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Report No: PAD3023

INTERNATIONAL DEVELOPMENT ASSOCIATION

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED IDA CREDIT

IN THE AMOUNT OF US$144.0 MILLION

AND A

PROPOSED IDA GRANT

IN THE AMOUNT OF SDR 4.4 MILLION
(US$6.0 MILLION EQUIVALENT)

TO THE

REPUBLIC OF MALAWI

FOR THE

MALAWI ELECTRICITY ACCESS PROJECT

May 30, 2019

Energy and Extractives Global Practice
Africa Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective April 30, 2019)

Currency Unit = Malawian Kwacha (MWK)

MWK 736.40 = US$1

US$1 = SDR 0.72162568

FISCAL YEAR
July 1 - June 30

ABBREVIATIONS AND ACRONYMS

AAC	All Aluminum Conductor
ADMD	After Diversity Maximum Demand
AECF	African Enterprise Challenge Fund
AEP	Accelerated Electrification Program
BIF	Business Innovation Facility
CAPEX	Capital Expenditure
CAS	Country Assistance Strategy
CoC	Code of Conduct
CPF	Country Partnership Framework
CSO	Civil Society Organization
DfID	United Kingdom Department for International Development
DHS	Demographic and Health Survey
DSM	Demand-side Management
EGENCO	Electricity Generation Company Limited
EIRR	Economic Internal Rate of Return
EnDev	Energizing Development Partnership
ENPV	Economic Net Present Value
ESCOM	Electricity Supply Corporation of Malawi
ESDP	Energy Sector Directions Paper
ESIA	Environmental and Social Impact Assessment
ESMAP	Energy Sector Management Assistance Program
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ESSP	Energy Sector Support Project
FI	Financial Intermediary
FIRR	Financial Internal Rate of Return
FM	Financial Management
FNPV	Financial Net Present Value
FSTAP	Financial Sector Technical Assistance Project

FY	Fiscal Year
GBV	Gender-based Violence
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIS	Geographic Information System
GNI	Gross National Income
GoM	Government of Malawi
GRM	Grievance Redress Mechanism
GRS	Grievance Redress Service
IFC	International Finance Corporation
IFR	Interim Financial Report
IPDC	Internal Procurement and Disposal Committee
IPF	Investment Project Financing
IPP	Independent Power Producer
IRP	Integrated Resource Plan
IVA	Independent Verification Agent
IT	Information Technology
LED	Light Emitting Diode
LV	Low Voltage
M&E	Monitoring and Evaluation
MAREP	Malawi Rural Electrification Program
MCA	Millennium Challenge Account
MCC	Millennium Challenge Corporation
MEAP	Malawi Electricity Access Project
MERA	Malawi Energy Regulatory Authority
MFI	Microfinance Institution
MGDS	Malawi Growth and Development Strategy
MoNREM	Ministry of Natural Resources, Energy, and Mining
MSMEs	Micro, Small, and Medium Enterprises
MV	Medium Voltage
MWK	Malawian Kwacha
NEP	National Electrification Program
NES	National Electrification Strategy
NPL	Nonperforming Loan
NPP	National Procurement Procedure
NPV	Net Present Value
O&M	Operation and Maintenance
OGS	Off-grid Solar
OHS	Occupational Health and Safety
OPEX	Operating Expenditure
PAYG	Pay-as-you-go
PDO	Project Development Objective
PIM	Project-level Implementation Manual

PIU	Project Implementation Unit
PO	Partner Organization
POM	Project Operations Manual
PP	Procurement Plan
PPSD	Project Procurement Strategy for Development
PV	Photovoltaic
RAP	Resettlement Action Plan
RBF	Results-based Financing
RBM	Reserve Bank of Malawi
RFB	Request for Bids
RFQ	Request for Quotation
RPP	Revenue Protection Program
SACCO	Savings and Credit Cooperative
SAPP	Southern African Power Pool
SDG	Sustainable Development Goal
SDR	Special Drawing Rights
SE4ALL	Sustainable Energy for All
SHS	Solar Home System
SMEs	Small and Medium Enterprises
SPD	Standard Procurement Document
STEM	Science, Technology, Engineering, and Mathematics
STEP	Systematic Tracking of Exchanges in Procurement
TA	Technical Assistance
ToR	Terms of Reference
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
VAT	Value Added Tax

