation of the credit line, the DBZ will receive TA of up to US$0.5 million through the implementation of the IDP in order to raise its capability in key areas. This TA effort will be shared with the AfDB, which has just signed a credit line with the DBZ for the agriculture sector, with a TA component. Proposed areas for TA with a budget estimate are given in able 5.3. The TA program includes a budget to provide long-term consultants to strengthen the DBZ due diligence teams in credit assessment and solar energy market risks. It also includes an allowance for seconding the DBZ staff to one or more commercial banks to improve credit assessment, loan monitoring and collections. The DBZ management believes that its own staff need exposure to commercial bank operations, and this will be more valuable than having temporary consultants working in the DBZ, who may leave without transferring skills to permanent staff. The IDP also includes assistance with managing foreign exchange risk. The DBZ has used currency swaps to hedge U. S. dollar/Zambian kwacha exposures, but it would like to explore the use of other methods to mitigate foreign exchange risks.

Table 5.3. TA

Component	Budget (US$)
Credit Assessment on Solar Energy Projects	50,000
Environmental and Social Due Diligence	50,000
Risk-based Loan Pricing and Model	100,000
Seconding of Consultants to DBZ	100,000
Seconding of DBZ staff to commercial banks	50,000
Foreign Exchange Risk Management	50,000
Total TA Budget	400,000

Description of Options Assessed and Rationale for Proposed Option

62. Broadly, the following three options were considered:

(a) DBZ - Option 1

(b) One or more commercial banks with operations in Zambia - Option 2

(c) A specialized solar energy fund manager - Option 3

Option 1 - DBZ

63. The DBZ was selected as the principal FI (Option 1) for the following main reasons:

(a) The DBZ has a development mandate to contribute to economic growth and encourage new growth sectors, such as solar energy that are not sufficiently developed to be fully commercially viable.

(b) The DBZ has existing staff and banking systems and already manages some donor credit lines, including for SME lending. The ESAP can include TA to the DBZ to increase its capability for solar projects.

(c) The DBZ is a relatively low overhead cost option, an important factor for such a small credit line.

(d) The DBZ is able to offer domestic currency and U.S. dollar credits for short-, medium-, and long-term financing.

(e) The DBZ has some initial experience in the energy sector having already extended loans to ZESCO and REA.

(f) The DBZ will be offered TA under the ESAP and will have to reach target performance levels as a condition of implementing the credit line.

(g) While the size of the credit line proposed under the ESAP (about US$2 million) is too small to interest most of the commercial banks, one or two smaller banks might work as retail lenders with the DBZ as the apex.

Option 2 - Commercial Banks

64. Commercial banks would have the advantages of more capability to assess credit risk and monitor loan performance and possibly more branches in Zambia than the DBZ. However, prevailing commercial bank interest rates are too high, and collateral requirements are too vast for this to be a viable option at the moment for solar energy companies. The local banks are also not familiar with the domestic solar energy space and are risk averse in a new evolving industry where borrowers do not have much credit history. The credit line is also too small for the commercial banks to be interested in taking on the apex role. Commercial banks could, however, participate under the DBZ as noted earlier.

Option 3 - Specialized Fund Manager

65. The specialized fund managers will typically know more about the solar energy market than all of the banks, and they will be best placed to provide long-term equity investment and management advice to SMEs. However, the size of the credit line is too small to interest the funds, and their fees would also be expensive, perhaps up to 4 percent per year. One fund indicated that a minimum fund size of about US$30 million would be needed to make the business viable. The fund manager typically also does not invest its own capital.

ANNEX 6: ZAMBIA OFF-GRID ENERGY SECTOR

1. Over 96 percent of rural households in Zambia have no access to electricity but depend on traditional lighting sources such as kerosene lamps, candles, or battery-powered torches which are both expensive and can cause health and environmental hazards. The dispersed settlement pattern in most parts of the country, coupled with relatively low-income levels, makes grid connection prohibitively expensive for households and largely unviable for the national utility, ZESCO. However, Zambia has significant potential for distributed power generation based on solar energy due to its geographical position and relatively high solar irradiation throughout most of the year.[67] Preliminary data show that the least-cost option to reach universal access by 2030 for over 48 percent of the population is through mini-grid or stand-alone systems[68] based on solar PV.

