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IDA/R2017-0301/1

September 11, 2017

Closing Date: Thursday, September 28, 2017 at 6 p.m.

FROM: Vice President and Corporate Secretary

Mozambique - Power Efficiency and Reliability Improvement Project

Project Appraisal Document

Attached is the Project Appraisal Document regarding a proposed grant to Mozambique for a Power Efficiency and Reliability Improvement Project (IDA/R2017-0301), 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

Document of
The World Bank

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Report No: PAD1935

INTERNATIONAL DEVELOPMENT ASSOCIATION

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED GRANT

IN THE AMOUNT OF SDR 106.6 MILLION
(US$150 MILLION EQUIVALENT)

TO THE

REPUBLIC OF MOZAMBIQUE

FOR A

POWER EFFICIENCY AND RELIABILITY IMPROVEMENT PROJECT (PERIP)

September 7, 2017

Energy and Extractives Global Practice
Africa Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective July 31, 2017)

Currency Unit	=	Mozambican Metical (Mt)
MZN 61.11	=	US$ 1
US$ 1.41	=	SDR 1

FISCAL YEAR
January 1 – December 31

ABBREVIATIONS AND ACRONYMS

AMR	Automatic Meter Reading
AMS	Asset Management System
ARENE	Energy Regulatory Authority *(Autoridade Reguladora de Energia)*
BAU	Business-as-Usual
CAPEX	Capital Expenditure
CMS	Commercial Management System
CNELEC	National Council for Electricity (*Conselho Nacional de Electricidade*)
CPF	Country Partnership Framework
CTRG	Ressano Garcia Thermal Power Plant *(Central Termica Ressano Garcia)*
CQS	Selection based on the Consultants' Qualifications
DA	Designated Account
DES	Directorate of Social Energy
DP	Development Partner
EDAP	Energy Development and Access Project
EDM	Electricity of Mozambique *(Electricidade de Moçambique, E.P.)*
EIRR	Economic Internal Rate of Return
ERP	Enterprise Resource Plan
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
FM	Financial Management
FUNAE	Energy Fund (*Fundo de Energia*)
GDP	Gross Domestic Product
GIAF	Integrated Financial Management System (*Gestão Integrada de Administração e Finanças*)
GIS	Geographic Information System
GoM	Government of Mozambique
HCB	Cahora Bassa Hydropower (*Hidroeléctrica de Cahora Bassa)*
ICB	International Competitive Bidding
ICS	Internal Communication System
ICT	Information and Communication Technology
IPP	Independent Power Producer
IRR	Internal Rate of Return

IS	Information Systems
JICA	Japan International Cooperation Agency
LCS	Least-Cost Selection
M&E	Monitoring and Evaluation
MCC	Metering Control Center
MDM	Meter Data Management
MIP	Management Improvement Plan
MIREME	Ministry of Mineral Resources and Energy *(Ministerio de Recursos Minerais e Energia)*
MIS	Management Information System
NCB	National Competitive Bidding
NESP	National Electrification Strategy and Plan
NPV	Net Present Value
O&M	Operation and Maintenance
OMS	Outage Management System
OPEX	Operating Expenditure
PERIP	Power Efficiency and Reliability Improvement Project
PIU	Project Implementation Unit
PPA	Power Purchase Agreement
QCBS	Quality- and Cost-based Selection
RAP	Resettlement Action Plan
RPF	Resettlement Policy Framework
RPP	Revenue Protection Program
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
SCADA	Supervisory Control and Data Acquisition
SIGEM	Integrated Management System (*Sistema Integrado de Gestão*)
STE	National Transmission Backbone (*Sociedade de Transporte de Energia*)
STIP	Short-Term Investment Program
TA	Administrative Court *(Tribunal Administrativo)*
TUP	Transmission Upgrade Project
USAID	United States Agency for International Development
ZESA	Zimbabwe Electricity Supply Authority
ZESCO	Zambia Electricity Supply Corporation
WACC	Weighted Average Cost of Capital

Regional Vice President:	Makhtar Diop
Country Director:	Mark R. Lundell
Senior Global Practice Director:	Riccardo Puliti
Practice Manager:	Sudeshna Ghosh Banerjee
Task Team Leaders:	Mariano Salto
	Zayra Romo Mercado

REPUBLIC OF MOZAMBIQUE
Power Efficiency and Reliability Improvement Project (PERIP) (P158249)

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Power Efficiency and Reliability Improvement Project (PERIP) (P158249)

PROJECT APPRAISAL DOCUMENT

AFRICA

Energy and Extractives Global Practice

Report No.: PAD1935

Basic Information		
Project ID P158249	EA Category B - Partial Assessment	Team Leader(s) Mariano Salto, Zayra Luz Gabriela Romo Mercado
Financing Instrument Investment Project Financing	Fragile and/or Capacity Constraints [ ] Financial Intermediaries [ ] Series of Projects [ ]	
Project Implementation Start Date 28-Sep-2017	Project Implementation End Date 30-Dec-2022	
Expected Effectiveness Date 30-Nov-2017	Expected Closing Date 30-Dec-2022	
Joint IFC No		

Practice Manager/Manager	Senior Global Practice Director	Country Director	Regional Vice President
Sudeshna Ghosh Banerjee	Riccardo Puliti	Mark R. Lundell	Makhtar Diop

Borrower: Ministry of Economy and Finance			
Responsible Agency: Electricidade de Mozambique (EdM)			
Contact:	Joaquim Ou-Chim	Title:	Head of Projects
Telephone No.:	258823139580	Email:	joaquim.ou-chim@edm.co.mz
Responsible Agency: Ministry of Mineral Resources and Energy			
Contact:	Antonio Eugenio Manda	Title:	Director Planning and Cooperation
Telephone No.:	258843055962	Email:	mandamueda@gmail.com

Project Financing Data (in USD Million)					
[ ]	Loan	[X]	IDA Grant	[ ]	Guarantee
[ ]	Credit	[ ]	Grant	[ ]	Other

Total Project Cost:	150.00	Total Bank Financing:	150.00
Financing Gap:	0.00		

Financing Source	Amount
IDA Grant	150.00
Total	150.00

Expected Disbursements (in USD Million)

Fiscal Year	2018	2019	2020	2021	2022	2023
Annual	5.00	20.00	30.00	45.00	40.00	10.00
Cumulative	5.00	25.00	55.00	100.00	140.00	150.00

Institutional Data

Practice Area (Lead)

Energy & Extractives

Contributing Practice Areas

Proposed Development Objective(s)

The Project Development Objective (PDO) is to improve the operational capacity of the electricity network in the project areas and the operational efficiency of EDM.

Components

Component Name	Cost (USD Millions)
Component 1: Rehabilitation and Upgrade of Network Infrastructure	117.00
Component 2: Enhancement of EDM Operational and Commercial Operations	29.50
Component 3: Capacity Building and Implementation Support	3.50

Systematic Operations Risk- Rating Tool (SORT)

Risk Category	Rating
1. Political and Governance	High
2. Macroeconomic	Substantial
3. Sector Strategies and Policies	Substantial
4. Technical Design of Project or Program	Moderate
5. Institutional Capacity for Implementation and Sustainability	Substantial

6. Fiduciary	Substantial
7. Environment and Social	Moderate
8. Stakeholders	Low
9. Other	
OVERALL	Substantial

Compliance

Policy

Does the project depart from the CAS in content or in other significant respects?	Yes [ ] No [X]
Does the project require any waivers of Bank policies?	Yes [ ] No [X]
Have these been approved by Bank management?	Yes [ ] No [ ]
Is approval for any policy waiver sought from the Board?	Yes [ ] No [X]
Does the project meet the Regional criteria for readiness for implementation?	Yes [X] No [ ]

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

Legal Covenants

Name	**Recurrent**	**Due Date**	**Frequency**

Description of Covenant

Conditions

Source of Fund	**Name**	**Type**
IDAT	Execution of Subsidiary Agreement	Effectiveness

Description of Condition

The Subsidiary Agreement has been executed on behalf of the Association and the Project Implementing Entity.

Source of Fund	Name	Type
IDAT	Execution of Project Agreement	Effectiveness

Description of Condition

The Project Agreement has been executed on behalf of the Association and the Project Implementing Entity, where the Association agrees to sign the Project Agreement on the date it signs the Financing Agreement.

Source of Fund	Name	Type
IDAT	Adoption of Project Operations Manual	Effectiveness

Description of Condition

The Recipient and the Project Implementing Entity have adopted the Project Operations Manual satisfactory to the Association in accordance with Section I.C of Schedule 2 of the Financing Agreement.

Team Composition

Bank Staff

Name	Role	Title	Specialization	Unit
Mariano Salto	Team Leader (ADM Responsible)	Energy Economist	Economist	GEE01
Zayra Luz Gabriela Romo Mercado	Team Leader	Senior Energy Specialist	Engineer	GEE01
Antonio Laquene Chamuco	Procurement Specialist (ADM Responsible)	Senior Procurement Specialist	Procurement	GGO07
Elvis Teodoro Bernado Langa	Financial Management Specialist	Sr Financial Management Specialist	Financial Management	GGO26
Ali Ouattara	Team Member	Senior Financial Specialist	Finance	GEE07
Camilla Gandini	Team Member	Consultant	Gender	GSU07
Chita Azuanuka Obinwa	Team Member	Senior Program Assistant	Assistant	GEE07
Claudio Miguel Jamisse Buque	Team Member	Energy Specialist	Engineer	GEE01
Donald Joseph Purka	Team Member	Senior Infrastructure Finance Specialist	Finance	GTPFS
Eden Gabriel Vieira Dava	Social Safeguards Specialist	Social Development Specialist	Social	GSU07

Gulgoren A. Cansiz	Team Member	Consultant	Engineer	GEE06
Jose C. Janeiro	Team Member	Senior Finance Officer	Finance Officer	WFALA
Maria Do Socorro Alves Da Cunha	Social Safeguards Specialist	Senior Social Development Specialist, Safeguard Po	Social	GSU07
Maria Isabel Nhassengo-Massingue	Team Member	Procurement Assistant	Procurement	AFCS2
Angela Maria Lopez Delfino	Counsel	Senior Counsel	Lawyer	LEGEN
Paulo Jorge Temba Sithoe	Environmental Safeguards Specialist	Environmental Specialist	Environment	GEN01
Pedro Antmann	Team Member	Lead Energy Specialist	Engineer	GEE08
Robert A. Robelus	Social Safeguards Specialist	Consultant	Environment	GEN05
Salma Chande	Team Member	Program Assistant	Assistant	AFCS2
Vladislav Vucetic	Team Member	Lead Energy Specialist	Engineer	GEE01

Extended Team

Name	Title	Office Phone	Location

Locations

Country	First Administrative Division	Location	Planned	Actual	Comments
Mozambique	Sofala	Caia	**X**		
Mozambique	Zambezia	Mocuba	**X**		
Mozambique	Cabo Delgado	Pemba	**X**		
Mozambique	Nampula	Nampula	**X**		
Mozambique	Nampula	Nacala	**X**		
Mozambique	Maputo	Matola	**X**		
Mozambique	Maputo	Maputo	**X**		
Mozambique	Niassa	Lichinga	**X**		
Mozambique	Zambezia	Alto Molocue	**X**		
Mozambique	Tete	Aldeia Matambo	**X**		

Mozambique	Zambezia	Chimuara	**X**		

I. STRATEGIC CONTEXT

A. Country Context

1. **Mozambique is a low-income country along the Southeastern coast of Africa with a gross national income of US$600 per capita and a population of 28 million people**. It has experienced strong and sustained economic development since the end of its civil war in 1992. The annual gross domestic product (GDP) growth has averaged 7.4 percent over the past two decades facilitated by trade, manufacturing, extractive industries, transport, communication, and electricity production.

2. **However, the rapid growth has not translated into significant poverty reduction.** Following a 16-percentage point decline in the national poverty headcount between 1997 and 2003, the pace has slowed considerably, with poverty further falling by only 4 percentage points between 2003 and 2009 and by another 3 percentage points between 2009 and 2015. Close to half of the Mozambican population still lived in poverty in 2015. The weakened relationship between growth and poverty reduction is due to the changing pattern of growth, which in the past decade was driven by capital-intensive, import-dependent sectors.

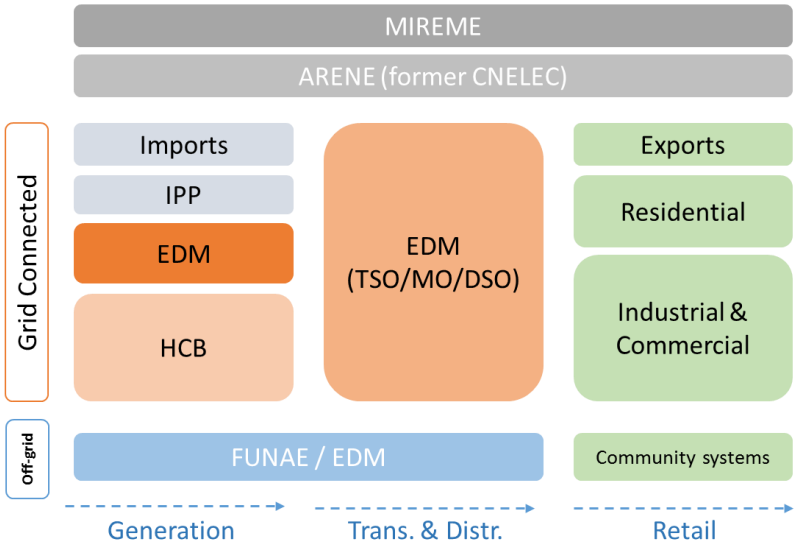
3. **Mozambique's recent economic growth has been derailed due to the compound effects of undisclosed sovereign debt, lower commodity prices, drought, internal conflict, and governance weaknesses.** The disclosure, in April 2016, of US$1.4 billion in commercial loans contracted by state-owned enterprises, equivalent to roughly 10 percent of GDP, undermined investor confidence and resulted in the suspension of the International Monetary Fund program and direct budget support by development partners (DPs). Public debt is estimated to have reached 120 percent of GDP in 2016 (of which 111 percent is external). Foreign direct investment and external credit lines to the private sector were reduced in 2016. This scenario contributed to a slowdown in the economy, with GDP growth contracting to 3.8 percent in 2016 from 6.6 percent in the previous year. Deteriorating economic conditions resulted in depreciation of the Mozambican metical by 27 percent against the U.S. dollar in 2015 and by an additional 37 percent in 2016. While the metical has appreciated by almost 30 percent in the first semester of 2017, its current trading value of Mt 60 per U.S. dollar represents a 45 percent depreciation since January 2015. Depleted fiscal buffers resulted in Mozambique defaulting on an interest payment on its sovereign bond in January 2017. The Government has approached creditors to restructure a part of its debt. Monetary policy tightening, which was ramped up in October 2016, has contributed to stabilizing the metical albeit at the expense of the private sector.

4. **Mozambique's five-year Government Plan (2015–2019) highlights agricultural and industrial development as the basis for socioeconomic development of the country**. The five-year Government Plan, gazetted in April 2015, presents five strategic pillars to achieve accelerated economic growth and social development and targets expanded infrastructure as a key element to enhance the productive sectors of the economy, economic diversification, and improve access to markets. It calls for rehabilitating and expanding access to electricity services which are recognized as a complementary input for the delivery of other basic social services, such as health, education, and sanitary services. Further, the lack of electricity services is identified as a factor of inequality and exclusion within the society. Therefore, provision of reliable, affordable, and sustainable electricity services is considered necessary to support economic growth, firm competitiveness, and poverty reduction in Mozambique.

B. Sectoral and Institutional Context

5. **The current institutional structure of the power sector in Mozambique was established in the 1997 Electricity Law**. The Ministry of Mineral Resources and Energy (MIREME) is the government entity responsible for energy policy and planning, as well as monitoring sector performance and governance. In May 2017, the Parliament approved the creation of the independent regulator, *Autoridade Reguladora de Energia*, (ARENE),[1] with authority to set the electricity tariff. *Electricidade de Moçambique*, (EDM) is the state-owned, vertically integrated utility responsible for electricity generation, transmission, and distribution countrywide. The Energy Fund (*Fundo de Energia*, FUNAE) is a public body with the aim of promoting the development and use of different forms of low-cost power and the sustainable management of power resources. Cahora Bassa Hydropower Plant (*Hidroeléctrica de Cahora Bassa*-HCB) is an entity operating the generation and transmission complex composed of a hydropower plant with an installed capacity of 2,075 MW and the high-voltage direct current transmission system connecting it to the South African power system and, through it, to the Mozambique network in the Maputo area. HCB is owned 92.5 percent by Zambezi Electrical Company (*Companhia Electrica do Zambeze)*, a wholly owned subsidiary of EDM, and 7.5 percent by *Redes Energeticas Nacionais* (a Portuguese Government owned entity). Private sector participation has materialized in the generation segment, through some independent power producers (IPPs) with power purchase agreements (PPAs) with EDM.

Figure 1. Power Sector Structure in Mozambique[2]



6. **The sector has reported impressive results across the value chain.** The country's installed generation capacity is significantly higher than its demand because of HCB. However, 1,330 MW of HCB's 2,075 MW capacity is committed to ESKOM[3], in South Africa, under a long-term PPA, which ends in 2029. The domestic peak demand has increased from about 320

[1] ARENE has been created as a derivative of the National Electricity Council (*Conselho Nacional de Electricidade*, CNELEC), which was established in 1997, under the Electricity Law.
[2] TSO: Transmission System Operator; MO: Market Operator; DSO: Distribution System Operator
[3] ESKOM is the national electricity utility in South Africa.

MW in 2006 to 876 MW in 2016. The current energy mix[4] comprises 56 percent hydropower, 42 percent gas power, and about 2 percent being imported from neighboring countries. The transmission network has expanded from 3,691 km in 2003 to 5,249 km in 2015, but the country still lacks a countrywide integrated electricity grid.

7. EDM has increased access to electricity services from 8 percent in 2006 to 26 percent in 2016 and has reached all administrative centers.[5] Currently, EDM serves more than 1,500,000 customers, including around 1,250,000 with prepaid meters. The collection rate improved from 77 percent in 2009 to 98 percent in 2016. This rate is higher than the weighted average for Sub-Saharan Africa (94 percent). The total system losses are currently estimated at 26 percent in 2016 and this is slightly higher than the weighted average for Sub-Saharan Africa, excluding South Africa (23 percent).

8. EDM remains the cornerstone of the sector, successfully mobilizing new resources for the generation sector, and is taking steps to improve its operational efficiency.