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Practice Manager: Sudeshna Ghosh Banerjee

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DATASHEET

BASIC INFORMATION

Country(ies)	Project Name	
Malawi	Malawi - Electricity Access Project	
Project ID	**Financing Instrument**	**Environmental Assessment Category**
P164331	Investment Project Financing	B-Partial Assessment

Financing & Implementation Modalities

[ ] Multiphase Programmatic Approach (MPA)	[ ] Contingent Emergency Response Component (CERC)
[ ] Series of Projects (SOP)	[ ] Fragile State(s)
[ ] Disbursement-linked Indicators (DLIs)	[ ] Small State(s)
[✓] Financial Intermediaries (FI)	[ ] Fragile within a non-fragile Country
[ ] Project-Based Guarantee	[ ] Conflict
[ ] Deferred Drawdown	[ ] Responding to Natural or Man-made Disaster
[ ] Alternate Procurement Arrangements (APA)	

Expected Approval Date	Expected Closing Date
20-Jun-2019	30-Jun-2024

Bank/IFC Collaboration

No

Proposed Development Objective(s)

The development objective of the project is to increase access to electricity in Malawi.

Components

Component Name	Cost (US$, millions)

Grid Electrification	105.00
Off-grid Market Development Fund	30.00
Technical Assistance and Capacity Building	15.00

Organizations

Borrower:	Ministry of Finance, Economic Planning and Development
Implementing Agency:	Ministry of Natural Resources Energy & Mining Electricity Supply Corporation of Malawi, Ltd.

PROJECT FINANCING DATA (US$, Millions)

SUMMARY

Total Project Cost	150.00
Total Financing	150.00
of which IBRD/IDA	150.00
Financing Gap	0.00

DETAILS

World Bank Group Financing

International Development Association (IDA)	150.00
IDA Credit	144.00
IDA Grant	6.00

IDA Resources (in US$, Millions)

	Credit Amount	Grant Amount	Guarantee Amount	Total Amount
National PBA	144.00	6.00	0.00	150.00
Total	**144.00**	**6.00**	**0.00**	**150.00**

Expected Disbursements (in US$, Millions)

WB Fiscal Year	2019	2020	2021	2022	2023	2024	2025

Annual	0.00	14.83	31.97	39.69	33.52	27.23	2.76
Cumulative	0.00	14.83	46.81	86.49	120.02	147.24	150.00

INSTITUTIONAL DATA

Practice Area (Lead)

Energy & Extractives

Contributing Practice Areas

Finance, Competitiveness and Innovation

Climate Change and Disaster Screening

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

Gender Tag

Does the project plan to undertake any of the following?	
a. Analysis to identify Project-relevant gaps between males and females, especially in light of country gaps identified through SCD and CPF	Yes
b. Specific action(s) to address the gender gaps identified in (a) and/or to improve women or men's empowerment	Yes
c. Include Indicators in results framework to monitor outcomes from actions identified in (b)	Yes

SYSTEMATIC OPERATIONS RISK-RATING TOOL (SORT)

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

9. Other	Substantial
10. Overall	Substantial

COMPLIANCE

Policy

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

[ ] Yes [✓] No

Does the project require any waivers of Bank policies?

[ ] Yes [✓] No

Safeguard Policies Triggered by the Project	Yes	No
Environmental Assessment OP/BP 4.01	✓	
Performance Standards for Private Sector Activities OP/BP 4.03		✓
Natural Habitats OP/BP 4.04	✓	
Forests OP/BP 4.36	✓	
Pest Management OP 4.09	✓	
Physical Cultural Resources OP/BP 4.11	✓	
Indigenous Peoples OP/BP 4.10		✓
Involuntary Resettlement OP/BP 4.12	✓	
Safety of Dams OP/BP 4.37		✓
Projects on International Waterways OP/BP 7.50		✓
Projects in Disputed Areas OP/BP 7.60		✓

Legal Covenants

Sections and Description

ESCOM to maintain a ratio of total operating revenues to total operating expenses of not less than 1.0.