Approach to Develop a Stand-alone Solar System Market in Zambia

2. The GRZ has supported the off-grid solar sector through VAT and customs duty exemption for solar equipment[69] and together with various development partners through several off-grid projects, including the Sustainable Solar Market Package (SSMP) approach supported under the now closed IDA-financed IAES Project (P077452). The SSMP approach aggregated under one contract the supply, installation, and maintenance (for five years) of institutional solar PV systems in schools, health centers, and the sale of lanterns and SHSs to households at a subsidized cost. The initial target was that the SSMP would enable 250 public institutions and 10,000 households in rural areas to have access to modern energy services. At completion, a total of 104 public facilities and 2,563 households were provided with solar PV systems. The main constraint to reaching the initial targets was identified as being the limited ability of the rural households to pay for products and the lack of interest from the private sector in implementing/carrying out the SSMP contracts. In addition, as no funding mechanism for maintenance was put in place after the five-year maintenance contract, institutions are now reaching out to REA as solar batteries have reached the end of their useful life and need to be replaced.

3. Another model was tried together with SIDA, where three electricity service companies that were funded by SIDA provided Government-procured SHS to a total of 400 off-grid customers, including households and government buildings in Chipata, Lundazi, and Nyimba in the Eastern Province. The SHS remained Government property and the customers paid for energy services received through monthly payments. Some of the challenges included the following:

(a) Technical flaws of the prepayment system.

(b) The selected batteries had a short life span, and the ESCOs did not have the financial means to pay for replacements, as the monthly payments were not sufficient to cover the replacement costs. The ESCOs therefore asked the clients to procure new batteries, which

[67] The country has an average solar insolation of 5.5 kWh per m^2 per day, with an average 3,000 hours of sunshine per year.
[68] http://electrification.energydata.info/. Least-cost option for 43 percent of the population is through stand-alone solar system and 5 percent is through solar PV mini-grids—least-cost option for over 53 percent of the population is through off-grid energy solutions.
[69] Currently, only solar panels, solar batteries, and inverters for solar power are included in the exemption list.

only a few of them did. Without replacement batteries, the customers refused to pay the monthly fees. The ESCOs could not remove the systems, as the costs for removal and reinstallation were too high.

(c) The number of original installations was too small to sustain the administrative cost of the companies and, in addition, inflation eroded the monthly payments to about 30 percent of their original value, despite several adjustments.

(d) The SHSs were offered only as standard packages, and an upgrade was not available. This resulted in households that needed higher levels of energy service and could afford these to start running diesel generators in parallel.

4. In addition to these initiatives, a commercial solar market has emerged in Zambia, though it is still at a relatively early stage, particularly for SHSs. The market has been focused predominantly on solar lanterns for the broader market and large, fixed PV installations for rooftops for those who can afford the investment. The number of solar lanterns and SHSs for the 12-month period from July 2015 to June 2016 is estimated to be around 118,000 units.

5. To date, small informal traders have been the primary distributors of solar lanterns in the Zambian market, particularly in rural areas. Distribution to end customers is typically carried out by informal village-level tradesmen stocking up on merchandise at nearby towns for resale in the villages. In these informal channels, the frequency of product restocking is ad hoc, traders frequently change, and traders' purchase decisions are driven primarily by price and available cash flows. Products traded in informal channels are frequently low cost and low quality and are able to enter Zambia because of inconsistent application of licensing and import control procedures.

6. The number of formal sector solar companies in Zambia has increased over the last few years but they still operate at a small scale. Systems have mainly been distributed through cash sales model, which has reached limited scale due to limited consumer affordability. However, in November 2015, Zambia's first PayGo financing option was launched. In addition, SIDA's 'Beyond the Grid Fund', which is expected to be launched in May 2017, has been able to attract new international PayGo companies to Zambia.