9. **New financing in generation assets.** EDM has mobilized private and public financing for several generation projects commissioned over the last two years or to be implemented in the next three years [6] in the form of state-owned power plants or IPPs. The commissioning of these power generation projects has enabled Mozambique to not only meet its domestic demand and remove emergency power supply, but has also positioned Mozambique as an important player in the regional electricity market, with the possibility to boost EDM's revenues in hard currency through electricity exports. In 2016, about 7,018 GWh of electricity was sold by EDM. The volume of sales has been growing in the past years, with growth in both domestic sales and exports—the compounded annual average growth rate between 2010 and 2016 was 14 percent per year.[7] Domestic sales represented 71 percent and exports 29 percent of the total electricity sales (GWh) by EDM in 2016.

10. **Management information system.** The Integrated Management System, SIGEM (*Sistema Integrado de Gestão*), financed by the World Bank's Energy Development and Access Project (EDAP)(P108444) consists of the incorporation of a management information system (MIS) and other tools to improve efficiency, transparency, and accountability in operations in all business areas, as well as enhance corporate governance. The MIS incorporated through the SIGEM includes (a) a commercial management system (CMS); (b) an incident recording and management system, renamed Outage Management System (OMS), which supports customer complaints related to quality of electricity supply; (c) a corporate resources management system or 'enterprise resource planning' (ERP), which supports management of accounting, finance, human resources, procurement, and logistics; and (d) an internal communication system (ICS), the communication backbone through which all EDM's sites using the MIS are interconnected. Through the implementation of the system, EDM has been able, for the first time, to publish its financial statements without qualification and to clearly identify the gaps in procedures, process

[4] Excluding electricity exported to South Africa

[5] Mozambique has a total of 128 administrative centers.

[6] Operational: *Central Termica Ressano Garcia* (CTRG) (175 MW, gas), Gigawatt (100 MW, gas) and Kuvaninga (40 MW, gas). Under construction: CTM (100 MW, gas) and Mocuba (40 MW, solar). Financing secured: Japanese loan - Temane (100 MW, gas), Metoro (40 MW, solar).

[7] In 2014, Cabo Delgado Province experienced an annual growth of 25 percent in the demand for electricity.

and approvals, and delegation authority, which are an integral part of the governance of the company.

11. **Revenue protection program.** EDM is implementing a revenue protection program (RPP) aimed at eliminating commercial (non-technical losses) in electricity supply to EDM's largest customers (around 5,000 customers, representing close to 45 percent of the company's sales and revenues) through remote monitoring of consumption using advanced metering infrastructure.

12. Significant challenges remain in the power sector to meet the objectives of the Government of Mozambique (GoM) in becoming an energy hub, while providing affordable and sustainable access to electricity service to its population.

13. **Poor network infrastructure.** Lack of a countrywide, interconnected transmission system with limited redundancy and capacity presents a challenge for operation and security of electricity supply. The system is unable to transfer the surplus of energy from the south of the country to other areas that are energy deficient, such as northern Mozambique, where the demand for electricity increased by 25 percent in 2014 due to gas and mining industry activities. Further, the medium- and low-voltage distribution networks have not been dimensioned for such rapid growth of electricity demand. Consequently, the distribution networks are currently overloaded in the main load centers of the country, further compromising the reliability of the electricity service.

14. **Fragile financial health of EDM**. EDM's financial position has become progressively more difficult due to a combination of factors, including (a) the macroeconomic crisis exacerbating EDM's exposure to foreign currency liabilities in 2015–2016; (b) high level of electricity losses in the system;[8] (c) increasing use of new and more expensive thermal-based IPPs (compared to the cost of supply from the Cahora Bassa plant, EDM's main supplier); (d) lack of timely and adequate adjustments to the retail tariff to cover the cost of power purchases and operations; (e) difficulties in collecting payments from a few external customers;[9] and (f) the lack of adequate funding preventing full capital expenditures for rehabilitation of the network and increasing energy access.

15. Despite tariff adjustments in 2015 (26.4 percent) and 2016[10] (40 percent), EDM's average sale price (in U.S. dollar) declined from US$0.0845 per kWh in 2011 to US$0.0629 per kWh in 2016, whereas its average domestic supply costs (in U.S. dollar and net of export revenues) increased from US$0.0846 per kWh in 2011 to US$0.0955 per kWh in 2015 before falling to US$0.0742 per kWh in 2016. Consequently, EDM started to experience significant net losses in 2015 (Mt 1.95 billion on total revenues of Mt 16.3 billion). The preliminary results for 2016 appear slightly better with regards to net losses (Mt 0.98 billion on total revenues of Mt 29 billion), with the operational deficit slightly higher than in 2015 (Mt 2.4 billion versus Mt 2.2 billion).

[8] EDM's operational losses reached 26 percent in 2016 representing around of US$100 million of forgone revenue per year.
[9] Notably from Zambia's utility (ZESCO).
[10] Recently an additional tariff increase (effective August 15th, 2017) of between 30-40 percent was approved, which will increase the average sales price to domestic customers to approximately US$0.1/kWh.

Table 1. EDM Key Financial Indicators (2011–2016)

Indicator	2011	2012	2013	2014	2015	2016
Net profit margin (%) [a]	8.67	1.23	–0.69	–0.57	–11.90	–3.38
Operating margin (%) [b]	7.73	4.32	3.72	0.94	–9.69	–8.34
Current ratio [c]	1.21	1.12	1.03	0.83	0.72	0.69
Leverage [d]	0.62	0.36	0.48	0.75	1.29	2.17

Source: World Bank analysis based on EDM's financial statements.
Note: a. Net profit margin is the percentage of revenue left after all expenses have been deducted from sales. The measurement reveals the amount of profit that a business can extract from its total sales.
b. Operating margin is the ratio of operating income divided by net sales presented in percent. This is an indicator of profitability and is often used to compare the profitability of companies and industries of differing sizes.
c. Current ratio is a liquidity and efficiency ratio that measures a firm's ability to pay off its short-term liabilities with its current assets
d. Long-term debt-to-equity ratio.

16. **Continuing operational inefficiencies.** While the implementation of the SIGEM has made it possible to achieve significant improvements in EDM's operations, it still needs to be expanded to all business areas to enhance operational and commercial performance by accurately recording of billing, revenues, and losses, EDM, through a Project Preparation Advance provided by the World Bank, has already procured technical consultants to review the implementation of the MIS, identify gaps in each sub-system, propose actions to address them, and consolidate the systematic effective application of the systems.

17. **Low electricity access**. Only about one in four Mozambicans has access to electricity. The pace of electrification has also slowed to 80,000 new connections in 2016 compared to 120,000 new connections annually in previous years. The distribution network in larger demand centers cannot accommodate additional customers due to the poor state of the networks. At the same time, the medium-voltage lines that have been built to reach all the districts of the country are underutilized because they only serve electricity to public entities. The low energy consumption and long distance of the lines present an operational challenge to transfer energy at acceptable quality levels. However, the lack of adequate planning and financing prevents EDM and FUNAE from implementing an efficient electrification program to optimize the use of the medium-voltage networks.

18. **Lack of coordinated planning and competitive procurement of new generation capacity.** The GoM has been actively pursuing investments in generation, both through public and private financing, that are not aligned with least-cost options from the country perspective. While projects have enabled Mozambique to maintain adequate domestic supply and increase electricity exports, they have also created a financial burden for the sector. EDM has taken an important step in ensuring long term visibility by preparing a Power Sector Master Plan (2018–2043) (to be completed later this year with technical assistance provided by the Japan International Cooperation Agency [JICA]—see box 1), but it would be required that projects are developed and implemented following least-cost principles developed in the plan and adhering to a competitive and transparent approach.

19. **The GoM is approaching the transformation of the power sector in a multifaceted manner.**

20. **Creation of ARENE.** In May 2017, the Parliament approved a law to transform CNELEC, established as a consultative body providing advice on issues related to the power sector, such as new concessions and tariffs, into an independent regulatory body, ARENE, that

will oversee the power sector. Among other things, ARENE will be responsible for (a) proposing and approving electricity tariffs; (b) promoting competition in the power sector; and (c) proposing legislation in the energy sector. The establishment and capacity building of ARENE are supported by DPs.

21. **Modernization of EDM.** EDM has developed a three-pronged strategy to transform the way in which the company provides electricity services. This includes the following:

(a) **Corporate transformation plan.** This plan (under implementation) comprises a complete overhaul of the organizational structure, consolidation of the MIS (SIGEM) through its effective implementation across all functions, and the reinforcement of the company's financial management (FM) system, including the publication of audited financial statements.

(b) **Improvement of the system reliability**. This activity will implement the short-, medium-, and long-term investments identified in the Transmission and Distribution Master Plan (2012–2027) required to achieve the plan's objectives in extending the grid and ensuring security of supply. In the immediate phase, the short-term supply constraints to increase generation capacity was accorded priority attention. In the subsequent phases, EDM will focus on transmission and distribution system bottlenecks hampering security of supply. As such, EDM has packaged several priority investments, referred to as the Short-Term Investment Program (STIP), to alleviate the most pressing constraints, until longer-term initiatives requiring more time to implement can be completed (see box 2).

(c) **Financial recovery plan.** EDM has prepared a financial recovery plan and has discussed it with the Ministry of Economy and Finance. The plan is under revision by EDM and will be informed in part by a cost-of-service study, supported by the World Bank. This plan, with defined and monitorable milestones, include efforts both on the cost and revenue side, as well as on addressing the stock of debt accumulated in EDM's balance sheet. Actions being considered include cost reduction measures (both in operation and investment), revenue enhancement measures (tariff adjustments, revenue-maximizing export strategies), and other measures to support the company's balance sheet (especially with respect to the payment arrears), as well as measures to ensure more sustainable investment strategies.

22. **Development of the National Electrification Strategy and Plan (NESP).** Over the past years, EDM has been tasked to expand electricity access without proper consideration of how to shoulder the full financial impact of such expansion, as related investments have not specifically been included in the electricity tariff. Without the GoM's financial support, every effort made by EDM to expand access has systematically contributed to the erosion of its profitability and capital base. Therefore, the NESP, currently under preparation with support from the World Bank, aims at developing strategic pathways to achieve national electrification targets without compromising the sector's financial viability (box 1).

23. **The proposed project will support EDM's operational performance as a prerequisite to increase EDM's viability as an off taker.** First, investments in infrastructure rehabilitation will increase the reliability and capacity of the existing transmission and distribution system, which is expected to stabilize the provision of electricity service. Second,

support toward company restructuring built on a sound MIS will increase transparency and accountability, optimize efficiency in operations, and enhance corporate governance. Finally, the targeted investments in reducing commercial losses, will protect EDM's revenue and contribute to restoring its financial sustainability.

Box 1. Mozambique Power Sector Planning Initiatives

(A) **Power Sector Master Plan (2018–2043)**

In 2014, EDM completed the Transmission and Distribution Master Plan (2012–2027) which identified emergency investments in transmission and distribution infrastructure to stabilize the system, while meeting the forecasted demand up to 2027. With the recent discovery of gas fields and commencement of mining activities, the forecasts in the plan require updates.

To update this plan to meet the rapid demand for electricity driven by the discovery of gas fields and commencement of mining activities, EDM is currently preparing an integrated Power Sector Master Plan supported by Japan International Cooperation Agency (JICA), including the investments required for power generation, transmission, and distribution at least-cost to meet the domestic demand growth for the next 25 years (starting in 2018). Preparation of the revised Power Sector Master Plan began in December 2016 and is expected to be completed in November 2017.

(B) **National Electrification Strategy and Plan (NESP)**

The NESP is being developed with the support of the World Bank, with the aim to evaluate the current model for electrification, and propose a new business model to achieve universal access by 2030. This work is undertaken in close coordination with the MIREME, EDM, and FUNAE. The main focus of the NESP is the development of a framework which can accelerate universal access (on-grid and off-grid) in Mozambique. The NESP analysis includes institutional, technical, and financial considerations, which need to be addressed to achieve universal access by 2030. The NESP will also highlight provisions, which will ensure sustainable electricity services to consumers countrywide.

The NESP will comprise a 10-year National Electrification Plan, in full consistency with all the planning and implementation features characterizing the strategy. The plan will comprise the following components: (a) detailed description of proposed electrification projects for an initial three-year period and (b) an outline of investments for the seven-year period following the initial three-year plan, with less granularity in terms of details. The NESP is expected to be delivered in October 2017.

24. **The proposed project is part of a comprehensive World Bank program of support to the power sector.** The project builds on the lessons learned from the recently implemented projects - the Transmission Upgrade Project (TUP, P084404) for the rehabilitation and increase of the substations at transmission level and Energy Development and Access Project (EDAP, P108444) for increasing access and distribution capacity, as well as the first phase of the implementation of the MIS in EDM.

25. **The proposed project represents coordinated and complementary efforts from the DPs to support the development of the power sector in Mozambique.** The STIP, supported by a number of DPs, is the most immediate effort to reestablish the operational performance of EDM (see box 2). In addition, the capacity-building activities, proposed under this project, are complemented by the capacity program financed by the French Development Agency (*Agence Française de Développement*) focusing on technical training and the robust technical assistance to MIREME and ARENE for planning and regulation provided by the Kingdom of Norway, the United States Agency for International Development (USAID), and Sweden. The project also builds on the diagnostic program for loss reduction options for EDM commissioned by USAID. The report coincides with the World Bank technical review and financial support in which Automatic Meter Reading (AMR) is identified as a priority.

Box 2. Short-Term Investment Program

The STIP was defined in April 2015, with the objective of implementing EDM priority investment projects to improve the supply of electricity service by addressing constraints on the reliability of supply, infrastructure capacity, system losses, and operational flexibility of EDM's network This program is also based on EDM's longer-term investment plans and programs. The selection of priority investments was aligned with the following criteria: (a) improvements in quality of supply; (b) reducing negative current impacts on operation and maintenance (O&M); (c) addressing bottlenecks for unserved demand; and (d) risks to health, safety, and environment.

The program consists of eight investment projects in the central and southern regions of the country with a total value of about US$200 million. Financing was secured in two phases in 2016, and July 2017, with construction works expected to commence on September 2017.

Phase	**DP**	**Financing (US$, millions)**
Phase I	Norway	9.5
	European Investment Bank	22.6
	Kreditanstalt für Wiederaufbau	9.8
	EDM	6.3
Phase II	World Bank	150.0
	Total	198.2

C. Higher Level Objectives to which the Project Contributes

26. The proposed project builds on the World Bank's Systematic Country Diagnostic for Mozambique,[11] which notes that access to reliable electricity is key to economic growth and social inclusion and that in Mozambique efforts to offer reliable access are hindered by the poor state of the electricity network and the weak operational and financial position of EDM. The project addresses these aspects as critical first steps to improve the provision of reliable and efficient electricity supply, so that the company may then expand electricity services, in line with the World Bank's twin goals of ending extreme poverty and boosting shared prosperity.

27. The proposed project is aligned with the GoM's 2015–2019 five-year plan and the World Bank's Country Partnership Framework (CPF) FY17–21, whose overarching goal is to support Mozambique in achieving its objective of creating more inclusive growth through employment creation and improving productivity and competitiveness in a sustainable manner. The CPF has three focus areas: (a) Promoting Diversified Growth and Enhanced Productivity; (b) Investing in Human Capital; and (c) Enhancing Sustainability and Resilience. This project is directly linked to the first focus area, contributing to the CPF Objective of 'Expanding Access and Improved Reliability of Electricity'. The CPF target for access to electricity in 2021 is 33 percent of the population.

[11] Report No. 103507-MZ.

II. PROJECT DEVELOPMENT OBJECTIVES

A. PDO

28. The Project Development Objective (PDO) is to improve the operational capacity of the electricity network in the project areas and the operational efficiency of EDM.

Project Beneficiaries

29. The project beneficiaries comprise existing electricity consumers, including industrial, commercial, and residential customers of EDM. Specifically, businesses suffer loss of sales, damage to equipment, and incur additional cost from deploying standby generators when grid electricity supply is unreliable. The reinforcement of the network capacity will enable new customers to be connected to the electricity network and create conditions for access expansion.

30. MIREME and EDM will be beneficiaries of technical assistance to improve the planning capabilities of the sector and the operational performance of EDM.

PDO Level Results Indicators

31. Two indicators will be used to measure achievement of the PDO:

- Cash-recovery index (billing index multiplied by collection index)[12]
- Transmission capacity constructed or rehabilitated under the project (kVA)

III. PROJECT DESCRIPTION

32. The project supports three components aimed at (a) rehabilitation and upgrade of the transmission and distribution network; (b) enhancement of the operational and commercial performance of EDM; and (c) institutional development, capacity building, and project implementation support. The components of the project also build on the recently completed Mozambique TUP (which focused on increasing transmission capacity) and EDAP (which focused on investments to extend the electricity service to new customers and the implementation of the new MISs).

33. A Project Preparation Advance in the amount of US$2 million has been used by EDM to hire consultancy services needed for preparation of project components. The main activities are related to the safeguard studies, preparation of bidding documents for investments in rehabilitation of network infrastructure, and post-implementation review of the SIGEM to identify the main components of the transformation of the EDM initiative.

A. Project Components

Component 1: Rehabilitation and Upgrade of Network Infrastructure (US$117.0 million equivalent)

34. The focus of this component is to improve security and reliability of electricity supply through the reinforcement and rehabilitation of transmission and distribution lines, installation of additional transformers to increase capacity, and installation of reactive compensation equipment in the cities of Maputo, Matola, Nacala, Pemba, and Lichinga, depending on the specific needs of each city.

[12] This will include only domestic energy billed.

35. This component includes urgent investments in the rehabilitation and upgrade of electricity transmission and distribution infrastructure needed to eliminate the existing operational conditions that jeopardize the reliability and quality of services provided by EDM. This component will also include the replacement of obsolete control and protection equipment and the installation of upgrades of the supervisory control and data acquisition (SCADA) equipment in high-voltage substations in Matambo, Chimuara, Mocuba, Alto-Molocue and Nampula to enhance supervisory and control capabilities of the network. This will result in reduced frequency and duration of system interruptions in the main load centers of the country. The installation of control equipment will also enable future integration to the proposed National Control Centre.

Component 2: Enhancement of EDM Operational and Commercial Operations (US$29.5 million equivalent)

36. The focus of this component is to enhance governance, efficiency, transparency, and accountability in operations in EDM's key business areas.