Sections and Description

ESCOM to maintain a ratio of current assets to current liabilities of not less than 1.0.

Sections and Description

ESCOM to ensure that the estimated free cash flows from its operating activities shall be at least 1.0 times the estimated maximum debt service requirements for any such Fiscal Year on all its debt.

Sections and Description
The Recipient shall not later than thirty (30) days after the Effective Date establish the Project Steering Committee with a mandate, resources, terms of reference and functions, satisfactory to the Association, and thereafter, maintain said Project Steering Committee throughout the Project implementation.

Sections and Description
The Recipient, by no later than one hundred eighty (180) days after the Effective Date, appoint external monitoring and evaluation experts ("Independent Verification Agent"), to act as third-party verifiers of proper implementation of the Financing Facility underPart B of the Project.

Conditions

Type	Description
Disbursement	For Category 1 as defined in Schedule 2, Section III.B. of the Financing Agreement, the Project Implementing Entity has recruited the following specialists: (i) an environmental safeguards officer (including occupational health and safety); and (ii) a social specialist, all with terms of reference, qualifications and experience, satisfactory to the Association.
Type	Description
Disbursement	For Category 2(a) as defined in Schedule 2, Section III.B. of the Financing Agreement, the Recipient has: (i) recruited the Fund Manager, in accordance with the Procurement Regulations; and (ii) prepared and adopted the Project Operations Manual, in form and substance satisfactory to the Association.
Type	Description
Disbursement	For Category 2(b) as defined in Schedule 2, Section III.B. of the Financing Agreement, the Recipient has, in form and substance satisfactory to the Association, completed the preparation of the mini-grid Subprojects, and launch of tender process for said Subprojects by Participating Mini-grid Developers.
Type	Description
Effectiveness	The Recipient has prepared and adopted the Project Implementation Manual, in form and substance satisfactory to the Association.
Type	Description
Effectiveness	A Subsidiary Agreement has been duly executed between the Recipient and the Project Implementing Entity.

I. STRATEGIC CONTEXT

A. Country Context

1. **Malawi is a landlocked country in southeastern Africa, bordered by Zambia, Tanzania, and Mozambique, with a population of about 18 million people.** The population growth rate is estimated at 2.8 percent per year, and the population is expected to reach 23 million by 2025. Malawi remains a rural economy; however, the country is urbanizing at an annual rate of about 3.5 percent, higher than the average for Sub-Saharan Africa. Malawi has had a stable democratic political system since 1994 and has initiated economic and political reforms in public financial management, business regulations, and the foreign exchange regime. The country has a very young population with 56 percent of Malawians being younger than 20 years. Of the people ages 15 years and above, 14.2 percent have never attended school and 70 percent have not completed primary school. [1]

2. **The economy is largely agrarian, and poverty is widespread.** Agriculture represents about 30 percent of gross domestic product (GDP), over 80 percent of total export earnings, and 85 percent of employment. The agriculture sector is dominated by two crops, maize for food security and tobacco for export revenues. This sector is heavily dependent on rainfall and, in recent years, climate variability has led to a recurrence of floods and droughts in various parts of Malawi. The country remains one of the world's poorest countries, with over half of its population living in poverty. In 2016, the proportion of poor households living below the poverty line of US$1.9 per day (2011 purchasing power parity) stood at 70 percent of the population.[2] The gross national income (GNI) per capita[3] was estimated at US$340 in 2015. Malawi is ranked 171 out of 188 countries on the United Nations Human Development Index[4].

3. **Malawi's development perspective is spelled out in Malawi's Vision 2020.** The vision was launched in 1998 with the aim to move Malawi to being a country that is "[…] secure, democratically mature, environmentally sustainable, self-reliant with equal opportunities for and active participation by all, having social services, vibrant cultural and religious values and a technologically driven middle-income economy" by 2020. The implementation of Vision 2020 has progressed in five-year medium-term strategies. To date, three medium-term national development strategies have been implemented including Malawi Poverty Reduction Strategy (2002–2005), Malawi Growth and Development Strategy (MGDS) I (2006–2011), and MGDS II (2012–2016). The Government has launched the MGDS III (2017–2022), which has five main pillars, namely (a) Agriculture and Climate Change Management; (b) Education and Skills Development; (c) Transport and Information and Communication Technology Infrastructure; (d) Energy, Industry, and Tourism Development; and (e) Health and Population Management.