7. In the PayGo business model, which was developed in East Africa in the last five years, companies install solar PV systems in households or small businesses. Using mobile communications and locking mechanisms (such as meters with Global System for Mobile communication chips) to remotely control the energy assets, PayGo companies can accept small payments every day, week, or month from customers who can pay with mobile money and can also remotely lock the functionality in the event of nonpayment by a consumer. By spreading payments over time, this model makes solar off-grid products more affordable to the end user. As the systems are leased, the PayGo companies are responsible for the system maintenance and, in particular, for taking care of the batteries, which have to be replaced at regular intervals.

8. It is estimated that the total potential market size for SHSs and solar lanterns with consumer financing (for example through the PayGo model) is US$46.7 million, which is six times larger than the estimated market size without consumer financing.

9. International funding has been key to the emergence of PayGo offerings. PayGo financing requires substantial up-front funding to purchase stock and bridge the gap to repayments from customers. Local funding has not been available for PayGo businesses or other off-grid energy companies, and the entry of such companies into the Zambian market has depended on external funding. However, scaling and systematic price reductions will depend on expanded local sources of funding in local currency.

10. The domestic financial sector in Zambia continues to experience high interest rates and a severe shortage of liquidity. According to the The Global Competitiveness Report 2015–2016,[70] companies in Zambia consider access to financing the main constraint to growth. Loans to SMEs and off-grid energy companies are constrained by an insistence on physical collateral (usually land and representing over 100 percent of the value of the loan), high interest rates (usually over 35 percent), (underdeveloped procedures related to credit risk quantification and asset-liability management, nascent credit information systems, and the dominance of short-term capital. In addition to commercial financing, privately developed mini-grids require public co-funding to cover the viability gap (the difference between cost of providing connection and what consumers are willing/able to pay for it). In addition to the access to finance constraints, there is a lack of an enabling regulatory environment (including unclear licensing regime, inconsistent application of the VAT exemption of solar equipment, and cumbersome tariff setting process).

11. Additional factors constraining the off-grid solar sector include (a) high import and in-country distribution costs due to being a land-locked country, lengthy customs clearance processes, low population density, and limited road infrastructure; (b) low purchasing power and limited access to consumer financing; (c) low mobile money penetration, which limits the use of the mobile payments that has an adverse impact on the PayGo business model for SHSs used successfully in East Africa; and (d) negative consumer perception of solar systems due to the inflow of low quality products.[71]

Table 6.1. Summary of Experience with Stand-alone Solar PV System in Zambia

Segment	Experience in Zambia	Challenges
Public programs	SSMP, ESCO	• Lack of sustainability, such as lack of funding for maintenance and battery replacement • Lack of appropriate technical design
Commercial market	Local solar PV companies	• Lack of access to finance for importers/distributors • High import and in-country distribution costs • Lack of clarity and consistency in regulatory framework • Low purchasing power and limited access to consumer financing • Low mobile money penetration • Negative consumer perception of solar systems

12. The World Bank's Africa Off-Grid Solar Approach Paper(P149497, 2016), prepared by the World Bank's Africa Energy Practice and based on lessons learned from experience in supporting the off-grid

[70] The Global Competitiveness Report 2015–2016, World Economic Forum.
[71] Analysis of off-grid solar in Zambia and suitable market-based options for scale-up, study ongoing 2017.

solar sector in there region, identifies six ways to catalyze the off-grid solar market in Sub-Saharan Africa which address many of the challenges identified above: developing the policy and regulatory environment for off-grid solar; supporting governments to mainstream off-grid PV into sector planning; facilitating access to working capital; issuing guarantees to reduce risk for commercial lenders that finance off-grid solar projects; using performance-based grants to push the market, when and where appropriate; and supporting creation of receptive markets through quality assurance and consumer awareness.