Subcomponent 2.1: Organizational Restructuring, Process Reengineering, and Capacity Building (US$3.7 million equivalent)

37. This subcomponent focuses on defining and implementing a new organizational structure for the company, as well as on reengineering processes and activities in all business areas, with the objective to optimize efficiency, transparency, and accountability in operations, and enhancing both internal and external governance. This subcomponent will also include capacity building and technical assistance to improve the performance of key departments, such as finance, human resources, technical, and procurement, as well as strengthening of the Environmental and Social Safeguards Unit and the Health and Safety Unit through technical assistance by internationally experienced consultants.

38. This subcomponent will focus on providing the skills and tools required to improve the day-to-day operations of the utility in a sustainable manner. Special attention will be directed at addressing gender-related organizational gaps and promoting an inclusive environment among the female and male personnel. This component will also include a customer satisfaction survey aimed at engaging with beneficiaries and creating a feedback loop for EDM. The survey will be made public to enhance accountability and transparency.

Subcomponent 2.2: Consolidation of SIGEM (US$11.1 million equivalent)

39. The focus of this subcomponent is to ensure full permanent use of the functionalities provided by the information systems (IS) supporting operations in all business areas incorporated under the SIGEM. Transparent and accountable execution of efficient processes and activities in all business areas, with the support of IS, are key to improving EDM's operational performance.

40. Activities to be carried out under this subcomponent will involve training, incorporation of additional system functionalities, including a geographic information system (GIS), an asset management system (AMS), and a new package to optimize management of purchases by prepaid customers. While the implementation of the GIS will initially help improve operations in the distribution (for example, attention to outages and customers' complaints) and commercial areas, it will also serve as the cornerstone to plan and implement the expansion of service to new customers.

Subcomponent 2.3: Revenue Protection Program (RPP) - Phase II (US$6.3 million equivalent)

41. The focus of the RPP's second phase is to protect the revenues that EDM receives from sales to large and medium customers, ensuring that all users in that high-value segment are systematically billed according to accurately metered consumption, thus eliminating non-technical losses (unmetered consumption) in supply to those customers. The RPP's first phase will be completed in 2017 and will target 7,000 large consumers (0.5 percent of the total number of customers) representing 39 percent of the electricity consumption (GWh) and 30 percent of the revenue. This subcomponent refers to the RPP's second phase, comprising the remaining 2,000 customers identified in the preparation of the initial phase but not included in its scope, as well as a segment formed by around 8,000 medium sized customers being supplied in low voltage. This component will be completed by the implementation of meter calibration capabilities in EDM.

Subcomponent 2.4: Upgrade of Information Systems (US$8.4 million equivalent)

42. This subcomponent will include upgrades and acquisition of IS (hardware and software). All regions in the country, where EDM provides electricity services to its customers, need to have strong, reliable communication links with the data center where the IS are hosted. The initial phase of the SIGEM included the incorporation of an Internal Communication System (ICS) to provide the links needed for that first phase. However, the scope of the SIGEM will be expanded both through the incorporation of new software packages and the extended application of the existing IS to support key processes (such as prepayment). Therefore, it is crucial to strengthen and upgrade the ICS and the entire information and communication technology (ICT) infrastructure (hardware) needed to run the IS in all places where this is needed, with high reliability and level of performance (speed of communication, and so on).

Component 3: Capacity Building and Implementation Support (US$3.5 million equivalent)

43. This component aims to assist the GoM and EDM build capacity to address key sector issues and to provide support toward project implementation.

Subcomponent 3.1: Capacity Building and Implementation Support for MIREME (*US$2.0 million equivalent)*

44. The GoM, through MIREME and the recently created ARENE, is responsible for the development of adequate planning and regulation of the power sector, in particular for the development of sound mechanisms to implement the NESP and the Power Sector Master Plan (2018–2043), including transparent and competitive procedures for procurement of new generation capacity in a least-cost manner and a methodology for the calculation of the end-user tariff based on sound economic and technical principles. This subcomponent, implemented by MIREME, will support capacity-building activities for key sector institutions in aspects related to power sector planning, fostering competition in the power sector, methodologies and procedures to calculate electricity tariffs reflective of recognized (or allowed) efficient costs, and mechanisms to promote access and public participation in government-related activities (like planning or tariff processes). In addition, this subcomponent will support project management-related expenses such as the financing of external audit, office equipment, and incremental operating costs for MIREME.

Subcomponent 3.2: Capacity Building and Implementation Support for EDM (US$1.5 million equivalent)

45. This subcomponent will support project management-related expenses such as the financing of external audit, oversight of implementation of the environmental and safeguards instruments for the investments, as well as the oversight of health and safety aspects during construction and operation, office equipment, and incremental operating costs for EDM. In addition, this subcomponent will finance consultancy services that will be required to complement and build capacity in EDM for the effective implementation of the NESP and the Power Sector Master Plan (2018–2043). It also includes technical assistance to support two technical studies on the review of the network's protection system and a review of the existing national grid code.

B. Project Financing

46. The proposed instrument is an Investment Project Financing in the amount of a US$150 million equivalent International Development Association (IDA) Grant.

Project Cost and Financing

Project Components	Project cost (US$, millions)	IDA Financing (%)
Component 1: Rehabilitation and Upgrade of Network Infrastructure	**117.0**	**100**
Total Cost of Component 1	**117.0**	**100**
Component 2: Enhancement of EDM Operational and Commercial Operations	**29.5**	**100**
2.1: Organizational Restructuring, Process Reengineering, and Capacity Building	3.7	100
2.2: Consolidation of SIGEM	11.1	100
2.3: Revenue Protection Program (RPP) - Phase II	6.3	100
2.4: Upgrade of Information Systems	8.4	100
Total Cost of Component 2	**29.5**	**100**
Component 3: Implementation Support and Capacity Building	**3.5**	**100**
3.1: Capacity Building and Implementation Support for MIREME	2.0	100
3.2: Capacity Building and Implementation Support for EDM	1.5	100
Total Cost of Component 3	**3.5**	**100**
Total Costs	**150.0**	**100**

Note: Infrastructure project components include 7 percent of price and physical contingency and are based on studies and recent tendering process by EDM.

C. Lessons Learned and Reflected in the Project Design

47. **Financial sustainability requires a multipronged strategy.** The experience of the recently implemented projects, TUP (which focused on increasing transmission capacity) and EDAP (which focused on investments to extend the electricity service to new customers and the implementation of the new MISs), indicated the need of a holistic approach to enhance EDM's

efficiency that takes into account a comprehensive set of investments but also management support in the company to achieve the expected improvements on operational and financial performance. The proposed project provides the financial resources required for removing key physical bottlenecks at the distribution and transmission network, while addressing the gaps on the implementation of the MIS and the changes in the company structure.

48. **SIGEM has been driven by international best practices in power system operations**. Lessons from experiences with utility reforms across Sub-Saharan Africa (including Kenya, Rwanda, Tanzania, and Liberia) and emerging countries have informed the design of this project. During the 1990s and first decade of the 21st century, many countries (Armenia, Brazil, Chile, Colombia, Georgia, Ghana, India, Kenya, Moldova, and Peru) incorporated incentive-based regimes for regulation of the electricity distribution segment, providing incentives for distribution utilities to deliver high-quality service to their customers and maximize their profits through efficiency in operations. Under that regulatory environment, several distribution companies successfully implemented management improvement plans (MIPs) aimed at improving their performance in all business areas, with a focus on customer service in all dimensions.

49. In most cases, the main components of the MIPs were (a) selecting and appointing a new management team (initially having some foreign members, but becoming fully local overtime) with adequate technical skills and ethics; (b) incorporating a MIS to enable efficient, transparent, and accountable execution of operations; (c) implementing programs for sustainably reducing non-technical (that is, commercial) losses in supply, focused initially on large users; and (d) executing urgent investments in the rehabilitation and upgrade of existing electricity distribution networks, which are critical to achieving an acceptable quality of service.

50. **Implementation of SIGEM through EDAP ensured significant improvements in EDM's operations in most business areas**. Making proper use of the functionalities of the ERP for the first time, enabled EDM to achieve unqualified audited accounts for 2015. Improvements in the execution of all commercial functions have been significant, particularly, on the integral management of both prepaid and postpaid customers through the CMS. However, there were difficulties in enforcing systematic use of the MIS in certain areas, due to inadequate governance and leadership. Additionally, the implementation of the SIGEM did not go together with the corresponding restructuring of the company and definition and implementation of the new operational procedures, and training of the systems were not enforced and/or sufficient.

51. To address these aspects, the project includes the required support for restructuring the organization of the company, definition of demand authority and procedures, complementary training, and additional software infrastructure to support its proper implementation. Achievements in this task will serve to test the actual willingness and ability of EDM's Board to strengthen governance in the company, by enforcing the application of the MIS to improve efficiency, transparency, and accountability in operations. Strengthening the systematic use of the MIS incorporated under the SIGEM, eventual incorporation of new IS (asset management, and so on) and organizational restructuring of EDM will be the main tasks under Component 2 of the project.

52. **Project preparation advance has been secured for timely implementation.** During the implementation of EDAP and TUP, World Bank-financed procurement and execution of large infrastructure works were often delayed given the lack of implementation readiness of the

investments at the time of project effectiveness. Therefore, a Project Preparation Advance (PPA) was provided to ensure that activities are executed on time. The activities financed under this PPA are in advanced stages of preparation and/or procurement. The most critical activity included in the PPA is the hiring of a consultancy company responsible for providing the engineering services required for the design and supervision of the investments included in Component 1. The contract for those services has been awarded and the consultancy works have been initiated. In addition, the post-implementation review of the SIGEM has also been completed and the recommendations arising from those studies will be used as inputs for the preparation of the activities included under Component 2 of the proposed project.

IV. IMPLEMENTATION

A. Institutional and Implementation Arrangements

53. Project implementation will be led by MIREME and EDM. MIREME will implement Subcomponent 3.1 and EDM will implement Components 1 and 2 and Subcomponent 3.2. For the MIREME subcomponent, the National Directorate of Energy will be responsible for the implementation. In the case of activities executed by EDM, a dedicated team (Project Implementation Unit [PIU]) has been appointed with experience in implementing IDA-financed projects. This PIU will also include international expertise with regard to the implementation of the Environmental and Social Management Plan (ESMP), Resettlement Action Plan (RAP), and Health and Safety Plans. Given the relevance of activities funded under Component 2, the PIU will report directly to the Board of EDM on the progress made. This is key to ensure that all decisions on transformation, adopted during execution of tasks in the component, are effectively implemented as defined and fully enforced companywide.

54. **EDM PIU.** The PIU is led by a Director and is supplemented with additional staff given the size of the project portfolio it manages, including the additional projects that are part of the STIP. The Director will be supported by the other departments of EDM (project management, contract management, procurement, social safeguards, environmental safeguards, health and safety, and project accounting) and specialist consultants who will be financed through PERIP. Appropriate technical assistance is included to support implementation, especially in the areas of procurement processing and supervision of construction works, as well as international technical assistance to build capacity in EDM's Environmental and Social Unit and EDM's Health and Safety Unit to oversee the adequate implementation of the ESMP, RAP, and health and safety aspects during construction.

55. **MIREME PIU.** The implementation of Subcomponent 3.1 will rely on MIREME's existing structure that has implemented World Bank-financed projects in the past. This will be led by the National Directorate of Energy (*Direcção Nacional de Energia*), which is also in charge of planning of the power sector.

B. Results Monitoring and Evaluation

56. The monitoring and evaluation (M&E) of the project will be carried out by the MIREME and EDM PIU for each of their components. At MIREME, the National Directorate of Energy will prepare a quarterly report to be submitted to the Minister of MIREME. In the case of EDM, the unit will prepare a quarterly progress report for discussion by the EDM's senior management and on a periodic basis by the EDM's Board. Both progress reports will be submitted to the World Bank, including the results indicators, as well as reporting on the implementation of the

ESMP, RAP, and Health and Safety Plans. Annex 1 presents the project's Results Framework, which defines specific outcomes and results to be monitored.

C. Sustainability

57. EDM's new management is committed to turn around the overall status of the company for the sustainable provision of electricity services.

(a) **Grid reinforcement components will accelerate the recovery of operational performance of the company.** The current condition of the transmission and distribution infrastructure prevents EDM from providing adequate electricity services to customers located in certain areas of the country, limits the possibility to serve the increasing electricity demand from existing and prospective customers, and contributes to increase technical losses in the system. Timely project implementation will allow Mozambique to reduce voltage drops and technical losses while meeting the rapidly increasing demand for electricity in the country with important economic benefits, as demonstrated in the economic analysis.

(b) **Enhancement of EDM's operational performance will affect EDM's financial situation.** By targeting improvements on the operational, management, and commercial activities within EDM (proper implementation of Component 2), the project is expected to improve EDM's financial situation. In addition, technical assistance activities developed under this project, complemented with related ongoing activities supported by the World Bank (for instance, debt restructuring options funded by Sustainable Energy for All) will help define and establish a sound road map for more efficient EDM operations and restore its long-term financial sustainability. Improving the financial situation of the company will ensure that sufficient resources are allocated for O&M, thus preventing system failure as is the present situation. This is critical to ensure that the economic benefits proposed under this project are not eroded by systemic EDM constraints.

V. KEY RISKS

A. Overall Risk Rating and Explanation of Key Risks

58. The overall risk rating for the project is Substantial. Key risks and mitigation measures are discussed in the following paragraphs.

59. **Political and governance risks (High).** Political and governance risk in the sector could raise concerns for the project. Lack of adequate tariff regulation, sectoral planning, and funding of critical investments in the sector have prevented EDM to adequately run routine O&M of the existing assets. This situation is exacerbated with the rapid demand for electricity services putting additional pressure on the existing infrastructure. Additionally, the GoM pursued investments in generation that do not follow a least-cost option from the country perspective, significantly affecting the sector efficiency.

- **Mitigation.** The project is expected to alleviate and partly improve the physical constraints in the network by increasing capacity or rehabilitating it through Component 1. Additionally, Component 2 is expected to increase the overall operational performance of the company that will facilitate having sufficient maintenance funds so the benefits of the project can be sustained. Component 3 is

expected to support capacity building on power sector regulation and planning at the government level, through MIREME, to enforce that investments follow the least-cost option and that the tariff recognizes the efficient costs of providing electricity services.

60. **Macroeconomic risk (Substantial).** The increase in debt levels, the depreciation of the new Mozambique metical, and external shocks (such as commodity price) have heightened Mozambique's macroeconomic vulnerability and exposure to fiscal risk. EDM, like many other state-owned enterprises in Mozambique, is cash constrained and is struggling to meet current payment obligations. This is putting undue stress on its current liabilities, with no new sources of working capital. There is limited capacity from the Government to financially bridge or remedy these short-term issues. This situation warrants a financial recovery plan for EDM. Macroeconomic risks are being mitigated through policy dialogue and technical assistance through the study of 'Cost of Electricity Services', which aims at (a) establishing the actual cost of electricity to be recognized through the tariff; (b) establishing a tariff methodology to carry out adjustments; and (c) analyzing the options for EDM's financial recovery plan.

61. **Sector strategies and policies (Substantial).** Weak corporate governance and inadequate senior management capacity in EDM may delay project implementation.

- **Mitigation.** EDM is undergoing a restructuring process aiming to improve overall performance of the company. Through the restructuring process, EDM is defining and implementing a new organizational structure for the company, as well as reengineering processes and activities in all business areas, with the objective to optimize efficiency, transparency, and accountability in operations, and enhance both internal and external governance. These actions, supported through the project under Component 2 and a Steering Committee (Transformation Team), are not only expected to change procedures and operations of the company but also change the internal culture of the current business operation of the company.

62. **Institutional capacity for implementation and sustainability (Substantial).** EDM is implementing large capital investments in transmission and distribution system expansion and upgrade, which is financed by several donors, commercial banks, and by its own resources. While this unit has extensive experience in implementing projects with World Bank financing in TUP and EDAP, the capacity of EDM's existing PIU, which is handling these projects, is stretched.

- **Mitigation.** The existing PIU in EDM will be strengthened to undertake activities under Components 1, 2, and 3 by specialists in the most technical areas of the project. For Component 2, the PIU will receive technical input from the SIGEM unit. Additionally, EDM is establishing a Transformation Team to ensure that the actions aiming at restructuring the company are delivered. The Transformation Team will also provide technical input for activities related to Component 2.

63. **Fiduciary risks (Substantial).** The FM assessment evaluated MIREME's and EDM's financial management arrangements with respect to their ability to (a) ensure that funds are used only for their intended purposes in an efficient and economical way; (b) enable the preparation of accurate and timely financial reports; (c) ensure that funds are properly managed; (d) enable project management to monitor the efficient implementation of the project; and (e) safeguard the

project's assets and resources. The conclusion of the review showed that current FM arrangements are weak, and thus the fiduciary risk of the project is Substantial.

- **Mitigation.** To mitigate this risk EDM and MIREME will need to implement the following measures: (a) updating of World Bank-related procedures of the existing FM Procedures Manual (part of the Project Implementation Manual); and (b) register the project and its components in the ERP. The proposed FM arrangements, as summarized in Annex 3, meet the requirements for FM under OP/BP10.00, and therefore, are able to provide, with reasonable assurance, accurate and timely information on the status of the project as required by IDA.

VI. APPRAISAL SUMMARY

A. Economic and Financial Analysis

64. **World Bank value added.** The World Bank is well-positioned to convene DPs and effectively leverage investment and technical assistance support. The scale of the challenges and the resources needed to transform Mozambique's power sector calls for an integrated, long-term support program, well beyond the capacity of one institution. The current, proposed project would not only respond to urgent and priority activities to respond to the short-term crisis but also support the restructuring of EDM toward more sustainable financial equilibrium, an important condition to set the stage and develop the NESP that can be used as a framework for future partner involvement. This strategy will provide the long-term vision to achieve national access targets, as well as ensure the proper coordination between the stakeholders, including the strategic support by multiple donors. The World Bank team will continue to closely coordinate to enable this partnership.

65. **Rationale for public sector provision/financing.** The transmission and distribution assets financed under Component 1 are capital-intensive projects with a long expected lifetime and low return on investment that are unlikely to be attractive for private sector financing. The World Bank financing helps ensure the financial viability of a project that is critical to guarantee the provision of electricity services in Mozambique. Commercial loans—if available at all for this project—would compound the financial burden on an already financially weak utility. Public financing for transmission and distribution infrastructure is complemented by private investments and Public-Private Partnerships in power generation, which relieve some of the pressure on scarce public funds.