4. **The medium-term economic prospects appear positive.** The Government of Malawi (GoM) under MGDS III is looking beyond the recent crisis and establishing strong foundations for economic recovery and growth. Economic patterns show signs of positive structural change, with the share of agricultural employment falling and that of more productive sectors like industry and services increasing. Real GDP

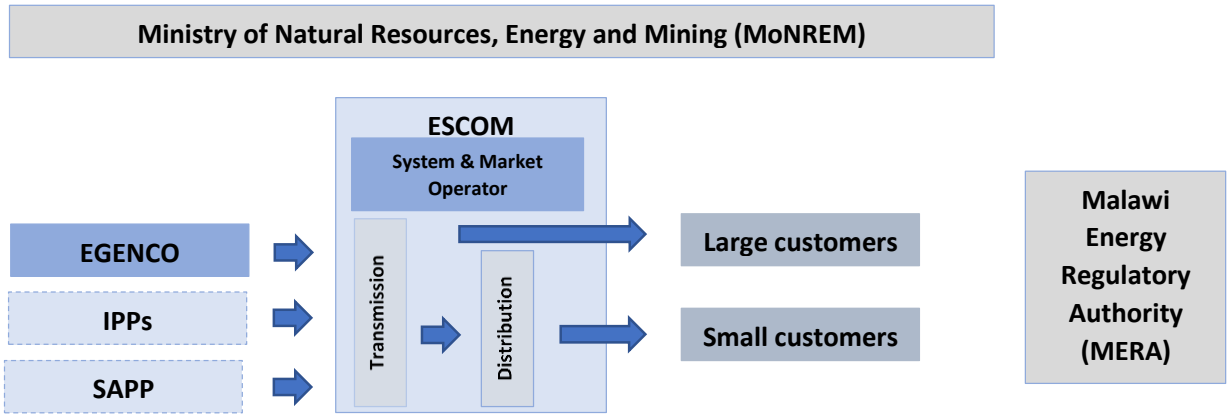
[1] Fourth Integrated Household Survey 2016–2017.
[2] World Bank. 2017. "Malawi Economic Monitor – Unleashing the Urban Economy." Macroeconomics and Fiscal Management Global Practice, Washington, DC: The World Bank.
[3] GNI per capita - atlas method (current U.S. dollar).
[4] UNDP. 2018. "Human Development Index 2018".

growth after two consecutive years of drought fell below 3 percent in 2016 but picked up again in 2017 increasing to 4 percent. Inflation dropped from 9.9 percent in March 2018 to 9.3 percent by March 2019[5].

B. Sectoral and Institutional Context

5. **Malawi's power sector is guided and structured by the National Energy Policy (2003) and the Electricity (Amendment) Act of 2016.** The Ministry of Natural Resources, Energy, and Mining (MoNREM) is tasked with the overall policy oversight. The Malawi Energy Regulatory Authority (MERA) was established in 2007 as an independent electricity regulator whose mandate is set out in the Energy Regulation Act (2004, with subsequent amendments). The role of MERA includes, among others, (a) reviewing tariff applications from the Electricity Supply Corporation of Malawi (ESCOM) and recommending tariff changes to the GoM; (b) granting licenses for generation and distribution operators; and (c) arbitrating commercial disputes that arise under the 2004 energy legislation. Under the amended Electricity Act of 2016, the former utility ESCOM has been unbundled into two entities: the distribution and transmission utility ESCOM and the Electricity Generation Company Limited (EGENCO). ESCOM assumed the new function of the single buyer and procures power from EGENCO and from independent power producers (IPPs) and in future, potentially, from the Southern African Power Pool (SAPP). Under the supervision of ESCOM's System and Market Operator, ESCOM Transmission supplies power to large and small customers through ESCOM Distribution. While the utility focuses on connecting high- and medium-demand customers in urban and peri-urban areas, the Government is electrifying rural trading centers across the country under the Malawi Rural Electrification Program (MAREP) based in MoNREM and funded through a 4.5 percent levy on energy sales (that is, liquid fuels, ethanol, liquified petroleum gas, and electricity).