Approaches to Mini-grid Development in Zambia

13. In Zambia, electrification through mini-grids is relatively undeveloped. There are currently 13 mini-grids, of which 10 are owned and operated by the national utility, ZESCO; one is community owned; and two are private ventures. Of the 10 mini-grids owned and operated by ZESCO, 9 are thermal diesel-based and one is a 1 MW mini-hydro in Shiwangandu. Due to the high fuel-related operating cost for the diesel-based mini-grids, ZESCO is in the process of connecting the mini-grids to the national grid. The Shiwangandu mini-hydro and the 60 kW solar PV-based mini-grid in Mpanda (which was developed and is owned by REA and operated by the community/Kafita Cooperative) were both financially supported through concessional loans from the DBZ provided under the UNDP/GEF project 'Renewable Energy Based Electricity for Isolated Mini-Grids in Zambia'. The project aimed to support private sector-led renewable energy mini-grid development but, due to lack of interest from commercial actors, the focus shifted to supporting publicly developed mini-grids. The Shiwangandu hydro mini-grid experienced significant delays due to redesign and delay in securing co-financing. It was commissioned in November 2012, six years after initiation of the project. The main challenge has been the lack of proper demand estimates and sizing of the power plant/turbines. The mini-grid, therefore, operates only at 10 percent of its capacity. This has resulted in a mini-grid that is not financially sustainable and is at risk of damaging the turbines that require a minimum 70 percent load. The REA-developed solar mini-grid was commissioned in 2013 after significant delays due to site relocation and as ownership arrangements were not in place. It also experienced fundamental technical problems due to technical design flaws. In addition, the households did not pay any connection fee or electricity usage fee during the first years as REA lacked the proper licence as an operator. In November 2013, the ERB granted REA a provisional licence for generation and distribution of electricity and approved a proposed monthly fee of ZMK 40 but collection of the monthly fee has been a major challenge, and the collected fees do not cover the O&M costs, which include three full-time staff who support the Kafita Cooperative with the day-to-day running of the plant. Building on the experience of the Mpanda project, REA is currently developing three new mini-grids, one hydro (Kasanjiku) and two solar PV (Chunga and Lunga) projects. REA will seek a private partner for the operation, maintenance, and tariff collection for these projects. The proposed tariff for Lunga is US$1.79 per kWh and for Chunga US$2.35 per kWh.

14. The privately developed mini-grids are the 750 kW mini-hydro Zengamina scheme in the North-West Province commissioned in 2007 and the 30 kW solar mini-grid in Sinda. The Zengamina mini-hydro was developed in 2000 by a charity, the Northern Western Zambia Development Trust, originally to provide power to the Kalene Hill Mission and its hospital. ZPL was created to operate the scheme as a registered company. The Northern Western Zambia Development Trust owns the mini-grid assets and 90 percent of ZPL. The scheme cost around US$3 million, funded by international donors and a US$25,000 subsidy obtained from REA. The connection fees and tariffs were approved through a two-year consultation process with ERB and stakeholders. The connection fees were between US$90 and

US$130 per connection, and the tariffs consisted of a fixed tariff of US$7 per month (up to 1.5 amps) and a stepped tariff of US$9 per month (first 150 kWh) plus US$0.06 per kWh to US$0.13 per kWh. The breakeven point was reached after seven years of operations (on operating expenses only). The customer base of ZPL consists of anchor businesses previously relying on diesel generators (a farmer and two telecom towers); small businesses (welders, hammer mills, bakeries); and around 500 households. To increase the revenue stream, the Director of ZPL decided to create his own businesses: a pineapple drying factory and a stone crushing business. The 30 kW solar micro-grid in Sinda, developed by Muhanya Solar Limited with 50 percent grant funding from the United States Agency for International Development (USAID), was commissioned in February 2017 and is providing access to 60 households. The approved connection fee for households is ZMW 100 and tariffs range from ZMW 5 to ZMW 8 per day. Muhanya Solar Limited also serves part of its customers in Sinda with PayGo SHS, taking advantage of the common rural settlement pattern where a RGC is surrounded by scattered households. ZPL is considering a similar approach.

Table 6.2.Summary of Experience with Stand-alone Solar System in Zambia

Mini-grid Models	Experience in Zambia	Challenges/Lessons Learned
Utility based	Shiwangandu mini-hydro	• Availability of critical data on demographics (including population density) and power demand estimates is critical (lack of this data caused oversizing of Shiwangandu).
Public/community based	Mpanda	• Public/community-developed projects (funded by development partners) often lack sustainability (tariffs not covering O&M costs in Mpanta).
PPP	Kasanjiku, Lunga, Chunga currently under development	• REA will seek a private partner for the operation, maintenance, and tariff collection for these projects.
Private based with grant (Capex or performance based)	Zengamina, Sinda, Standard micro-grid	• Clarity on legal and regulatory requirements (from project development-related standards and specifications, to tariff frameworks) is critical to enable developers to estimate development costs and mitigate risks along the value chain.Support to a range of technological solutions and business models are needed to respond to the diverse needs of varied population of different characteristics, the geographic population density and housing patterns, as well as income segments.Promoting day-use of energy, in particular for productive uses, will increase financial sustainability.