66. In the power sector in Mozambique, the World Bank's cascade approach is applied to prioritize private sector investment in new generation capacity (under an IPP scheme) and commercializing transmission infrastructure to connect power plants and interconnect existing systems. Public investment by EDM is the natural choice to rehabilitate, upgrade, and expand the existing network (transmission and distribution infrastructure).The amount of investment required exceeds the funds that Mozambique receives from exports of hydropower to its neighbor countries. Supporting those public investments is crucial considering the fragile macroeconomic situation that limits the availability of any credit facility (either commercial or concessional). Additionally, reinforcement and upgrades in the network are a critical precondition for expanding access which is normally, and should be, financed through public funds.

67. **Economic analysis.** The economic analysis shows that the project is economically viable even excluding the impact of reduced Green House (GHG) emissions. The baseline net present value (NPV) of the proposed project is US$41.7 million (at 6 percent discount rate) with an economic return of 10 percent (see table 2).

Table 2. Economic Analysis

Discount Rate	%	6%
Economic Internal Rate of Return (EIRR)		
EIRR (excluding. CO_2)	%	10.0
EIRR (including CO_2)	%	13.5
Composition of NPV		
Costs		
CAPEX	*US$, millions*	*97.43*
OPEX	*US$, millions*	*21.40*
Total costs	US$, millions	118.83
Benefits		
Reduced unserved demand	*US$, millions*	*9.29*
Reduced non-technical losses	*US$, millions*	*67.22*
Reduced technical losses	*US$, millions*	*84.03*
Total benefits	US$, millions	160.54
NPV (excluding CO_2)	**US$, millions**	41.71
Benefits from CO_2 reductions	US$, millions	45.65
NPV (including CO_2)	**US$, millions**	**87.37**

Note: CAPEX = Capital Expenditure; OPEX = Operating Expenditure.

68. **Financial analysis.** The results of the analysis show that the project is financially viable with an NPV of US$87.6 million (at 1.5 percent discount rate) with a financial internal rate of return (IRR) at 6 percent (see table 3).

Table 3. Financial Analysis

Discount Rate (WACC)	%	1.5%
Financial IRR		
IRR	%	6.0
Composition of NPV		
Costs		
CAPEX	*US$, millions*	*141.84*
OPEX	*US$, millions*	*47.49*
Total costs	US$, millions	189.32
Benefits		
Reduced unserved demand	*US$, millions*	*6.86*
Reduced non-technical losses	*US$, millions*	*122.34*
Reduced technical losses	*US$, millions*	*147.77*
Total benefits	US$, mil*lions*	276.98
NPV	**US$, millions**	**87.65**

Note: WACC = Weighted Average Cost of Capital

B. Technical

69. The proposed project includes works, equipment, and technical assistance related to (a) improving reliability and quality of services; (b) transforming EDM; (c) the RPP; and (d) technical assistance. The project presents no unusual construction and operational challenges. However, the project introduces support for the transformation of EDM to improve the overall performance of the company, requiring a different implementation arrangement. Such arrangements are based on the lessons learned from previous World Bank-financed projects.

70. **Rehabilitation and Upgrade of Network Infrastructure (Component 1).** This component will assist EDM in the refurbishment and upgrades of critical transmission and distribution infrastructure. EDM's equipment and infrastructure, in some locations, is old and in some cases obsolete. System failures due to aging equipment is one of the leading reasons for many of the power outages experienced in the country. The major cities in the north of the country have also experienced unexpected load growths, which have put strain on the existing transmission and distribution networks. Through the upgrades and refurbishments, the utility and its customers will benefit from a new and reliable grid, which is expected to improve the overall system efficiency and reliability. This component will also assist EDM in preventing long-lasting fault events that may cause damage to high-value equipment. The preliminary design of the projects to be included in this component has already been carried out by EDM and revised by a consulting engineering firm.

71. **Enhancement of EDM Operational and Commercial Operations (Sub-Components 2.2 and 2.4).** The technical aspect of this component is the implementation of the second phase of the SIGEM system. The SIGEM was first rolled out under EDAP, with the expectation that the system would improve the efficiency of the company's operations, through a centralized system which would provide transparency and good accountability in all business areas. The design of second phase is based on a post-evaluation review of the first phase of the program, which identified the gaps and next steps to stabilize the system and operations in the company. The second phase is designed in a manner that many of the management limitations that affect efficiency and reliability would be addressed

72. **Revenue Protection Program (Sub-component 2.3).** The first phase included installation of 3,000 new meters and the Automatic Meter Reading (AMR) system. These two components have integrated seamlessly without any technical challenges. The AMR system allows for the installation of meters from different manufacturers, which is an advantage to the utility. As part of the first phase of implementation, the AMR system will be integrated with the SIGEM, particularly with the CMS. The second phase of the RPP will be designed based on the audit of the program and how the installation and integration of the meters with the SIGEM has been carried out.

C. Financial Management

73. An FM assessment was conducted according to OP/BP 10.00. Its objective was to determine whether MIREME and EDM have acceptable and adequate FM arrangements to (a) ensure that funds are used only for their intended purposes in an efficient and economical way while implementing agreed activities; (b) enable the preparation of accurate and timely financial reports; (c) ensure that funds are properly managed and flow smoothly, rapidly, adequately, regularly, and predictably; (d) enable project management to monitor the efficient implementation of the project; and (e) safeguard the project's assets and resources.

74. The conclusion of the review of the proposed FM arrangements was that the overall residual FM risk rating of the project is Substantial. EDM will need to implement mitigating measures to the identified risks, including the updating of World Bank-related procedures of the already existing FM Procedures Manual (part of the Project Implementation Manual), and register the project and its components in the ERP. The external audit will be under the responsibility of the same private auditor in charge of auditing EDM entity financial statements, who will be recruited within three months of effectiveness. The proposed FM arrangements, as

summarized in annex 3, meet the requirements for FM under OP/BP 10.00, and therefore, are able to provide, with reasonable assurance, accurate and timely information on the status of the project as required by the World Bank (IDA). Similar mitigation actions need to be implemented at MIREME.

D. Procurement

75. The proposed procurement activities for the project will be managed by two separate PIUs, one under the EDM's Directorate of Social Energy (DES) and supported by different units to provide technical input and final implementation of the components and another existing PIU for MIREME subcomponent. The EDM PIU is currently managing a PPA for this operation. In addition, the DES is currently implementing other World Bank-funded operations. The EDM PIU will report to the Director of DES and is headed by a Project Manager, experienced in World Bank-funded operations, including fiduciary requirements, and supported by, amongst others, a Deputy Project Manager, a Contracts Management and Procurement Officer, and a Project Engineer. The MIREME subcomponent will be managed by the PIU currently managing the World Bank-funded Mining and Gas Technical Assistance Project (P129847), with a highly satisfactory track record in World Bank fiduciary requirements.

76. The capacity of these PIUs was reviewed during preparation and was found to be adequate for managing the procurement activities for the project as the PIUs are staffed with qualified and experienced personnel. External support will be required to provide technical review for specific assignments on a short-term basis for the EDM's PIU. Nevertheless, the capacity of the PIUs will be continuously monitored, during implementation, to ensure that both EDM and MIREME can implement the project as required.

77. Procurement for the proposed operation will be carried out in accordance with 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', published by the World Bank in January 2011 and revised in July 2014 ('Procurement Guidelines'), in the case of goods, works, and non-consulting services; and 'Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits and Grants by World Bank Borrowers', published by the World Bank in January 2011 and revised in July 2014 ('Consultant Guidelines') in the case of consultants' services, and the provisions stipulated in the Grant Agreement. Further, the 'Guidelines on Preventing and Combating Fraud and Corruption in Projects Financed by IBRD Loans and IDA Credits and Grants', dated October 15, 2006, and revised in January 2011 will apply.

78. Major risks associated with the implementation of the project are related to the capacity of the PIU to secure and retain qualified specialists, with adequate experience in procurement and contract management. The country's current practice of making payment abroad may also affect the performance of the procurement function and the project. In addition, the fulfillment of the requirements of the *Tribunal Administrativo* (TA) may lead to delays for contract signing after the issuance of the World Bank's 'no objection' to the contract award. It is instrumental that the time required for the processing by the TA is carefully taken into consideration.

79. The procurement risk associated with the project, in view of the risks indicated earlier and the experience of previous World Bank-financed projects, is **Moderate**.

E. Social (including Safeguards)

80. The proposed project is expected to have positive social benefits, and provide improved reliability of electricity service will lower costs for businesses across the country. The rehabilitation and refurbishment of the transmission and distribution infrastructure will remove the current infrastructure bottleneck for expanding the grid for electrification.

81. Almost all infrastructure investments under Component 1 (Rehabilitation and Upgrade of Network Infrastructure) and Component 2 (Enhancement of EDM Operational and Commercial Operations) will be within the footprint of the existing electricity network infrastructure (that is, at existing EDM substations and lines). It is expected that permanent land acquisition for these components will be minimal, and to the extent that it occurs, it will not require involuntary resettlement. Land acquisition requirements have only been identified in one line for which small parcels will be required along a road with no settlements.

82. The utility prepared two different safeguards instruments depending on whether the exact locations of the investments were known at the time of appraisal. A Resettlement Policy Framework (RPF) was prepared for investments in Nacala, Pemba, and Lichinga, for works without identified exact locations. The RPF includes preliminary impacts identification, an eligibility matrix, along with a clear process to complete the identification of project-affected people that needs to be recorded into an RAP. This will be completed once the design is finalized for each project and the locations are known. For Maputo/Matola area, given that the project corridor is defined, a substantially complete RAP has been developed. The RAP includes special provisions regarding the two project areas with less defined footprints, including estimates of impact and brief discussion of possible variability and alternatives, eligibility matrix, and provisions to adjust the RAP for these sections within a defined time frame before bidding out the respective works.

83. All construction is expected to take place in urban and peri-urban areas, as such there will be no major worker camps and the labor force is expected to be local. During implementation of the project, EDM will have to ensure that the ESMPs include adequate health and safety management plans, stakeholder engagement plans, and community safety measures. Contractors will be required to prepare and implement site-specific construction ESMPs and Health and Safety Plans.

84. EDM will establish and implement a grievance redress mechanism and will require each contractor to have a procedure to address complaints received and channel them to EDM's grievance redress mechanism.

85. The RPF and RAP have been consulted upon, approved by the World Bank, and have been disclosed in the World Bank webpage and in-country on according to the table below:

Table 4. Safeguard Instrument Disclosure

Safeguard instrument	Date of disclosure in World Bank webpage[13]	Date of disclosure in-country
RAP Maputo/Matola	August 1, 2017	August 1, 2017
RPF for all the cities	August 1, 2017	August 1, 2017

[13] Date of instrument submission to the World Bank webmaster for publication on the World Bank webpage.

86. **Gender.** As part of EDM's restructuring process, the project will support the analysis of the gender gaps at EDM company level and support action for a more equal and inclusive environment. From the external perspective, the customer survey will track sex-disaggregated data for M&E purposes.

F. Environment (including Safeguards)

87. The proposed project is category 'B' given the limited impact of the project on the natural environment and low density settlement patterns within project routes. The project does not affect natural or critical natural habitats and does not cross protected forest areas or national parks. The project will finance the rehabilitation and upgrades of existing transmission and distribution lines, and the construction of one new transmission line of 220 kV and 66 kV mostly along the existing rights-of-way. Other investments of the project will finance rehabilitation of the existing power equipment within existing substations of Maputo, Matola, Nacala, Pemba, and Lichinga.

88. The client prepared four different safeguard instruments regarding the environmental and social assessments or plans following the World Bank guidelines on safeguards and the Mozambican Law. The safeguard documents include two separate Environmental and Social Impact Assessments (ESIAs) for Maputo and for the rest of the cities, for which locations of investments are known, and two separate Environmental and Social Management Frameworks (ESMFs) for Maputo/Matola and for the other cities, for which locations were not known at the time of appraisal. The documents were approved by the World Bank and disclosed in its webpage and in-country as shown in table 5.

Table 5. Safeguard Instrument Disclosure

Safeguard Instrument	Date of Disclosure in World Bank webpage[14]	Date of Disclosure In-country
ESIA for Maputo/Matola	July 28, 2017	July 26, 2017
ESMF for Maputo/Matola	July 28, 2017	July 26, 2017
ESIA for all the cities	July 28, 2017	July 26, 2017
ESMF for all the cities	July 28, 2017	July 26, 2017

89. The project will be in compliance with the applicable World Bank Safeguard Policies and be in compliance with the World Bank Group's General Environmental, Health, and Safety (EHS) Guidelines from April 2007 and the EHS Guidelines for Electric Power Transmission and Distribution. All contractor employees will need to sign a Code of Conduct in which it is clearly stated that sex with minors (under 18 years) is strictly forbidden. Contractors will be responsible for the monitoring of the Code of Conduct. Non-compliance could result in project stoppage. It is forbidden for contractors to employ child labor as children sometimes leave school to be employed. The labor influx management plan should clearly prescribe how temporary local employees are hired in compliance with Mozambican Law and the International Labor

[14] Date of instrument submission to the World Bank webmaster for publication in the World Bank webpage.

Organization's labor standards. Unskilled labor will be hired, by preference, from the nearby communities in the area where construction is taking place and will vary in accordance with progress of construction. Contractors will need to have sufficient insurance for workers in case of disability or a fatal accident. The contractors' and owner's engineers will be requested, in their bids, to provide a specific budget line for the construction, the ESMP, and the Health and Safety Plan that will take into account the resources for their preparation and implementation. In case of non-compliance, these amounts will be withheld.

90. EDM's Environmental and Social Unit, as well as EDM's Health and Safety Unit will be strengthened under the project. An international environmental and social consultant, as well as an international health and safety consultant, will be hired under the project to provide capacity building for EDM on those aspects.

G. World Bank Grievance Redress

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

H. Citizen Engagement/Beneficiary Feedback

92. The project includes a gender-sensitive customer survey with a feedback loop as part of the M&E system for assessment of electricity users' satisfaction with the service provided by EDM. Outcomes of the survey will be incorporated as part of reengineering and transformation of the company supported under the project and will be made public to enhance accountability and transparency.

Annex 1: Results Framework and Monitoring

Mozambique: Power Efficiency and Reliability Improvement Project (PERIP) (P158249)

Results Framework

Project Development Objectives								
PDO Statement								
The Project Development Objective (PDO) is to improve the operational capacity of the electricity network in the project areas and the operational efficiency of EDM.								
These results are at	Project Level							
Project Development Objective Indicators								
		Cumulative Target Values						
Indicator Name	Baseline	YR1	YR2	YR3	YR4	YR5	YR6	End Target
Transmission capacity constructed or rehabilitated under the project (Kilovolt-Ampere [KVA])	0.00	0.00	0.00	15,000.00	30,000.00	40,000.00	50,000.00	50,000.00
Cash-recovery index (Percentage)	71.50	71.50	71.50	71.70	72.00	72.50	73.00	73.00
Intermediate Results Indicators								
		Cumulative Target Values						
Indicator Name	Baseline	YR1	YR2	YR3	YR4	YR5	YR6	End Target
Transmission lines constructed or rehabilitated by the project	0.00	0.00	0.00	20.00	50.00	60.00	70.00	70.00

(Kilometer)								
Customers with Advanced Metering Infrastructure (Number)	5,000.00	5,000.00	6,000.00	7,000.00	8,000.00	9,000.00	10,000.00	10,000.00
EDM's operational practices revised (Yes/No)	No	No	No	Yes	—	—	—	Yes
Revised organizational structure of EDM adopted (Yes/No)	No	No	No	Yes	—	—	—	Yes
EDM staff provided with operational training in either HR, Finance, Technical, Procurement (Number)	0.00	10.00	30.00	60.00	90.00	120.00	150.00	150.00
Female EDM staff provided with operational training in either HR, Finance, Technical, Procurement (Number - Sub-Type: Breakdown)	0.00	5.00	15.00	30.00	45.00	60.00	75.00	75.00
EDM to develop a gender-sensitive customer service survey and make results public in the web (Yes/No)	No	No	No	Yes	—	—	—	Yes

Indicator Description

Project Development Objective Indicators				
Indicator Name	**Description (indicator definition etc.)**	**Frequency**	**Data Source / Methodology**	**Responsibility for Data Collection**
Transmission capacity constructed or rehabilitated under the project	KVA of transmission capacity that are constructed or rehabilitated by the project	Quarterly	EDM monitoring report	EDM
Cash-recovery index	This is an indicator of the percentage of power purchased and generated by EDM that is paid for by consumers. This is calculated as (energy billed by EDM / energy purchased and energy generated by EDM) × (electricity billings paid by consumers / total electricity billings issued to consumers). Cash Recovery Index (%) = [kWh billed by EDM / kWh purchased and generated by EDM) × [Mt$ paid by consumers to EDM / Mt$ billed by EDM to consumers] ×100	Quarterly	EDM	EDM
Intermediate Results Indicators				
Indicator Name	**Description (indicator definition etc.)**	**Frequency**	**Data Source / Methodology**	**Responsibility for Data Collection**
Transmission lines constructed or rehabilitated by the project	Kilometers of transmission lines (66 kV) that are constructed or rehabilitated by the project	Quarterly	EDM monitoring report	EDM
Customers with Advanced Metering Infrastructure	Customers supplied with smart meters and incorporated into the Meter Data Management System	Quarterly	EDM monitoring report	EDM
EDM's operational	EDM management to approve an	Quarterly	EDM monitoring report	EDM

practices revised	operation practices manual consistent with the MIS			
Revised organizational structure of EDM adopted	EDM management to approve and implement a revised organizational structure	Quarterly	EDM monitoring report	EDM
EDM staff provided with operational training in either HR, Finance, Technical, Procurement	EDM staff provided with training in the specific areas	Quarterly	EDM monitoring report	EDM
Female EDM staff provided with operational training in either HR, Finance, Technical, Procurement	Female EDM staff provided with training in the specific areas	Quarterly	EDM monitoring report	EDM
EDM to develop a gender-sensitive customer service survey and make results public in the web	*Citizen Engagement Indicator*. Customer service survey developed. Results of the survey made public, along with how the survey outcomes are feeding into the EDM reengineering.	Quarterly	EDM monitoring report	EDM

Annex 2: Detailed Project Description

Mozambique: Power Efficiency and Reliability Improvement Project (PERIP)

1. EDM has had limited resources for capital investments to ensure adequacy in the transmission and distribution network to follow the rapid increase in electricity demand. Consequently, the overall condition of the network is poor with an urgent need for rehabilitation and upgrade. In 2015, EDM recorded 270 hours of outages and 26 percent of total electricity losses. The transmission system lacks redundancy, protection, and capacity, compromising the security, reliability, and quality of electricity supply.