Figure 1. Structure of the Malawi Power Sector



6. **Malawi has abundant, largely untapped solar and hydro resources.** The country's current installed generation capacity is 482 MW, of which 75 percent is from hydropower resources and the remainder from diesel power, the latter in the form of emergency generation. All major power stations are in the southern region along the Shire river. One small hydro station, the 4.5 MW Wovwe plant,

[5] Consumer Price Indices (March 2019): The GoM National Statistical Office.

operates in the north of the country. The hydro potential of the Shire river alone is estimated at about 600 MW, and another 400 MW of potential exists on smaller rivers. In addition, Malawi has great untapped solar potential with an average of 3,000 hours of sunshine per year, the development of which is being taken into consideration within the context of optimal land use against competing demands, e.g. agriculture. Finally, the country is also strategically located for interconnection with the SAPP, to be achieved upon the commissioning of the proposed Mozambique-Malawi Regional Interconnector Project.

7. **Notable results have been achieved with regard to infrastructure expansion and electricity service delivery.** Electricity connections have grown on average 11.5 percent in the past five years from 238,041 to 409,540 connections.[6] In the previous fiscal year alone (ending June 2018), ESCOM connected 35,000 customers. Under MAREP, 836 district administration and trading centers in rural areas were connected to electricity supply. Significant progress has been made in developing a robust transmission network. ESCOM's transmission system presently comprises some 1,340 km of 132 kV lines and 1,100 km of 66 kV lines and associated substations. Total system losses have seen a major improvement from 21 percent in 2012–13 to 18 percent in 2016–17.[7] The bill collection rate in Malawi has increased to 94 percent.[8] This has resulted from the installation of Automated Metering Infrastructure for all industrial customers representing about 50 percent of ESCOM's annual base and the migration from postpaid meters to prepaid meters for domestic consumers.

8. Despite this progress, the sector is beset with a multitude of challenges.

9. **First, Malawi has one of the lowest electricity access rates in the world.** Currently, the electricity access rate stands at 11 percent with severe disparities between urban (42 percent) and rural areas (4 percent).[9] The inequity among the rich and poor is stark—the poorest 20 percent reports 1 percent and the richest 20 percent reports 31 percent electrification rate.[10] The current annual population growth rate of 2.8 percent is outstripping the pace of electrification.[11] Malawi's off-grid sector is very nascent consisting of few donor-funded initiatives. Access to electricity and reliability of the network are major constraints for the private sector. According to the latest 2018 Doing Business Report, procedures, time, and cost to get connected to the electrical grid as well as the reliability of electricity supply and the transparency of tariffs in Malawi are ranked extremely low (169th out of 190 countries) and below the Sub-Saharan African average.

10. **Second, power supply is constrained at times and vulnerable to hydrologic variability.** While Malawi's current installed generation capacity is 482 MW, demand is estimated at around 440 MW leading to a supply deficit due to the low availability of hydropower especially during the dry season. In addition, the hydropower sources are exposed to hydrologic variability, and in the past two years, severe droughts have led to reduced water levels in Lake Malawi and consequently, reduced flow rates in the

[6] Information provided by ESCOM.
[7] ESCOM. 2018. "5-Year Integrated Strategic Plan (2017–2022)."
[8] http://rise.worldbank.org/country/malawi.
[9] World Bank. 2018. "First Order Geospatial Least-cost Electrification Plan."
[10] Kojima, M., X. Zhou, J. Han , J. de Wit, R. Bacon, and C. Trimble. 2016. "Who Uses Electricity in Sub-Saharan Africa – Findings from Household Surveys."
In each country, people are divided into quintiles based on per capita expenditures, with quintile 1 being the poorest and quintile 5 being the richest.
[11] 0.82 percent on average in the past five years.