Private Participation

15. Due to the magnitude of the resources required to achieve the GRZ's electrification targets and the challenges faced in the publicly developed off-grid electrification efforts, the Government decided to pilot innovative approaches for attracting private sector investment into the sector.

16. In Zambia, well-structured and properly incentivized PPP arrangements or performance-based grant programs could attract the private sector to engage in the energy access market, leveraging their

capital and expertise to accelerate progress toward universal electricity access. Table 6.3 shows a summary experience using different approaches to support private sector-led mini-grid development in Sub-Saharan Africa.

Table 6.3. Summary of Experience of Different Approaches to Support Private Sector Lead Mini-grid Development in Sub-Saharan Africa

Approaches	Experience in Sub-Saharan Africa
Private with performance/result-based grant support by the Government or development partner. Assets are built, operated, and owned by the private entity. The private entity receives performance/result-based grant (connection subsidies).	Tanzania (TZ-Energy Development & Access Expansion - (P101645) , REA, SIDA/U.K. Department for International Development) Performance-based grants/connection subsidy.US$500–75/connection. Zambia (SIDA BGFZ): Performance-based grants/connection subsidy. These arrangements are often used for solar/battery direct current micro-grid (<100 kW) and viable if sold by service (not kWh).
PPP, Concession/build, operate, own. Assets are built, operated, and owned by the private entity. Contract awarded through competitive tender or spontaneous proposal. Private entity co-finances major CAPEX. These arrangements are often used for direct current micro-grid (<100 kW)	Mali (*Projet de Candidatures Spontanées d'Electrification Rurale* [PCASER], Agence Malienne pour le Développement de l'Energie Domestique et l'Electrification Rurale AMADER): Spontaneous proposal by private entity. 75 percent CAPEX subsidy (about US$600 per connection). Differentiated tariff (US$0.50 per kWh). Result: 78,000 connections Guinee (*Fonds pour l'Electrification Rurale Décentralisée*(FERD): Spontaneous proposal by private entity. 80 percent CAPEX subsidy. Result: 25 mini-grids.
PPP, Concession/Build, operate, transfer The private entity builds and operates assets which are transferred to the Government/utility at the end of the concession. Contract awarded through competitive tender or spontaneous proposal. Public entity co-finances major CAPEX.	Senegal (*Electrification Rurale d'Initiative Locale* [ERIL], Agence Sénégalaise D'Electrification Rural: competitive tender for mini-grid concession. Assets are state owned and tariff determined by the regulator. Result: 500 connections These arrangements are often used for alternating current mini-grid (100 kW–1 MW) owned by the utility/REA. If solar, usually hybrid with diesel. Will require cost reflective tariffs for viability or cross subsidization.
PPP, Leasing (affermage)/O&M + collection. The private entity builds and/or refurbishes, operates assets, and collects tariffs. Contract awarded through competitive tender. Public entity co-finances major CAPEX.	Expected to be tested in Zambia through Lunga and Chunga mini-grids

17. Despite there being a number of examples of approaches supporting private sector led mini-grid sector, the track-record of large-scale rollout is still limited. The reason for this is that there are important barriers to the private sector approach delivering on its inherent potential, including (a) lack of information on where in a given geographical area there is demand for the quantity and quality of

electricity services that mini-grids (versus other technology choices, such as stand-alone SHSs) can deliver; (b) lack of clarity on the legal and regulatory requirements applicable to companies operating mini-grids;[72] (c) lack of clarity on grid expansion plans, creating uncertainty in the demand for off-grid services among potential customers; (d) institutional capacity constraints among public sector agencies for structuring PPP deals and supporting private sector development; and (e) lack of appropriate incentives, most notably consideration on the part of policy makers that most off-grid renewable electricity generation technologies are very different from large, centralized systems based on conventional energy, and therefore require different tariff regimes.[73]