2. The distribution networks are currently overloaded and there is a deterioration in system reliability, representing a bottleneck for expanding the electricity service to new customers. In 2015, EDM reported a System Average Interruption Frequency Index (SAIFI) of 73.88. This was a 29 percent increase from 57.46 in 2014. The System Average Interruption Duration Index (SAIDI), in 2015, was 270 hours, a 136 percent increase from 114 hours in 2014. The deterioration in these two performance indicators shows the decrease in the quality of electricity supply. The system has an increasing number of faults, which are becoming more frequent and generally take longer to repair.

Table 2.1. Reliability Indictors for EDM Network

Indicator	2011	2012	2013	2014	2015
SAIDI (Hours)	43:13:47	42:24:00	59:18:59	114:58:31	270:05:00
SAIFI	57.03	52.21	52.01	57.46	73.88
SARI (Hours) [a]	0:45:29	0:48:44	1:08:26	2:00:03	3:39:00

Note: SARI = System Average Restoration Index. It measures the time it takes to restore the system after a fault has occurred.

3. EDM has prepared a STIP, which addresses the system reinforcements and upgrades required to achieve an acceptable standard of electricity services and prevent further decline in the network quality. In addition to operating old equipment, EDM has so far not incorporated an integrated management system to control and monitor asset operations. This has become increasingly necessary as the utility grows and provides services to a larger number of customers and new geographical areas. The lack of an integrated management system hinders the reliability of service provision and causes non-technical losses.

4. The proposed project is a complement to STIP, focused on financing some of the short-term activities identified in the program and improvement of EDM management. In addition to urgent and priority investments, the project will provide financing for technical assistance and project implementation support. Specifically, the project has three components, aimed to (a) improve quality and reliability of electricity service delivery; (b) support institutional transformation of EDM and enhance management of the company; (c) scale up revenue protection measures for loss reduction in electricity supply; and (d) provide technical assistance and support project implementation. The components of the project include the lessons learned and improvements from the recently completed projects in Mozambique (TUP and EDAP).

Component 1: Rehabilitation and Upgrade of Network Infrastructure (US$117.0 million equivalent)

5. The objective is to improve security and reliability of electricity supply through the reinforcement and rehabilitation of transmission and distribution lines, installation of additional transformers to increase capacity in substations, and installation of reactive compensation equipment in the cities of Maputo, Matola, Nacala, Pemba, and Lichinga, depending on the specific needs of each city.

6. This component includes urgent investments in the rehabilitation and upgrade of electricity transmission and distribution infrastructure needed to eliminate the existing operational conditions that jeopardize the reliability and quality of services provided by EDM - reinforcement of medium-voltage lines and substations and replacement of obsolete control and protection equipment and the installation of mini-SCADA equipment in Matambo, Chimuara, Mocuba, Alto-Molocue and Nampula to enhance supervisory and control capabilities of the network. These investments are expected to reduce the frequency and duration of system interruptions in the main load centers of the country. The installation of control equipment will also enable future integration to the proposed National Control Centre. Additional power transformers will be installed in transmission substations in Lichinga (1 x 40 MVA) and Maputo (6 × 40 MVA) to ensure the necessary level of redundancy, security of supply, and reliable operation of the power system supplying these cities.

7. To reduce overloads in medium-voltage lines, the transmission and distribution networks in Maputo and Matola cities will be reinforced through the installation of approximately 70 km of 66 kV lines and underground cables along the existing corridors and eventually along some new routes connecting the major substations in Maputo (to be determined through the detailed engineering design). Those reinforcements will contribute to increasing the security of supply and create redundancy in power supply at the 66 kV level.

8. In the northern part of the country, the network is characterized by long high-voltage lines, which create significant voltage drops in supply to main consumption centers and affects system stability. Such inadequate operating condition can be improved with the incorporation of equipment for reactive power compensation. Component 1 will also finance the supply and installation of static reactive power compensators (15 MVAR static compensator in Pemba substation), to improve the security of power supply in the northern system.

9. The central-northern transmission line is a 220 kV line (900 km), starting in Tete, passing Caia, and ending in Nampula. This line comprises seven substations used to provide electricity to consumers in small towns along the line. This component will support the modernization of these substations, through the replacement of obsolete control and protection panels in all substations of the line, including the assembly of mini-SCADA at the respective substations. As a result, the reliability and efficiency in operations of the central and northern systems will improve through enhanced supervisory and control capabilities. The modernization of the substations will allow future integration of the equipment to the proposed National Control Centre.

Component 2: Enhancement of EDM Operational and Commercial Operations (US$29.5 million equivalent).

Subcomponent 2.1: Organizational Restructuring, Process Reengineering, and Capacity Building (US$3.7 million equivalent)

10. This subcomponent focuses on defining and implementing a new organizational structure for the company, as well as on reengineering processes and activities in all business areas, with the objective to optimize efficiency, transparency, and accountability in operations and enhance both internal and external governance.

11. This subcomponent will also include capacity building and technical assistance to improve the performance of key departments such as human resources, finance, technical, and procurement. It will focus on providing the operational skills and tools required to improve the day-to-day operations of the utility in a sustainable manner. The restructuring and capacity-building processes will be developed following a gender-sensitive approach to identify potential organizational gender gaps and subsequently promote a more inclusive environment among EDM personnel. Staff and customer surveys will serve as the first analytical tools to investigate EDM gender aspects.

12. Particularly, capacity building activities in the human resources department will include: (a) a gender-informed total compensation study; (b) rightsizing of EDM staffing; (c) a gender-sensitive staff survey; (d) developing a pension and health insurance system; (e) a learning strategy; (f) onboarding program; and (g) a gender-sensitive customer survey.

Subcomponent 2.2: Consolidation of SIGEM (US$11.1 million equivalent)

13. This subcomponent aims to ensure full and permanent use of the functionalities provided by the IS, supporting operations in all business areas incorporated under the SIGEM project. Transparent and accountable execution of efficient processes and activities in all business areas, with the support of IS, are key to improving EDM's operational performance.

14. This subcomponent will support training, incorporation of additional system functionalities, a GIS, an AMS, a Work Force Management (WFM), and a new package to optimize management of purchases by prepaid customers. While the implementation of the GIS will initially help improve operations in the distribution (in particular, attention to outages and customers' complaints) and commercial areas, it will also serve as the cornerstone to plan and implement the expansion of service to new customers.

Subcomponent 2.3: Revenue Protection Program - Phase II (US$6.3 million equivalent)

15. This subcomponent aims to protect the revenues that EDM receives from sales to large and medium customers, ensuring that all users in that high-value segment are systematically billed according to accurately metered consumption, thus eliminating non-technical losses (unmetered consumption) in supply to those customers.

16. In the first phase of the SIGEM project, implemented under EDAP, it was determined that 7,000 large consumers (0.5 percent of the total number) represent 39 percent of the electricity consumption (GWh) and 30 percent of the revenue. The first phase comprised the supply and installation of 3,000 meters with remote reading capability, together with the incorporation of specific software (Meter Data Management [MDM]) to manage metering data for revenue protection purposes, and the creation of three Metering Control Centers (MCCs) to

permanently monitor the consumption of targeted customers with the support of the software. Another 2,000 existing meters, with remote reading functionalities, were incorporated to the MCCs for management using the MDM.

17. This subcomponent encompasses a second phase of the RPP, comprising the remaining 2,000 customers identified in the preparation of the initial phase but not included in its scope, as well as a segment formed by around 8,000 medium-sized customers being supplied in low voltage.

Subcomponent 2.4: Upgrade of Information Systems (US$8.4 million equivalent)

18. This subcomponent will support upgrades and acquisition of IS (hardware and software). All regions in the country, where EDM provides electricity services to its customers, need to have strong, reliable communication links with the data center where the IS run. The initial phase of the SIGEM project included the incorporation of an ICS to provide the links needed for that phase. However, the scope of the SIGEM will be expanded both through the incorporation of new software packages and the extended application of the existing IS to support key processes (such as prepayment). This makes it crucial to strengthen and upgrade the ICS and the whole ICT infrastructure (hardware) needed to run all the IS in all places where this is needed, with high reliability and level of performance (speed of communication, and so on).

Component 3: Capacity Building and Implementation Support (US$3.5 million equivalent)

Subcomponent 3.1: *Capacity Building and Implementation Support for MIREME (US$2.0 million equivalent*)

19. The GoM, through MIREME and the recently created ARENE, is responsible for the development of adequate planning and regulation of the power sector, in particular for the development of sound mechanisms to implement the NESP and the Power Sector Master Plan (2018–2043), including transparent and competitive procedures for procurement of new generation capacity in a least-cost manner and a methodology for the calculation of the end-user tariff based on sound economic and technical principles.

20. This subcomponent, implemented by MIREME, will support capacity-building activities for key sector institutions in aspects related to power sector planning, fostering competition in the power sector, methodologies and procedures to calculate electricity tariffs reflective of recognized (or allowed) efficient costs, and mechanisms to promote access and public participation in government-related activities (like planning or tariff processes). In addition, this subcomponent will support project management-related expenses such as the financing of external audit, office equipment, and incremental operating costs.

Subcomponent 3.2: Capacity Building and Implementation Support for EDM (US$1.5 million equivalent)

21. This subcomponent will support project management-related expenses such as the financing of external audit, oversight of implementation of the environmental and safeguards instruments for the investments, office equipment, and incremental operating costs. In addition, this subcomponent will finance consultancy services that will be required to complement and build capacity in EDM for the effective implementation of the NESP and the Power Sector Master Plan (2018–2043). It also includes technical assistance in the form of two studies aimed at increasing system reliability. The studies are (a) the review of the protection system and (b) a review of the existing national grid code.

Table 2.2. Project Costs per Activity

Project Components	Project cost (US$, million)	% Financing
Component 1: Rehabilitation and Upgrade of Network Infrastructure	**117.0**	**78.0**
Reinforcement of Maputo and Matola transmission and distribution networks	52.6	35.1
Installation of additional transformers in Lichinga and Maputo	20.9	13.9
Reactive power compensation in Pemba	17.3	11.5
Rehabilitation of distribution networks in Nacala	17.2	11.5
Modernization of central-northern transmission line substations	9.0	6.0
Total Cost of Component 1	**117.0**	78.0
Component 2: Enhancement of EDM Operational and Commercial Operations	**29.5**	**19.7**
2.1: Organizational Restructuring, Process Reengineering, and Capacity Building	3.7	2.5
Asset audit and valuation	1.0	0.7
Financial processes review and reengineering	0.4	0.3
Cost center accounting	0.2	0.1
Store management policy and plan	0.2	0.1
Outsourcing strategy	0.3	0.2
Customer survey	0.2	0.1
Mapping and allocation	0.2	0.1
Matrix of delegation of authority	0.2	0.1
Total compensation study	0.2	0.1
Pension and health insurance system	0.2	0.1
Staff survey	0.2	0.1
Learning strategy	0.4	0.3
2.2: Consolidation of SIGEM	11.1	7.4
System stabilization: GIAF, CMS, OMS	1.5	1.0
Geographic information and customer care system (GIS) - Lot 1	3.5	2.3
Technical assistance for implementation of SIGEM phase II	1.0	0.7
End-to-end business process review and upgrade for commercial	1.2	0.8
Asset Management and Survey	3.0	2.0
Work force management (WFM)	0.4	0.3
Maintenance management system (MMS)	0.5	0.3
2.3: Revenue Protection Program (RPP) - Phase II	6.3	4.2
Extension of the existing RPP	5.0	3.3
Audit and improve performance of AMR infrastructure	0.6	0.4
Establishment of a meter calibration lab and special store	0.3	0.2
Establish a metering unit within EDM	0.2	0.1
Establishment of meter inspection and testing procedures	0.2	0.1
2.4: Upgrade of Information Systems	8.4	5.6
Maputo and Matola ICT network redesign - Lot 1	1.5	1.0
Rest of the Country ICT network redesign - Lot 2	3.5	2.3

Project Components	Project cost (US$, million)	% Financing
Data center network redesign (redundancy, high availability, high performance)	1.5	1.0
EDM Infosec baseline assessment	0.2	0.1
Digital board - EDM Management Portal	0.2	0.1
Business continuity (email continuity)	0.3	0.2
Data architecture and application integration	0.6	0.4
EDM operation portal, corporate service center, and e-learning platform	0.6	0.4
Total Cost of Component 2	**29.5**	**19.7**
Component 3: Implementation Support and Capacity Building	**3.5**	**2.3**
3.1: Capacity Building and Implementation Support for MIREME	2.0	1.3
3.2: Capacity Building and Implementation Support for EDM	1.5	1.0
Implementation of the NESP and the Power Sector Master Plan (2018–2043)	0.6	0.4
Review of the grid code	0.2	0.1
Power system protection study	0.3	0.2
Project implementation support	0.4	0.3
Total Cost of Component 3	**3.5**	**2.3**
Total Costs	**150.0**	**100.0**

Note: Infrastructure project components include 7 percent of price and physical contingency and are based on studies and recent tendering process by EDM.
GIAF = *Gestão Integrada de Administração e Finanças;*

Annex 3: Implementation Arrangements

Mozambique: Power Efficiency and Reliability Improvement Project (PERIP)

Project Institutional and Implementation Arrangements

1. **Overall coordination**. The implementing agencies are EDM and MIREME. MIREME will implement Subcomponent 3.1 and EDM will implement Components 1 and 2 and Subcomponent 3.2. For the MIREME subcomponent, the National Directorate of Energy will be responsible for the implementation. In the case of activities executed by EDM, a dedicated team (PIU) has been appointed with experience in implementing IDA-financed projects. Given the relevance of activities funded under Component 2, the PIU will report directly to the Board of EDM on the progress made to ensure that all decisions on transformation, adopted during execution of tasks in the component, are effectively implemented as defined and fully enforced companywide.

2. **EDM and MIREME PIUs**. For MIREME, there will be a Project Coordinator, appointed under the National Directorate for Energy, who will work directly with the existing structure. This directorate will be the recipient of the capacity building to increase planning capabilities. In the case of EDM, the PIU is led by a Director and is supplemented with additional staff given the size of the project portfolio it manages, including the additional projects that are part of the STIP. The Director at EDM will be supported by the other departments of EDM (project management, contract management, procurement, social safeguards, environmental safeguards, health and safety, and project accounting) and specialist consultants who will be financed through the proposed project. Appropriate technical assistance is included to support implementation, especially in the areas of procurement processing and supervision of construction works, as well as international technical assistance to build capacity in EDM's Environmental and Social Unit and EDM's Health and Safety Unit to oversee implementation of the ESMP, RAP and health and safety aspects during construction.

Figure 3.1. Project Implementation Arrangement - MIREME

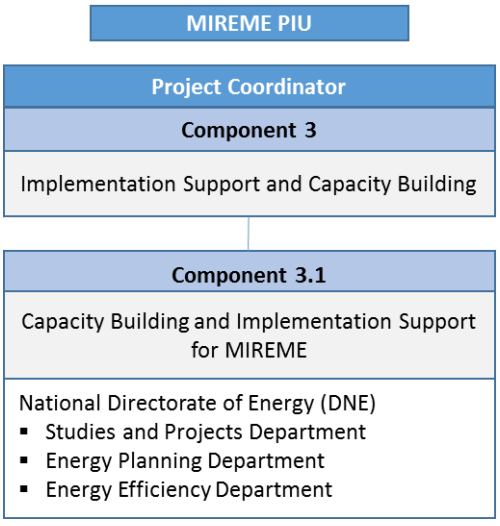
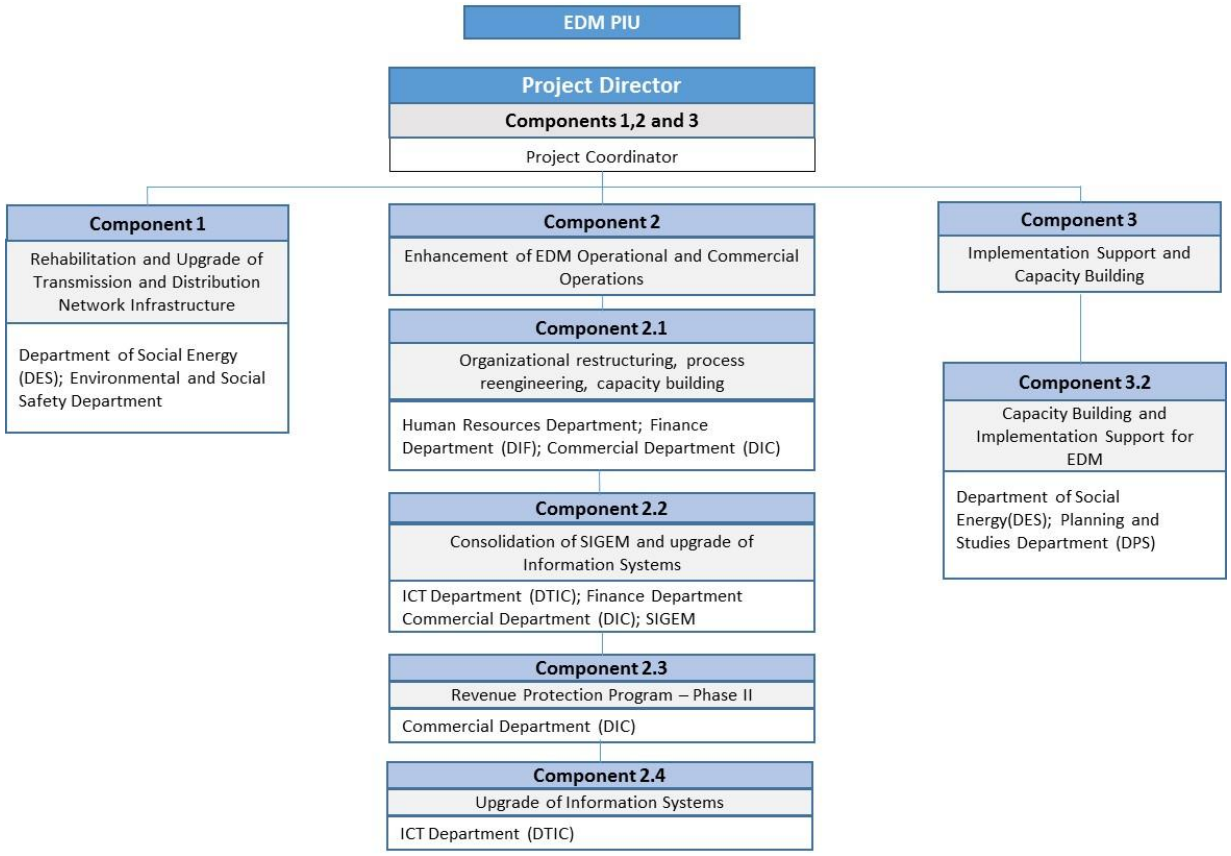


Figure 3.2. Project Implementation Arrangement - EDM



3. EDM and MIREME will be responsible for the preparation and submission of progress reports to IDA on a quarterly basis.