Shire river. This shortage resulted in prolonged load shedding of up to 12–16 hours or more a day during several months of the year, but the situation has abated somewhat with the introduction of new diesel generation. About 108 MW of emergency diesel generation capacity has been installed to immediately assist with the supply deficit although at a high cost of about US$0.42/kWh.

11. **Third, the weak financial position of the utility hampers the ability to undertake aggressive access expansion and ensure reliable service delivery.** The average electricity tariff is insufficient to meet ESCOM's cash flow requirements. Due to its financial situation, the utility has no borrowing capacity, and the Government has been assuming debt for meeting ESCOM's capital expenditure (CAPEX) needs. As a result of its financial position, ESCOM (a) has not been able to perform regular operation and maintenance (O&M), which led to poor customer service including service interruptions and increased restoration time; and (b) has focused on only connecting high-value customers able to afford the connection charge. Minor improvements in the tariff regime have been made over time. ESCOM submitted a new application to MERA to request a 60 percent increase in tariffs for the next four-year period of 2018 to 2021 against which 31.8 percent was approved for the same duration of which 20 percent was made effective in 2018/19. The average tariff for 2018/19 is MWK 88.02 (about US$0.12) and will increase to MWK 95.15 (about US$0.13) in 2021/22.

12. **The GoM is addressing these challenges through a comprehensive power sector reform program:**

- **First, through investment in generation and transmission projects.** The GoM is aggressively expanding its generation and transmission capacity in the near-to-medium term to ensure power supply adequacy and by matching demand growth and grid expansion plans through three major initiatives: (a) immediate additional power from 108 MW of emergency diesel generation and 120 MW of solar photovoltaic (PV) from IPPs;[12] (b) interconnecting to the SAPP through the Mozambique-Malawi Regional Interconnector transmission line, which will initially allow for an additional 50 MW of imported capacity from 2022 onward; and (c) increased domestic generation through IPPs by embarking on reforms that attract more private investment in generation. The World Bank, under the recently completed Energy Sector Support Project (ESSP) (P099626), supported the preparation of an Integrated Resource Plan, that is, a least-cost generation and transmission expansion plan that offers a list of priority energy projects through 2037.[13] The World Bank is supporting the Government with the design and financing of the Mpatamanga Hydropower Project (P165704) and the Mozambique-Malawi Regional Interconnector Project (P164354). Other donors, especially the Millennium Challenge Corporation (MCC), are also active in the sector (the MCC compact closed in September 2018). The US$350.7 million U.S.-funded MCC compact invested in transmission and distribution system strengthening and expansion through investments in

[12] The solar IPP program entailed a solar auction, which was the first instance of this approach being used in Malawi's power sector. In addition to the 120 MW of solicited solar IPP generation, another 90 MW of unsolicited solar PV generation is also under review.

[13] The World Bank has further financed, under the ESSP, the preparation of feasibility studies, environmental and social impact assessments (ESIAs), and tender documents for two large hydropower projects; and the western transmission backbone, along with solar resource mapping (Energy Sector Management Assistance Program [ESMAP] grant); and assessment of geothermal potential, wind resource mapping, and bagasse-fired generation. In addition, the World Bank prepared, through financing from the Government of Norway, the feasibility study and ESIA for the Mozambique-Malawi Regional Interconnector Project.

the transmission backbone project, transmission and distribution substations, and related technical assistance (TA) support.