Design of Subcomponent B.1 Off-Grid Electrification Smart Subsidy Program

18. Subcomponent B.1 aims at addressing the abovementioned barriers through upstream activities, including (a) identifying potential sites through the use of the geospatial planning platform;[74] (b) preparing market assessments[75] for the potential sites; (c) reviewing the regulatory framework and supporting relevant institutions in streamlining requirements in support of private sector-led, off-grid electrification; (d) designing the OGESSP, including types and levels of subsidy to be provided and developing operational procedures for the OGESSP; and (e) developing standard legal documents, including drafts of tendering documents and agreements. REA will undertake this upstream work[76] in close consultation and collaboration with both public sector agencies, such as ERB, and private sector developers.

19. In the second phase, REA will pilot the OGESSP with private operators selected through a competitive tendering process to provide energy service to households, public facilities, and MSEs in the selected rural localities.

Design of Subcomponent B.2 Off-Grid Loan Facility

20. To further address access to finance constraints, Subcomponent B.2 will set up and pilot a Loan Facility for eligible borrowers, which would include companies importing and selling solar equipment and developers of mini-grids.

21. Several financing mechanism options were considered during the design stage. A summary of these options can be found in Table 6.4.

Table 6.4.Summary of Financing Mechanism Options considered during the Design Stage of the Project

Loan facility	Description	Assessment
Working capital loans (U.S. dollar and kwacha)	Revolving credit line, to provide solar system importers and distributor with ongoing liquidity access to finance	Included. Loan facility through the DBZ will provide working capital loans/trade finance to solar system importers and distributors.

[72] From ESCO licensing and environmental permitting, to import duties and electricity tariffs, to eventual grid interconnection.
[73] Off-grid renewable energy-based systems have high capital costs and thus typically prioritize highly-efficient end-use appliances, the result being that the customer can get more service output with less energy input.
[74] The geospatial-based electrification planning platform developed by IFC and the World Bank available through the World Bank's energydata.info project will be further refined, detailed, and used.
[75] Including demand estimates, WTP/ability to pay assessments, customer segmentation, and so on.
[76] With potential support from IFC, subject to mobilization of funding from other sources.

	inventories.	
Long-term loans (kwacha)	Local currency long-term loan to mini-grid developers.	Included. Loan facility through the DBZ will provide long-term local currency to mini-grid developers.
Equity Fund		
Equity	Equity fund that can invest and provide advice to mini-grid and solar companies.	Not included. No specialized fund manager for the renewable energy sector is established in Zambia. The limited amount of funding is not enough to attract regional funds to Zambia.
Convertible debt fund	Debt that can be converted by the holder into a specified number of shares of common stock in the issuing company	Not included. No specialized fund manager for the renewable energy sector is established in Zambia. The limited amount of funding is not enough to attract regional funds to Zambia.
Guarantee mechanisms		
First loss guarantee	First loss guarantee to support lending through commercial banks by reducing risk exposure	Not included. Local commercial banks are not familiar the renewable energy sector and risk averse in a new evolving industry where borrower have limited credit history. USAID experience with providing a partial risk guarantee to commercial banks for energy loans has not been successful.
Partial risk guarantee	Partial risk guarantee to support lending through commercial banks by reducing risk exposure	Not included. Local commercial banks are not familiar the renewable energy sector and are risk averse in a new evolving industry where borrowers have limited credit history. USAID's experience in providing a partial risk guarantee to commercial banks for energy loans has not been successful.
Grants		
TA	Grant-funded assistance for market assessment, business plan, pre-feasibility studies, and so on	Included. Component 3 will support upstream activities, including development of standard legal documents site identification, market assessment, and pre-feasibility studies.
Up-front expansion or Capex grant	Up-front liquidity for investments	Included. Grant to Capex will be provided to cover the viability gap (the difference between cost of providing connection and what consumers are willing/able to pay for it).
Performance/results-based grants	Grants based on results, such as connection/tier grants	Included. The grant to cover the viability gap will be provided through a performance-based subsidy based on final number of operating connections and service tiers (part of the subsidy will be paid up front and the rest upon verification of the results).