Financial Management and Disbursements

4. The World Bank's FM assessment of MIREME and EDM concluded that the project's FM arrangements meet the World Bank's minimum requirements under OP/BP 10.00. The overall residual risk rating for the project is Substantial.

5. The objective of the FM assessment was to determine whether the FM arrangements (a) ensure that funds are used only for their intended purposes in an efficient and economical way while implementing agreed activities; (b) enable the preparation of accurate and timely financial reports; (c) ensure that funds are properly managed and flow smoothly, rapidly, adequately, regularly, and predictably; (d) enable project management to monitor the efficient implementation of the project; and (e) safeguard the project's assets and resources. The assessment complied with the Financial Management Manual for World Bank-Financed Investment Operations that became effective on March 1, 2010 and was revised on February 4, 2015.

Project Financial Management Arrangements

6. **Budgeting arrangements**. The budgeting process will need to consider all relevant aspects of the project and be prepared at least two months before the fiscal year to which it pertains. The Department of Social Energy (*Departamento de Energia Social*), in close coordination with other relevant units of EDM, will prepare budget activities which will be captured in annual work plans, which will need to be submitted to IDA for approval. MIREME will follow the normal government budget preparation cycle, where project activities will need to be incorporated into the ministry's budget and submitted to the Parliament for approval. The budget will be monitored through the unaudited quarterly financial reports, which will measure the actual performance against the targets for each period, through the integrated management tool for FM, GIAF accounting software, which is already functional and has been used to prepare the latest annual accounts of EDM, while MIREME's budget monitoring will take place through e-SISTAFE and spreadsheets. Significant differences between the planned and actual expenditures will also need to be documented in the quarterly reports, which will be submitted to IDA within 45 days after the end of each calendar quarter. The principles and procedures for preparation of the consultative budget are already included in the existing Implementation Manual, including its respective formats.

7. **Accounting arrangements.** The accounting transactions will be recorded and summarized in the GIAF accounting software for EDM, which will also be used to generate quarterly and annual reports. In addition to the accounting system to be installed and the books needed to maintain an accurate and complete record of transactions, MIREME's transactions will be recorded directly on e-SISTAFE and monitored through spreadsheets. EDM will need technical assistance to ensure just-in-time country-based support for GIAF to ensure continuity in the case of interruption.

8. EDM's finance department is headed by an experienced Director and accountants, and EDM has been implementing several World Bank-financed operations over the last decade. Also, EDM has appointed an accountant who will be solely responsible for the activities of the project, but will still work under the overall responsibility of the Director. The Director's experience will play a key role in the transfer of know-how and providing training to all accountants. MIREME also has extensive experience in handling World Bank-financed operations, including the recently closed EDAP. The mix of skills and experience of the accountants of MIREME are sufficient to handle Subcomponent 3.1.

9. The project will make use of International Public Sector Accounting Standards and Cash Basis of accounting, which recognizes transactions and events only when cash (including cash equivalents) are received or paid by both the implementing agencies.

Internal Control Arrangements

10. **Internal control systems.** The assessment was favorably affected by the fact that EDM and MIREME have been implementing World Bank-financed operations continuously for at least the past decade and they have generally performed well. However, the review of the payment process indicates that there are significant delays which could impact the timely implementation of activities. EDM and MIREME will need to strengthen its payment cycle to ensure that the process is clear and transparent. These procedures will be documented in the Implementation Manual, which will be approved by the World Bank. A review of project audit reports and internal systems and procedures did not reveal significant reportable issues.

However, EDM continues to face challenges, particularly with regard to pension provisions and differences between commercial and financial systems, which are expected to be solved with the full implementation of the GIAF.

11. EDM already has an overall Implementation Manual documenting some internal control procedures and responsibilities related to project management. This manual needs to be updated to include an annex covering procedures related to the project, particularly with regard to the celerity of payments. The annex will cover specific issues related to reporting (including the agreed format of quarterly reports) to IDA, preparation of withdrawal applications, detailed processes for filing, and other issues that may be relevant from the GIAF accounting software system.

12. MIREME makes use of the *Manual de Administração e Finanças*, which is the manual used in the public sector of Mozambique. The manual is sufficiently detailed and contains procedures to be followed from budgeting to reporting on the use of funds.

13. **Internal auditing.** EDM and MIREME have each internal audit department performing post-audit activities on all the financial transactions of the entity, including an assessment of whether the budget utilization is in line with the intended purposes. At least annually, the internal audit department would be involved in conducting audits pertaining to this project and such reports will need to be shared with IDA. The internal audit function reports directly to the Chairman and Board of Directors for independence in the case of EDM and directly to the Minister in the case of MIREME.

Funds Flow and Disbursement Arrangements

14. **Funds flow arrangements.** EDM and MIREME will open separate Designated Accounts (DA) for the project at the *Banco de Moçambique*, in U.S. dollar. For MIREME, funds will flow from the DA to the Government's single treasury account from which payments can be made. Details of the DA and the Authorized Signatories Letter, in the format defined in the Disbursement Letter, should be submitted to the World Bank, soon after the Financing Agreement is signed, to ensure that there are no delays in the first disbursement.

15. Both the implementing entities will submit an initial withdrawal application to the World Bank based on a six-month forecast, as stated in the Disbursement Letter, but also based on agreed project work plans and budget. The arrangement is relatively simple, as shown in figure 3.3, with centralized payments at DES allowing for more effective control of the project funds for EDM and payments effected directly from the single treasury account for MIREME.

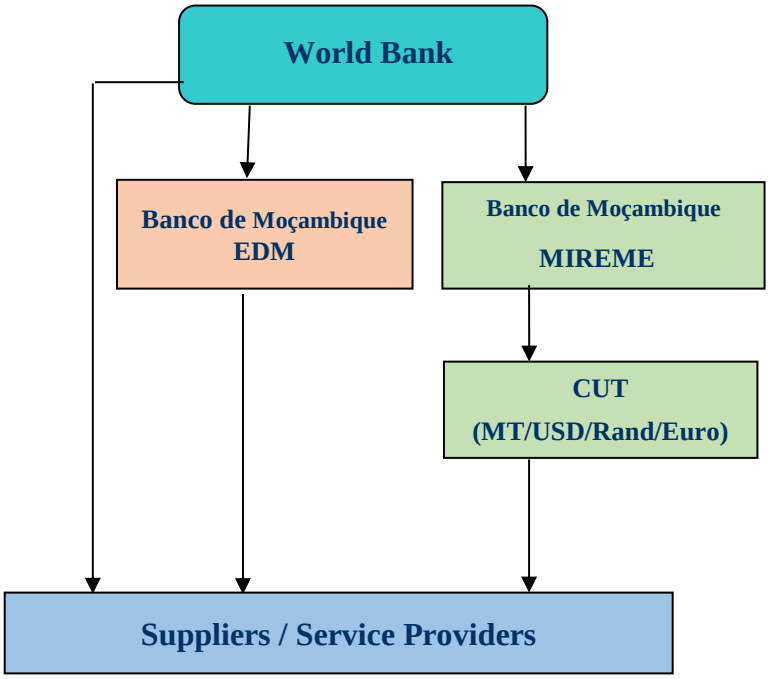


Figure 3.3. Fund Flow Arrangement

16. **Disbursement arrangements.** Both implementing agencies will use report-based disbursement procedures mainly through the Advance disbursement method. It may also use other methods of disbursement such as Direct Payments, Special Commitments, and Reimbursements. Details concerning disbursements are spelt out in the project's Disbursement Letter.

Table 3.1. – Disbursement Categories

Category	Amount of the Grant Allocated (expressed in SDR)	Percentage of Expenditures to be Financed (inclusive of Taxes)
(1) Goods, Training, and consultants services for Part 3(a) of the Project	1,403,000	100%
(2) Goods, works, non-consulting services, Operating Costs, Training, and consultants services for Parts 1, 2, and 3(b) of the Project	103,757,000	100%
(3) Refund of Preparation Advance	1,440,000	Amount payable pursuant to Section 2.07 (a) of the General Conditions
TOTAL AMOUNT	106,600,000	

17. **Financial reporting arrangements.** EDM and MIREME will prepare quarterly unaudited financial reports in form and content satisfactory to the World Bank, which will be submitted to the World Bank within 45 days after the end each calendar quarter to which they relate. To simplify arrangements, the format of the reports will be similar to those used under the recently closed project. Details of the reporting requirements, including content, format, as well as frequency will be defined in the Implementation Manual. These reports will include (a) DA activity statement; (b) summary payments subject to the World Bank's prior review; (c) summary payments not subject to prior review; (d) detailed use of funds by project components/activity; and (e) explanation of variances and short-term forecasts of expenditures.

18. **Auditing arrangements.** Annual audited financial statements with the respective Management Letter will be submitted by EDM and MIREME to the World Bank within six months of the end of the year being audited. The audit reports will be publicly disclosed on the World Bank's external website and the audits will be conducted in accordance with International Standards on Auditing. EDM's audits will include appropriate disclosure of the project activities as follows:

(a) A statement of sources and uses of funds showing funds;

(b) A summary of expenditures analyzed by both component and category;

(c) The supporting notes in respect of significant accounting policies and accounting standards adopted by management; and

(d) Summary listing of withdrawal applications by reference number, date, and amount.

19. EDM has already hired an auditor acceptable to the World Bank, while MIREME will be audited by the TA, which is constitutionally mandated to audit all public funds. EDM will submit its financial statements, which will include, in the notes to the financial statements, financial information related to the project.

Table 3.2. Audit Compliance Requirements

Action	Periodicity	By Whom
Submit entity audit report within 6 months of the end of year	Annual	EDM
Submit annual audit report within 6 months of the end of the year	Annual	MIREME

20. **FM action plan.** As stated, the project's FM arrangements meet the World Bank's minimum requirements under OP/BP 10.00. Given its residual risk rating, the project will require, at least, twice a year on-field supervisions. The FM action plan in table 3.2 outlines the mitigating measures which, if implemented, would strengthen the FM arrangements.

Table 3.3. FM Action Plan

	Action	Date Due By	Responsible
1	Agree the format of interim financial report with the World Bank and audit terms of references	Board presentation	World Bank/EDM
2	Completion of customization/addition of project to GIAF	Within 3 months of effectiveness	EDM

Procurement

21. Procurement activities for the proposed project will be carried out in accordance with 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', dated January 2011, revised July 2014; 'Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits and Grants by World Bank Borrowers', dated January 2011, revised July 2014; and the provisions stipulated in the Financing Agreement for the project.

22. Further, the 'Guidelines on Preventing and Combating Fraud and Corruption in Projects Financed by IBRD Loans and IDA Credits and Grants', dated October 15, 2006, and revised in January 2011 will apply.

23. The following activities form part of the project and are subject to the World Bank's procurement procedures:

- **Works.** Works contracts procurement under the project will include the installation of new transformers, construction of overhead lines and static compensators, rehabilitation of distribution networks, supply and installation of control panels in high-voltage substations and supply and installation of meters, among others.
- **Goods.** Goods procurement under the project includes the installation of mini-SCADA equipment, among others.
- **Non-consulting services.** Non-consulting services to be procured under the project will include improvements in the GIS, an AMS; nationwide network redesign; and a wide area network.
- **Consulting services.** Consulting services under the project with include the design and supervision consultants for the infrastructure interventions, tariff studies, assets inventory and evaluation, human resources review and analysis, among others.

Particular Methods of Procurement of Goods, Works, and Non-Consulting Services

24. **International Competitive Bidding (ICB).** Except as otherwise provided below, goods, works, and non-consulting services shall be procured under contracts awarded based on ICB.

- **Preferences.** Domestic Preference for ICB shall be applicable in accordance with Para. 2.55 of the applicable Guidelines.

25. **Other methods of procurement of goods, works, and non-consulting services.** The following methods, other than ICB, may be used for procurement of goods, works and non-consulting services for those contracts specified in the Procurement Plan:

- National Competitive Bidding (NCB), subject to the additional procedures detailed in paragraph 26
- Shopping
- Direct Contracting

26. The following are the additional procedures for NCB:

(a) **General**. The procedures to be followed for NCB shall be those set forth in the World Bank's Procurement Regulation, with the modifications described in the following paragraphs.

(b) **Eligibility.** No restriction based on nationality of bidders and/or origin of goods shall apply. Foreign bidders shall be allowed to participate in NCB without restriction and shall not be subject to any unjustified requirement which will affect their ability to participate in the bidding process such as, but not limited to, the proof that they are not under bankruptcy proceedings in the recipient's territory; have a local representative; have an attorney resident domiciled in the recipient's territory; form a joint venture with a local firm. In cases of joint ventures, they shall confirm joint and several liabilities.

(i) Prior registration, obtaining a license or agreement shall not be a requirement for any bidder to participate in the bidding process.

(ii) The recipient's government-owned enterprises or institutions shall be eligible to participate in the bidding process only if they can establish that they are legally and financially autonomous, operate under commercial law, and are not dependent agencies of the recipient.

(c) **Bidding documents.** Standard bidding documents acceptable to the Association shall be used for any procurement process under NCB.

(d) **Preferences.** No domestic preference shall be given to domestic bidders and/or to domestically manufactured goods.

(e) **Applicable procurement method under the Regulation.** Subject to these NCB exceptions, procurement under NCB shall be carried out in accordance with the Regulation's public competition ('*Concurso Público'*) method.

(f) **Bid preparation time.** Bidders shall be given at least twenty-eight (28) days from the date of the invitation to bid or the date of availability of bidding documents, whichever is later, to prepare and submit bids.

(g) **Bid opening.** Bids shall be opened in public, immediately after the deadline for their submission in accordance with the procedures stated in the bidding documents.

(h) **Bid evaluation**

(i) Qualification criteria shall be clearly specified in the bidding documents, and all criteria so specified, and only such criteria so specified shall be used to determine whether a bidder is qualified; the evaluation of the bidder's qualifications should be conducted separately from the technical and commercial evaluation of the bid. Qualification criteria shall be applied on a pass or fail basis.

(ii) Evaluation of bids shall be made in strict adherence to the criteria declared in the bidding documents; criteria other than price shall be quantified in monetary terms.

(iii) A contract shall be awarded to the qualified bidder offering the lowest-evaluated and substantially responsive bid.

(iv) Bidders shall not be eliminated on the basis of minor, non-substantial deviations.

(i) **Rejection of all bids and re-bidding.** All bids shall not be rejected and new bids solicited without the Association's prior concurrence.

(j) **Complaints by bidders and handling of complaints.** The recipient shall establish an effective and independent complaint mechanism allowing bidders to complain and to have their complaint handled on time.

(k) **Right to inspect/audit.** In accordance with paragraph 1.16(e) of the Procurement Guidelines, each bidding document and contract financed from the proceeds of the financing shall provide that: (i) the bidders, suppliers, and contractors and their subcontractors, agents, personnel, consultants, service providers, or suppliers, shall permit the Association, at its request, to inspect their accounts, records, and other documents relating to the submission of bids and contract performance, and to have them audited by auditors appointed by the Association and (ii) the deliberate and material violation by the bidder, supplier, contractor, or subcontractor of such provision may amount to obstructive practice as defined in paragraph 1.16(a)(v) of the Procurement Guidelines.

(l) **Fraud and corruption.** Each bidding document and contract financed from the proceeds of the financing shall include provisions on matters pertaining to fraud and corruption as defined in paragraph 1.16(a) of the Procurement Guidelines. The Association may sanction a firm or individual, at any time, in accordance with prevailing Association sanctions procedures, including by publicly declaring such firm or individual ineligible, either indefinitely or for a stated period of time: (i) to be awarded an Association-financed contract and (ii) to be a nominated subcontractor, consultant, supplier, or service provider of an otherwise eligible firm being awarded an Association-financed contract.

(m) **Debarment under national system.** The Association may recognize, if requested by the recipient, exclusion from participation as a result of debarment under the national system, provided that the debarment is for offenses involving fraud, corruption, or similar misconduct, and further provided that the Association confirms that the particular debarment procedure afforded due process and the debarment decision is final.

Particular Methods of Procurement of Consultants' Services

(a) **Quality- and Cost-based Selection (QCBS).** Except as otherwise provided in paragraph (b) below, consultants' services shall be procured under contracts awarded on the basis of QCBS.

(b) **Other methods of procurement of consultants' services**. The following methods, other than QCBS, may be used for procurement of consultants' services for those contracts which are specified in the Procurement Plan:

(i) Least-Cost Selection (LCS)

(ii) Selection based on the Consultants' Qualifications (CQS)

(iii) Single-Source Selection of consulting firms

(iv) Selection of Individual Consultants

(v) Single-source procedures for the Selection of Individual Consultants

Review by the World Bank of Procurement Decisions

27. The review thresholds are shown in table 3.3. The Procurement Plan shall set forth those contracts which shall be subject to the prior review by the World Bank. All other contracts shall be subject to post review by the World Bank. Table 3.3 indicates the initial thresholds for prior review at the time of project appraisal, however, the World Bank may, at its own discretion, require that a sample of contracts below the threshold be subject to prior review or, that the thresholds are reviewed, at any time or when the Procurement Plan is updated.

Table 3.4. Provisional Thresholds for Procurement and Review Methods [a]

Expenditure Category	Contract Value Threshold (US$)	Procurement/Selection Method	Contracts Subject to Prior Review
Works	≥ 10,000,000	ICB	All
	< 10,000,000	NCB	None
	< 200,000	Shopping	None
Goods and Non-Consulting Services	≥ 2,000,000	ICB	All
	< 2,000,000	NCB	None
	< 100,000	Shopping	None
Consulting Services -Firms [b]	≥ 1,000,000	QCBS	All
	≥ 300,000 - < 1,000,000	QCBS	None
	< 300,000	CQS/Other (QCBS/LCS)	None
Consulting Services – Individuals (IC) [c]	≥ 300,000	Individual Consultant	All
	< 300,000	Individual Consultant	None

Note: a. The thresholds may be revised from time to time, upward or downward, based on the continued assessment of the performance of the PIU. Furthermore, the World Bank may, at its discretion, may mandate a prior review for activities below above amounts or the adoption of a more suitable procurement method.
b. All Terms of Reference should be submitted for World Bank prior review, regardless of the estimated cost.
c. All Terms of Reference should be submitted for World Bank prior review, regardless of the estimated cost.

28. All Direct Contracting and Single-Source Selection below the amounts for prior review shown in table 3.3, should be treated as post review.