- **Second, by improving the financial and operational performance of the utility.** Since mid-2016, various initiatives have been undertaken to improve the financial and operational performance of the sector entities. The MCC financed the implementation of ESCOM's turnaround aimed at restoring the utility's financial health and rebuilding the organization into a financially sustainable and well-managed utility. Consultants through MCC funding have conducted a financial modeling exercise that resulted in a set of recommendations on how to improve the financial health of the utility, including a sustainable debt management plan for ESCOM, plan for reducing ESCOM's high operating costs, a tariff adjustment methodology that will align tariff more with costs, and new accounting policies to adhere more closely to international financial standards. These interventions have already yielded results, that is, improvement in ESCOM's tax management, improved monitoring of CAPEX and budget utilization, and improved corporate performance. The MCC also supported ESCOM to introduce stronger operational practices to improve maintenance planning and execution, which will reduce the high system losses. In addition, ESCOM has moved most of its customers from postpaid to prepaid meters. ESCOM is also implementing a revenue protection program (RPP) and has already moved, through funding from the World Bank's ESSP, 750 of its industrial customers, representing 50 percent of ESCOM's revenues to advanced metering infrastructure, which will reduce nontechnical losses.
- **Third, by enhancing transparency and effectiveness of the regulatory framework.** To allow for the implementation and management of the new structure of the electricity sector that introduced the single buyer, the system and market operator, and IPPs in generation, MERA has adopted a new grid code and market rules for Malawi's electricity market. The Government is in the process of adopting a new National Energy Policy (2018) and a Renewable Energy Strategy (2017-2030), which will improve transparency of Malawi's regulatory framework, increase predictability, and generate investor confidence. Through ESMAP support, the World Bank carried out a regulatory gap analysis as well as a review of policies and regulatory instruments, including the National Energy Policy, the Renewable Energy Strategy, and the IPP Framework, which resulted in recommendations for supporting the reform process.

13. **The GoM aims to rapidly scale up electricity access to reach about 80 percent of the population by 2035, and it is developing a National Electrification Program (NEP).** In 2018, the GoM updated the National Energy Policy of 2003 to define the national energy development agenda in relation to the Malawi Vision 2020, MGDS III, and the Sustainable Development Goals (SDGs). The overall goal of the National Energy Policy 2018[14] is to establish a guiding framework including policy and strategic direction for achieving increased access to affordable, reliable, sustainable, efficient, and modern energy for every person in the country. It emphasizes the importance of establishing the institutional and regulatory framework to support the achievement of energy access goals. According to the National Energy Policy

[14] Currently awaiting Cabinet approval.

2018, the GoM currently aspires to reach 80 percent electricity connectivity by 2035.[15] The NEP, currently under preparation with World Bank TA support, embodies the following principles:

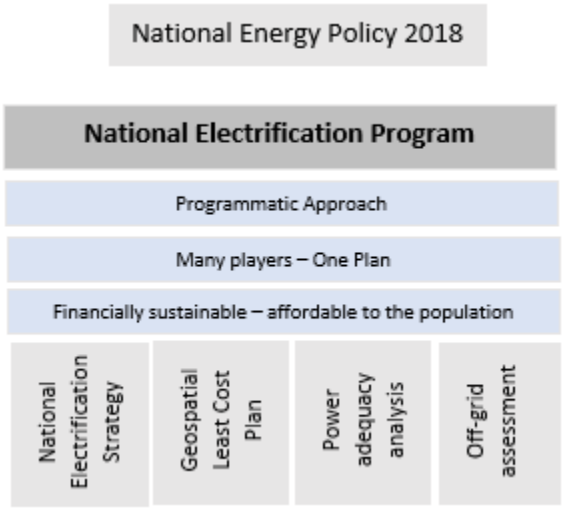
(a) A fast-paced ambitious grid connections rollout program implemented by ESCOM and MAREP.

(b) Enhanced design and reach of an off-grid access rollout program alongside grid connections.

(c) A catalogue of TA activities targeted at strengthening the institutional framework to deliver universal access to electricity. Responsibility of the overall program oversight of the NEP will lie with MoNREM.

14. **The NEP represents a strategic shift by the GoM, from the track record of numerous fragmented activities financed by development partners to a programmatic and holistic electrification approach.** The NEP's design and implementation are organized to rally all designated sector agents, development partners, and other stakeholders around a common sector platform and sector-wide implementation framework and process (Many players - One plan). Further, the Government recognizes the necessity of supplementing its limited budgetary and fiscal resources to ensure mobilization of adequate financing that can be sustained over the duration of the NEP's implementation, particularly for CAPEX associated with on-grid (medium voltage [MV], low voltage [LV], final service drops, and connections) and off-grid access rollout.

Figure 2. Malawi's NEP



15. The World Bank is supporting the NEP with the following ESMAP-financed activities:

(a) A National Electrification Strategy (NES) that defines the targets of the program as well as the key strategic elements that will ensure efficiency, effectiveness, and timeliness in program delivery.