Procurement Plan

29. The recipient has developed a Procurement Plan for the first 18 months of project implementation. This plan was agreed between the recipient and the World Bank during appraisal, and contains major contracts to be signed by project effectiveness. The plan will be made available in the project's database, and on the World Bank's external website after project

Board presentation. The Procurement Plan will be updated annually or as required to reflect the actual project implementation needs and improvements in institutional capacity.

30. The frequency of the procurement supervision missions will be once every six months. Special procurement supervision for post-procurement reviews will be carried out at least once every 12 months.

Environmental and Social (including safeguards)

31. **General safeguards**. The proposed project is category 'B' given the limited impact of the project on the natural environment and low density settlement patterns within project routes. The project does not affect natural or critical natural habitats and does not cross protected forest areas or national parks. The project will finance the rehabilitation and upgrades of existing transmission and distribution lines, and the construction of one new transmission line of 220 kV and 66 kV mostly along the existing rights-of-way. Other investments of the project will finance rehabilitation of the existing power equipment within existing substations of Maputo, Matola, Nacala, Pemba, and Lichinga. The project triggers the following World Bank operational policies. OP 4.01 (Environmental Assessment), OP 4.11 (Physical Cultural Resources), and OP 4.12 (Involuntary Resettlement). The Client has prepared six safeguard instruments. When the locations of investments were known, the Client prepared ESIAs and RAPs. When the locations were unknown, the Client prepared policy frameworks. The safeguard documents include (a) ESIAs for Maputo/Matola and all other cities; (b) ESMFs for Maputo/Matola and all other cities; (c) RPF for investments in Nacala, Pemba, and Lichinga; and (d) an RAP for Maputo/Matola area given that the project corridor is defined. The World Bank approved the documents, which were disclosed in its webpage and in-country according to table 3.4.

Table 3.5. Safeguard Instrument Disclosure

Safeguard Instrument	Date of Disclosure in WBG webpage[15]	Date of Disclosure In-country
ESIA for Maputo/Matola	July 28, 2017	July 26, 2017
ESMF for Maputo/Matola	July 28, 2017	July 26, 2017
ESIA for all the cities	July 28, 2017	July 26, 2017
ESMF for all the cities	July 28, 2017	July 26, 2017
RAP Maputo/Matola	August 1, 2017	August 1, 2017
RPF for all the cities	August 1, 2017	August 1, 2017

32. The abovementioned documents indicate the potential social and environmental impacts within the project area, and define a specific plan and actions how to address such impacts. EDM and its contractors will ensure timely preparation of all the action plans as defined in the ESIA, RAP, and ESMP to mitigate the potential impacts at the start of the project implementation.

33. The project will be in compliance with the applicable World Bank Safeguard Policies and be in compliance with the World Bank Group's General Environmental, Health, and Safety

[15] Date of instrument submission to the WBG webmaster for publication in the WB webpage.

(EHS) Guidelines from April 2007 and the EHS Guidelines for Electric Power Transmission and Distribution. All contractor employees will need to sign a Code of Conduct in which it is clearly stated that sex with minors (under 18 years) is strictly forbidden. Contractors will be responsible for the monitoring of the Code of Conduct. Non-compliance could result in project stoppage. It is forbidden for contractors to employ child labor as children sometimes leave school to be employed. The labor influx management plan should clearly prescribe how temporary local employees are hired in compliance with Mozambican Law and the International Labor Organization's labor standards. Unskilled labor will be hired, by preference, from the nearby communities in the area where construction is taking place and will vary in accordance with progress of construction. Contractors will need to have sufficient insurance for workers in case of disability or a fatal accident. The contractors' and owner's engineers will be requested, in their bids, to provide a specific budget line for the construction, the ESMP, and the Health and Safety Plan that will take into account the resources for their preparation and implementation. In case of non-compliance, these amounts will be withheld.

34. EDM's Environmental and Social Unit, as well as EDM's Health and Safety Unit will be strengthened under the project. An international environmental and social consultant, as well as an international health and safety consultant, will be hired under the project to provide capacity building for EDM on those aspects.

35. **Scope of the project and potential impacts**. The project will finance the rehabilitation and upgrades of the existing transmission and distribution lines and the construction of one new transmission line of 220 kV and 66 kV mostly along existing rights-of-way. Other investments of the project will finance rehabilitation of the existing power equipment within existing substations. Selected project corridors will mostly pass semi-urban areas, some agricultural land in the Rio Infulene Valley, and some bushland areas of low biodiversity value. The proposed 'Reinforcement of Maputo City Transmission Network', through the installation of 66 kV and 220 kV lines mostly along existing routes, has limited negative environmental and social impacts on communities, such as loss of land and assets. Impacts and mitigations actions are included in the abovementioned safeguard instruments.

M&E of Safeguards

36. Through the implementation of the TUP and EDAP, EDM has had substantial safeguards capacity developed over time. However, EDM is currently implementing several transmission and distribution projects creating a constraint on the human resources available to monitor the project. The project will provide financing for hiring a dedicated environmental specialist and a social development specialist to guide and lead the management of environmental and social aspects to ensure compliance with the safeguard requirements. Additionally, international expertise will be required to provide training while implementing the project.

Annex 4: Implementation Support Plan

Mozambique: Power Efficiency and Reliability Improvement Project (PERIP)

Implementation Support Plan

1. The implementation support has been divided into two phases to ensure appropriate allocation of resources to support the project development.

2. **First phase.** This phase will focus on ensuring timely establishment of the PIU at EDM and carrying out appropriate technical designs of the project components and procurement processes for the major infrastructure packages. In this regard, the terms of reference for the implementation unit positions at EDM will be prepared by the Client and will be reviewed by the World Bank to ensure that the tasks are appropriately defined and qualifications and experience are adequate to perform the key functions required for project implementation. The World Bank's team will include headquarters- and country office-based staff and consultants. Specialized expertise will be mobilized as required.

3. **Second phase.** This phase will focus on monitoring the construction process, contracts management, disbursements, and effectiveness of capacity building and technical assistance activities. The World Bank team will include headquarters- and country office-based staff and consultants, complemented with specialized expertise as required.

Main Areas of Supervision

4. The following three areas have been identified as key for project supervision: (a) procurement and technical aspects; (b) FM aspects; and (c) environmental and social aspects.

Procurement and Technical Aspects

5. The World Bank's procurement specialists will regularly participate in implementation support missions to assist in monitoring procurement procedures and plans. The Procurement Plan indicates those contracts which are subject to prior review. A set of procurement packages to be implemented during the first 18 months has been identified and included in the Procurement Plan. All other contracts will be subject to post-review. The World Bank team will include a World Bank staff engineer complemented with specialized expertise to review technical specifications and proposals. In the second phase, it is expected to conduct field supervisions of the construction sites. The Procurement Plan will be updated at least once each year (or more often as required to reflect the actual project implementation needs) and post-procurement reviews will be carried out, at a minimum, once annually. Procurement supervision will be conducted throughout the implementation of the project and detailed assessments will be carried out during all missions.

FM Aspects

6. FM supervision will start by assessing the progress of staffing the PIUs and reviewing the plan in place to execute disbursements following FM guidance. This supervision will take place before contracts are awarded in case any measures need to take place before disbursement. FM supervision will also review quarterly progress and financial audits. With regards to resources, a country office-based staff is expected to be required for eight weeks. FM supervision will be conducted twice per year.

Environmental and Social Aspects

7. Environmental safeguards support will include visits to project areas and the monitoring of mitigation measures. During construction, monitoring is necessary to ensure compliance with environmental and social safeguards related to the infrastructure projects. It is expected that implementation support missions will require three weeks per year. With regard to resources, environmental and social specialists are expected to support the project for six weeks each.

Overall Support Implementation Needs

8. The World Bank team will be composed of a mix of skills and experience for successful project implementation. Table 4.2 outlines the expected staff weeks and travel required to make sure the actions and schedule are appropriately resourced.

Table 4.1. Estimated Implementation Needs

Time	Focus	Skills Needed	Resource Estimate	Partner Role
First phase (approximately first 12 months)	Establishment of the PIU for Component 1 at EDM. Finalization of procurement documents.	Engineering, procurement, FM, environmental and social, and legal.	US$200,000	Close cooperation with EDM and MIREME
Second phase (approximately 13–80 months)	Review of progress in construction and capacity building, review of sector technical and financial performance, procurement, M&E, safeguards, FM.	Engineering, sector regulatory and planning, M&E specialist, financial analyst, economist, and environmental and social.	US$350,000	Close cooperation with EDM and MIREME

Table 4.2. Estimated Staff Weeks and Travel

Skills Needed	Number of Staff Weeks per year	Number of Trips per year	Comments
Co-team leader	12	0	Field staff
Co-team leader	12	3	—
Distribution engineer	6	0	Field staff
Procurement specialist	6	0	Field staff
Specialized technical experts	4	—	As required
Financial analyst	2	1	—
Legal	2	—	As required
Administrative support	3	0	Field staff
FM specialist	8	2	Field staff
Environmental specialist	6	2	Field staff
Social specialist	6	2	Field staff
M&E expert	3	2	—

Annex 5: Economic and Financial Analysis

Mozambique: Power Efficiency and Reliability Improvement Project (PERIP)

1. This annex presents the rationale for public financing of the program, the value added from the World Bank support, and the economic and financial analysis of the project's development impact in terms of expected benefits and costs. The project includes the following components:

- Component 1: Rehabilitation and Upgrade of Network Infrastructure (US$115.0 million equivalent)
- Component 2: Enhancement of EDM Operational and Commercial Operations (US$29.5 million equivalent)
- Component 3: Capacity Building and Implementation Support (US$3.5 million equivalent)

2. The evaluation of the components is restricted to the activities that generate benefits for which an economic value can be clearly identified and measured, notably benefits associated with investments under Component 1, Subcomponent 2.2, and Subcomponent 2.3. Subcomponent 2.1 and Component 3 are excluded due to the difficulty in valuing the economic outcomes of such activities.

Rationale for Public Sector Provision/Financing

3. Transmission and distribution assets are characterized by being capital-intensive projects with long expected lifetime (around 30 years). World Bank financing enables the GoM to source loans to EDM at concessional rates and long maturity periods vital for the provision of electricity services in Mozambique. The alternative would be private or commercial financing. However, participation of private sector in the downstream of the electricity sector value chain has been rather limited. Even if such financing were available, it would place an additional financial burden on an already fragile utility.

Value Added of the World Bank's Support

4. The World Bank is well-positioned to convene DPs and effectively leverage investment and technical assistance support. The scale of the challenges and the resources needed to transform Mozambique's power sector calls for an integrated, long-term support program. Coordinated, strategic, and well-sequenced donor support is critical to achieve scale and maximize added value. The proposed project will not only respond to the short-term crisis but also establish the vision and develop an electrification strategy—the National Electrification Strategy—that can be used as a framework for donor coordination. The World Bank team is and will stay in close coordination with other partners to enable such partnership.

Background

5. The overall condition of the network is poor with an urgent need for rehabilitation and upgrade of the existing infrastructure. In 2015, EDM recorded 270 hours of outages, and the total electricity losses are estimated at 27 percent in 2016. Lack of a countrywide interconnected system presents a challenge for operation and security of electricity supply. The system is unable to transfer the surplus of energy from the south of the country to other areas that are energy deficient, such as northern Mozambique. In addition, the transmission system lacks redundancy,

protection, and capacity, compromising the security, reliability, and quality of electricity supply. On the distribution side, while medium- and low-voltage networks in the larger demand centers have been expanded, the networks have not been dimensioned for such rapid growth of electricity demand. Therefore, the distribution networks are overloaded, compromising the reliability of electricity service and representing a bottleneck for expanding such services to new customers.

Economic Analysis

Methodology and Assumptions

6. The economic viability of the project was assessed through a standard cost-benefit analysis. Net benefits for the program were calculated by comparing total system costs and benefits for the 'with project' and 'without project' scenarios. Financial costs were estimated based on identification studies developed by EDM and adjusted to economic costs by removing taxes. In parallel, two sources of economic benefits were identified: (a) the incremental electricity consumption resulting from the improvements in service delivery and (b) the energy cost-savings resulting from reduced technical losses. Economic benefits were estimated following a conservative approach using an avoided cost methodology. The analysis also includes a quantification of the project's impact in terms of carbon emissions—both, in metric units and in monetary terms—however, no other relevant environmental and social externalities were quantified.

7. Table 5.1 presents a summary of the macroeconomic assumptions used in the economic analysis.

Table 5.1. Common Modeling Assumptions

Variable	Value	Comment
Exchange rate	72.6 Mt/US$	December 2016
US inflation	—	Modeled in real US$
Gas price (base year)	US$5/MMBTU	Adjusted based on the oil price scenario
Economic discount rate	6%	Long-term GDP per capita growth rate in the country is 3% [a]
VAT rate	17%	

Note: a. The long-term GDP per capita growth rate is calculated as the average growth rate from 1980–2021 in national currency at constant prices. All historical and forecasted figures are provided by the International Monetary Fund – World Economic Outlook (October 2016).

Program Costs

8. The capital costs include those in the different subcomponents under Component 1 and Subcomponents 2.2 and 2.3, totaling US$134.4 million (inclusive of taxes and physical contingencies); investments are assumed to be developed in five years, with a 25 percent, 30 percent, 45 percent, 40 percent, and 10 percent disbursement pattern (similar to the one proposed in the project disbursement schedule). The O&M activities are estimated as 2 percent of the capital costs.

Program Benefits

9. **Incremental electricity consumption resulting from the improvements in service delivery.** A significant part of electricity demand remains unserved in Mozambique because of poor grid condition. The installation of new transformers, reinforcement of lines, and the replacement of obsolete control protections envisaged under Component 1 are intended to reduce outage time at the transmission and distribution levels and make the service more reliable. By the implementation of Component 1, it is assumed that the average duration of interruptions—and accordingly unserved demand—will be reduced by at least 3 percent. Power outages in the urban and peri-urban areas of Maputo, Matola, Pemba, and Nacala impose big losses in terms of forgone production and large costs for running expensive self-generation. They increase the cost of doing business and adversely affect firms' productivity. Therefore, the economic value associated with reducing unserved electricity demand, intended as the cost of unserved energy to the economy, is huge in these areas. The cost of unserved energy to the economy is assumed to be the avoided cost of kerosene for lighting, estimated at US$0.15 per kWh.

10. **Energy cost-savings resulting from reduced losses.** Improvements in the technical condition of the grid and the implementation of the second phase of the RPP will also have a substantial impact on the total system losses.

(a) The project is assumed to reduce technical losses by 0.75 percent to 7.3 percent, and the associated savings in generation constitute an economic benefit under this project.

(b) The project is assumed to reduce non-technical losses by 1.5 percent to 17.5 percent; out of this 1.5 percent, the analysis assumes that 60 percent of the reduction in non-technical losses represents an increase in electricity sales while the 40 percent remaining is counted as generation savings. Only the associated savings in generation constitute an economic benefit under this project.

11. The savings in electricity generation derived from the reduction in electricity losses are valued at the marginal generation cost in Mozambique, which is estimated at US$0.13 per kWh.

Economic Analysis

12. The economic analysis shows that the project is economically robust. The baseline NPV of the proposed project is US$41.7 million (at 6 percent discount rate) with an economic return of 10 percent (see table 5.2).

Table 5.2.Main rations from economic analysis

Discount rate	**%**	**6**
EIRR		
EIRR (excluding CO2)	%	10.0
EIRR (including CO2)	%	13.5
Composition of NPV		
Costs		
CAPEX	*US$, millions*	*97.43*
OPEX	*US$, millions*	*21.40*
Total costs	**US$, millions**	**118.83**
Benefits		
Reduced unserved demand	*US$, millions*	*9.29*
Reduced non-technical losses	*US$, millions*	*67.22*
Reduced technical losses	*US$, millions*	*84.03*
Total benefits	**US$, millions**	**160.54**
NPV (excluding CO2)	**US$, millions**	41.71
Benefits from CO2 reductions	US$, millions	45.65
NPV (including CO2)	**US$, millions**	87.37

Sensitivity Analysis

13. A switching value analysis was performed to test the robustness of the economic viability of the project to changes in the assumed values of key parameters. Under the base case, the project remains viable until an increase in CAPEX of nearly 35 percent and a marginal reduction (a 1.6 percentage points reduction) in total losses would be enough to ensure the economic viability of the project.

Table 5.3. Sensitivity Analysis

	Base	**Switch**	**% Change**
CAPEX	114.9	155.2	35.1
Total losses (%)	27.0	25.4	−1.6

Greenhouse Gas Accounting and Environmental Co-benefits

14. The project is expected to reduce electricity losses from 27 percent to 24.8 percent. This is expected to save 2,571 GWh of electricity over 20 years as compared to the baseline scenario where losses remain at 27 percent. Each megawatt will avoid 0.95 tCO2, which is a standardized grid emission factor in the Southern Africa Power Pool. With these assumptions, the project will avoid 2,439,151 tCO2 over the economic life of 20 years. For the economic analysis, the economic benefits of the CO2 reductions are calculated by multiplying the net annual CO2

savings times the Social Value of Carbon[16] over the lifetime of the project. The total economic benefits of the CO2 reductions (in NPV) is estimated in US$ 45.7 million as presented in Table 5.2.

15. Through the implementation of Component 1 (Rehabilitation and Upgrade of Network Infrastructure), aimed at reducing technical losses as well as improving the reliability of the system, the project with contribute to climate co-benefits. The share of Component 1 in the overall IDA financing for the project is 78 percent.

Financial Analysis of the Project

16. The financial analysis focuses on the impact of the IDA grant on the financial sustainability of EDM. It is assumed that the cash flows from the activities linked to the project implementation will be used to offset the entire portion of the IDA grant that is transferred to EDM, that is, US$148 million. While the details of the Subsidiary Agreement between GoM and EDM are unknown at the time of preparing this section, the analysis assumes the IDA grant is on lent to EDM on concessional basis.

17. There are two identified revenue streams for the project: (a) the savings in electricity generation derived from the reduction in technical losses and from the proportion of the reduction in the non-technical losses that responds to the price elasticity (that is, 40 percent as assumed in the economic analysis), these savings are valued at the marginal generation cost of US$130 per MWh; and (b) the increase in electricity sales derived from the reduction in unserved demand and the proportion of the reduction in non-technical losses that does not respond to price elasticity (that is, 60 percent as assumed in the economic analysis), these additional sales are valued at the current average electricity sale price of US$62.9 per MWh.

18. For the discount rate, the analysis conservatively assumes a WACC of 1.5 percent considering that 90 percent of the CAPEX is financed with an IDA grant while the remaining 10 percent is financed by an equity contribution where the cost of equity is assumed at 15 percent. The analysis is prepared on real terms.

19. The project is financially viable with an NPV of US$87.6 million (at 1.5 percent discount rate) with an IRR at 6 percent (see table 5.4).

Table 5.4.Main financial rations from financial analysis

Discount rate (WACC)	***%***	***1.5***
Financial IRR		
IRR	%	6.0
Composition of NPV		
Costs		
CAPEX	*US$, millions*	*141.84*
OPEX	*US$, millions*	*47.49*
Total costs	**US$, millions**	**189.32**
Benefits		

[16] Based on CCGCE Guidance note on social value of carbon in project appraisal, September, 2014

Reduced unserved demand	*US$, millions*	*6.86*
Reduced non-technical losses	*US$, millions*	*122.34*
Reduced technical losses	*US$, millions*	*147.77*
Total benefits	**US$, millions**	**276.98**
NPV	**US$, millions**	**87.65**

Financial Analysis of EDM

20. The following financial analysis was prepared based on audited unconsolidated[17] financial statements of EDM for the fiscal years ending December 31, 2011 to 2016.

21. A historical analysis of the operating performance and financial position of EDM during the last six years (2011–2016) showed that EDM's financial position has gotten progressively more difficult due to increasing divergence between its revenues and costs and demand on its cash, as well as the difficulties in collecting payments from some external customers, notably Zambia's Zambia Electricity Supply Corporation (ZESCO).

22. EDM's costs have increased substantially due to currency devaluation in 2015 and 2016,[18] that triggered an increase in domestic inflation with the consequence of more expensive domestic borrowing, increase in the cost of already expensive thermal-based IPPs (compared to the cost of supply from the Cahora Bassa plant, EDM's main supplier).

23. Continued commercial and technical losses (unbilled electricity) hindered EDM's ability to increase revenue streams that could have been used to cover investment expenditures, including for access expansion and increasing needs for grid repairs and maintenance activities.

24. EDM reports show that despite tariff adjustments in 2015 (26 percent) and 2016 (40 percent), its average sale price (in U.S. dollars) declined from US$0.0845 per kWh in 2011 to US$0.0629 per kWh in 2016, whereas its average domestic supply costs (in U.S. dollar and net of export revenues) increased from US$0.0846 per kWh in 2011 to US$0.0955 per kWh in 2015 before falling to US$0.0742 per kWh in 2016. As a result, EDM started to experience significant net losses in 2015 (Mt 1.95 billion on total revenues of Mt 16.3 billion).

25. Nonetheless, the preliminary (unaudited) results for 2016 appear somewhat better in terms of net loss (Mt 0.98 billion on total revenues of Mt 29 billion), with operational deficit slightly higher than in 2015 (Mt 2.4 billion versus Mt 2.2 billion).

26. Table 5.5 presents the trend in some key financial indicators, which show the worsening trend.

[17] EDM has several subsidiaries for power generation projects, notably HCB, for which consolidated audited EDM financial statements have not been produced. This is in the process of being rectified.

[18] Exchange rate for the metical in 2013 was about Mt 30 per US$ and at the beginning of 2015 the metical was still trading at about Mt 33 per US$. However, between then and October 2016, it increased to about Mt 78 per US$. It has recovered some ground since then, trading at about Mt 62 per US$ (mid-May 2017).

Table 5.5. EDM Key Financial Indicators (2011–2016)

Indicator	2011	2012	2013	2014	2015	2016
Net margin (%)	8.67	1.23	−0.69	−0.57	−11.90	−3.38
Operating margin (%)	7.73	4.32	3.72	0.94	−9.69	−8.34
Current ratio	1.21	1.12	1.03	0.83	0.72	0.69
Leverage [a]	0.62	0.36	0.48	0.75	1.29	2.17

Note: a. Long-term debt-to-equity ratio.

27. One key aspect of the deterioration of EDM's finances is the payment arrears and debt. The divergence between the costs and revenues and EDM's obligation to maintain supply, resulted in higher borrowing and accumulation of payment arrears to suppliers. Between 2011 and 2016, EDM's short-term debt and payables to its suppliers increased from about Mt 3.4 billion (US$115 million) to Mt 31 billion in 2016 (US$397 million).

28. EDM funded its financial deficit in significant part by accumulating arrears to its suppliers. By the end of 2015, it owed about US$93 million to Cahora Bassa alone for electricity supplies. In 2016, this trend continued, with increasing payment arrears also to the IPPs (CTRG and Gigawatt, particularly) which—if not resolved in time—could be very damaging to EDM's reputation and jeopardize its strategy to attract private investments in the power system, including funding for the future Mozambique Gas to Power project.

29. Total payables to suppliers at the end of 2016 stood at about Mt 24 billion. EDM also developed significant difficulties in collecting payments from some of the export clients, especially from Zambia Electricity Supply Corporation (ZESCO) and Zimbabwe Electricity Supply Authority (ZESA), with trade receivables exceeding US$155 million in 2016, of which ZESCO arrears exceeded US$60 million.[19] At this stage, it remains unclear when and how EDM could recover these arrears. In the near term, EDM's financial problems may even worsen, as Cahora Bassa appears to be set for a reduction in generation due to the low level of water in its reservoir, which EDM will have to compensate from more expensive sources.

Projected Financial Position Analysis

30. Given the current EDM situation, the financial position of the company is not expected to return to positive figures even with the planned tariff increases, as the negative impact of the devaluation of the local currency will partially nullify all these efforts. EDM's profitability, liquidity, and leverage will be negatively affected by its poor operating performance. Therefore, the ongoing technical assistance on National Electrification Strategy and Cost of Service Study will be key to provide sound recommendations as to how to improve EDM's financial sustainability while not compromising the GoM's ambitions of achieving universal electricity access.

[19] In 2015, Zambia started to experience a major crisis in electricity supply due to a drought that adversely impacted its hydropower generation. To alleviate the crisis, ZESCO signed a number of 'emergency' electricity import contracts, including with EDM for supply of 80–150 MW of power over a two-year period (2016–2017). ZESCO, however, was not able to pay for these imports and has accumulated large payment arrears, including to EDM. The Government of Zambia is negotiating an adjustment loan with African Development Bank that would help develop a plan for restructuring/clean-up of ZESCO's balance sheet and for a financial turnaround strategy.

31. While the outputs of these studies are currently under development, the projected financial analysis developed under this project is based on a business-as-usual (BAU) scenario, where EDM implements its investment plan (including the cost of connecting new customers to achieve 50 percent access by 2023) without any tariff increase beyond 2018.

Profitability

32. EDM's profitability will experience a downward trend. All profitability metrics are expected to worsen further from an already mediocre position in 2015 to a worse and weakened position. Table 5.6 summarizes EDM's forecasted profitability situation.

Table 5.6. Main financial ratios

Profitability	2015	2017	2018	2019	2020	2021
Net margin (%)	−11.90	−7.86	0.52	−0.90	−7.00	−11.63
Operating margin (%)	−9.69	−7.19	1.55	1.33	−3.69	−7.34
Return on equity (%)	−15.2	−31.0	2.5	−5.3	−101.2	−187.2
Return on capital employed	−4.79	−3.59	0.25	−0.45	−4.22	−9.63

33. Without an adequate plan to improve efficiency in operation and the recovery of efficient costs, EDM's return on capital employed is expected to stay in negative territory in all years but 2018, reaching negative 9.63 percent in 2021. Similarly, EDM's return on equity is expected to deteriorate going from negative 31 percent in 2017 to negative 187.2 percent in 2021, as EDM's own equity is expected to be completely eroded (that is, insolvency) by the continued negative net results year after year.

Liquidity

34. EDM's liquidity position, already poor in 2015, is not expected to improve in the period 2017–2021 under a BAU scenario. Apart from the 'Days Cash on Hand' metric, all short-term liquidity metrics will see a significant deterioration. Table 5.7 provides a summary of the main metrics and their trends.

Table 5.7. Main financial ratio

Liquidity (short-term)						
	2015	2017	2018	2019	2020	2021
Quick ratio	0.63	0.69	0.42	0.36	0.32	0.29
Current ratio	0.72	0.83	0.53	0.44	0.40	0.37
Collection period	71	44	44	44	44	44
Days in Payable	1,620	1,245	2,076	2,243	1,800	1,652
Cash conversion cycle	−1,549	−1,201	−2,032	−2,199	−1,756	−1,608
Days Cash on Hand	85	87	93	92	86	83

35. EDM's quick and current ratios were weak in 2015 and are expected to stay mediocre and will even worsen on the forecast period, suggesting that without outside financial support, the company will no longer be able to pay for its short-term obligations.

36. Only EDM's collection period (days) will stay excellent on the forecast period, owing to the prepayment system in place that covers approximately 90 percent of the total customers.

37. EDM's 'Days in Payable', already high at 1,620 days (it takes on average 4.4 year to fully clear account payables) in 2015, will grow further up to 2,243 days in 2019 before falling back to the 2015 level as part of the reduction efforts in non-technical losses. The growth in account payables will remain a sign of stress on the company financials (Treasury).

38. A negative and growing cash conversion cycle is a sign that EDM will keep relying on its suppliers to finance its operations (working capital needs) which could lead in the long run to a supply of energy and/or fuel cut.

39. The average 'Days Cash on Hand' of around 80 days (for operating expenses cover, a higher number is better indicator of short-term financial health) is at the lower range of that of a typical electric utility in developed countries' cash management ranges. Typically, a minimum of 90 days cash in hand is expected.

Leverage

40. Under the BAU scenario, the development of its capital investment plan (including investments required to achieve 50 percent access by 2023) means that EDM will remain highly levered with capital structure and the leverage metrics is expected to go against a strong capital structure and financial soundness. Ignoring the contingent financial liabilities the company has taken through long-term Power Purchase Agreements signed with the IPPs, the capital structure (total liabilities/total assets) of the company is expected to be above 75 percent, which is relatively high, indicating that the company is expected to take on significantly higher amounts of debt without a corresponding increase in net assets. Table 5.8 summarizes the trends in the main metrics.

Table 5.8. Trends in the main metrics

Solvency (leverage)						
	2015	**2017**	**2018**	**2019**	**2020**	**2021**
Leverage (long-term debt-to-equity ratio)	1.29	5.70	6.57	7.66	16.79	−15.00
Indebtedness (liabilities/assets) (%)	78.97	92.93	94.34	95.44	98.13	101.78
Interest coverage ratio (TIER)	−0.46	−5.54	0.93	0.50	−0.99	−1.57
Interest coverage ratio (TIER) - Inclusive of interest income	−1.40	−10.66	1.50	0.60	−1.11	−1.71
Debt service coverage ratio	5.98	1.27	1.25	0.97	0.65	0.54
EBITDA/Net interest expense	1.51	−1.87	8.67	5.62	2.19	0.59
CFO/debt service	5.59	4.80	2.82	1.63	1.18	0.96

Note: CFO = cash flow from operation, EBITDA = . Earnings before interest, taxes, depreciation and amortization

41. EDM's capital structure (long-term debt / equity) is expected to continue to deteriorate during this period as equity in the company is effectively being eroded by chronic negative net result, creating a higher financial cost to the company through the service of higher interest

expenses.[20] Total indebtedness (liabilities / assets) is expected to grow from 79 percent in 2015 to 102 percent in 2021, as the account payables is expected to rise steadily to finance working capital needs.[21]

42. Interest coverage ratio being inadequate in 2015 (−0.46) will get worse and erratic as the company earnings before interest and taxes is expected to fall, increasing the burden on the company to find other sources of funding for interest expenses and debt repayment.

43. EDM's debt service coverage ratio is expected to be adequate (above 1.25) only for the period 2017–2018 as the cash needed for debt repayment and interest expenses can still be financed by working capital. However, without new borrowings and/or capital infusion, the company will not be able to finance its growing capital expenditure as cash flow from operations become increasingly insufficient to cover the additional capital needs. This is exacerbated by its cost recovery challenges through retail tariffs, until such time that tariff increases have been carried out.

44. Assuming a minimum equity of 10 percent of total assets (as usually legally required), the GoM would have to inject capital every year to absorb the losses it is expected to incur. Table 5.9 provides an indication of the size of capital injections needed under the BAU scenario (in the absence of additional tariff increases beyond 2018).

Table 5.9. Size of capital injections needed under the BAU scenario

Debt & Recapitulation (Mt, thousands)		**2017**	**2018**	**2019**	**2020**	**2021**
Minimum equity (% total asset)	**10%**	13,080,637	16,761,967	19,789,810	23,950,357	28,948,605
Total equity at the beginning of the year		12,121,392	13,080,637	16,761,967	19,789,810	23,950,357
(+) Accumulated profits		(1,912,531)	(1,673,149)	(2,147,087)	(6,682,555)	(16,305,185)
(+) Supplementary capital addition		**2,871,775**	**5,354,480**	**5,174,930**	**10,843,102**	**21,303,434**
Total equity at the end of the year		13,080,637	16,761,967	19,789,810	23,950,357	28,948,605

Asset Efficiency

45. Assuming EDM assets performance before 2015 for forecasting purposes, EDM's asset utilization ratios were kept stable. This reflects the change in EDM's asset utilization strategy, by using more IPP (and power imports) to supply its energy needs instead of investing in its own producing assets. Table 5.10 provides a summary of the metrics followed.

Table 5.10. Summary of metrics

Efficiency	**2015**	**2017**	**2018**	**2019**	**2020**	**2021**
Working capital turnover	−4.10	−2.98	−2.85	−2.81	−2.90	−2.97
Tangible asset turnover	0.34	0.38	0.35	0.33	0.35	0.38
Assets turnover	0.27	0.28	0.28	0.27	0.27	0.29

[20] A credit-worthy power utility (minimum BBB− credit rating) should have a ratio below 1.2
[21] A typical U.S. regulated power utility has a ratio below 50 percent, commonly between 35 percent and 40 percent.

Efficiency	2015	2017	2018	2019	2020	2021
Inventory turnover	0.81	3.46	3.61	3.61	4.46	5.77
Receivables turnover	0.19	0.12	0.12	0.12	0.12	0.12
Payables turnover	0.23	0.29	0.18	0.16	0.20	0.22

46. A negative working capital turnover characterizes a trend of financing the company's working capital needs through short-term liabilities (essentially through account payables). This trend should obviously be reversed as soon as possible, as it will eventually lead to a severe interruption of service and/or poor reliability.

47. EDM's asset turnover ratios are expected to stay stable, assuming that the change in asset development and operation strategy that were previously implemented will be pursued.

Annex 6: Project Maps (Component 1)

Figure 6. 1. Power Network Investments in Mozambique

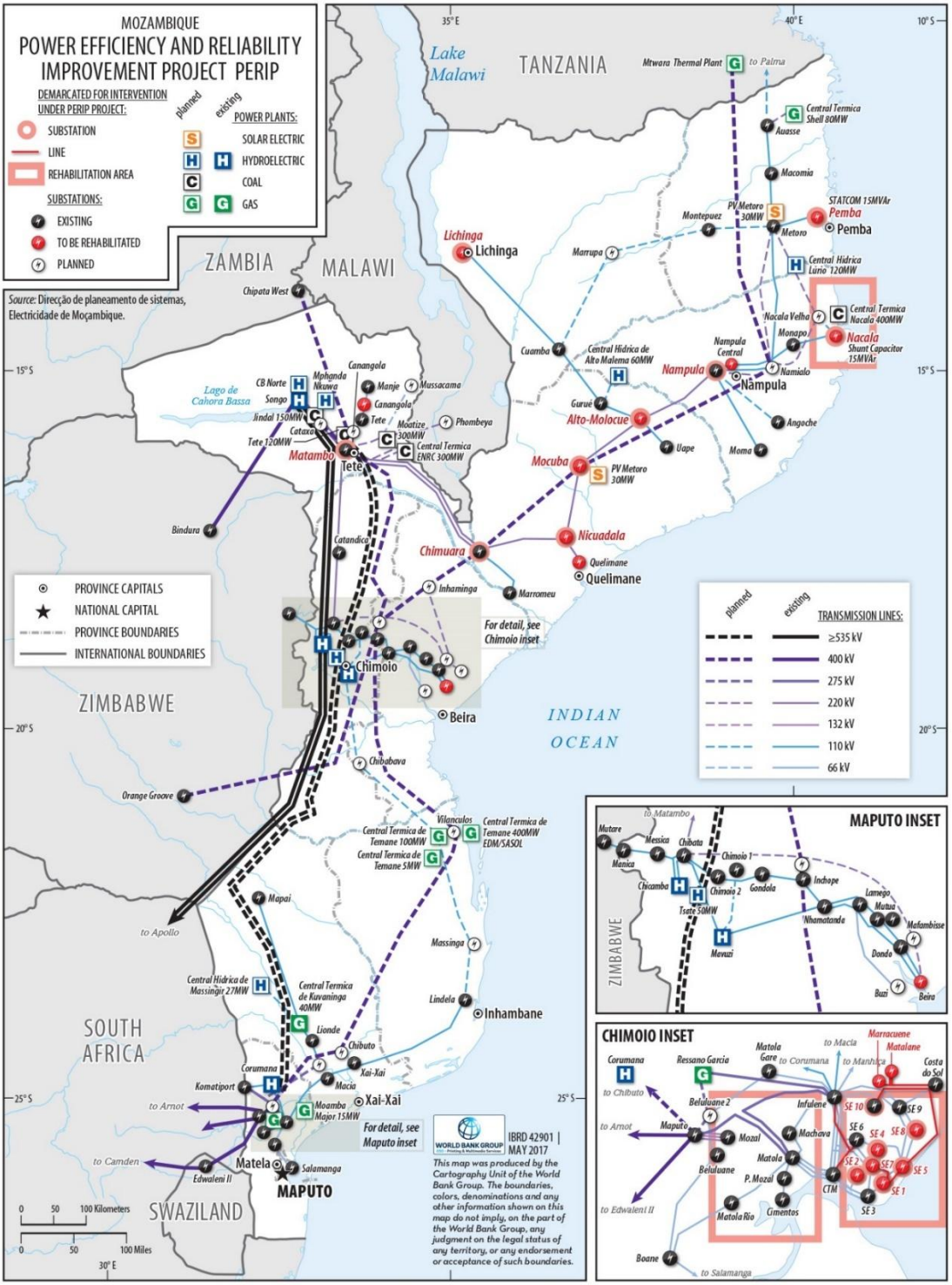


Figure 6.2. Infrastructure Investments in Maputo and Matola Cities