[15] 35 percent Tiers 4 and 5 and 45 percent Tiers 1, 2, and 3.

(b) A Geospatial Least-cost Electrification Plan that estimates optimal modality (grid and off-grid) for access provision, taking into account technical and economic viability, georeferenced demand centers, and load forecasts, all anchoring the financing prospectus.

(c) An off-grid market assessment that specifies the operational implementation design for the off-grid pre-electrification program for the scale-up of stand-alone solar systems solutions and mini grids.

(d) A power adequacy analysis that ensures the grid electrification rollout is aligned with plans for commissioning new generation capacity as determined under the Integrated Resource Plan for Malawi.

16. **Grid electrification is likely to be the dominant least-cost electrification technology.** According to preliminary conclusions of the Geospatial Least-cost Electrification Plan,[16] most (95 percent) of Malawi's population lives within 10 km of the existing MV grid network, and a high percentage of those currently live within 5 km of an existing ESCOM network infrastructure. Therefore, over the longer term, grid connections represent the least-cost delivery modality for achieving universal access. The most important practical insight for electrification planning for Malawi in the near term is the large number of potential connections in the range of existing transformers that can be reached with little to no additional MV lines in the near term (2019–2022). Of the national population, 40–45 percent representing 1.5 million households lives within 1 km of existing ESCOM lines. Connecting these households will bring the national access rate to 38 percent. The plan also highlights that the CAPEX for grid connections can be reduced by at least 25 percent when applying best practices under a national electrification plan.

17. **The pre-electrification segment of 2 million households represents the immediate off-grid market, including both mini-grids and off-grid solar.**

18. **Off-Grid Solar: Given that energy demand for rural households will be low for at least a couple of years before they start using higher power consuming appliances,[17] solar represents the best and fastest pre-electrification alternative.** The Business Innovation Facility (BIF)[18] conducted a small off-grid lighting and phone charging study in 2016, capturing a snapshot of household technologies, habits, and expenditure. The study highlights that 13 percent of off-grid households use solar lighting, 9 percent portable solar lights, and 4 percent fixed solar lights. Promoting the use of solar, including for productive use, presents an important pre-electrification option. The World Bank-supported off-grid market assessment suggests up to 3.7 million households could require off-grid solar (OGS) solutions by 2030 (that is, 310,000 units per year). This translates to a potential market of about US$265 million for the 12-year period, or US$22 million a year.

19. **Limited access to finance is the primary factor preventing the solar companies from expanding their businesses and customer base.** There are no local manufacturers in Malawi, and all systems are being imported, mostly from China. The amount of the financing requirements expressed by the companies in the off-grid market assessment adds up to US$30 million. Most of this (70–80 percent) would be required to finance stock and receivables (working capital financing), while 20–30 percent would

[16] The preliminary Least-cost Electrification Plan has been prepared and is currently being reviewed by the Government.
[17] Demand is usually limited to a few lamps, radio, and/or television; these products can easily be powered by solar systems.
[18] The sample size of the survey was 513 households in seven districts: Blantyre, Zomba, Lilongwe, Mzuzu, Rumphi, Chikwawa, and Salima.

be required to invest in the development of the distribution network (that is, selecting agents, training them, providing them with financial support, and so on). The micro, small, and medium solar enterprises (MSMEs) operate in a nascent market for financial institutions. Commercial banks are currently not lending to the solar enterprises; only one microfinance institution (MFI) and one commercial bank have started to pilot consumer finance for solar. These companies have been relying on a mix of own equity and grants to invest and support their business. To make products affordable, solar companies are also providing consumer financing through a pay-as-you-go (PAYG) system, allowing installment payments for up to 18 months (with only 20 percent up-front payment). This means companies are taking credit risk and locking in their working capital, thereby limiting their capacity to grow. The cost of credit in Malawi is also a prohibitive factor, making commercial debt unaffordable for OGS companies, most of which are in their early years of operation or new entrants. Commercial interest rates currently range from 30 percent to over 100 percent for micro loans[19] (see Annex 4 for the state of the OGS sector in Malawi).

20. **Mini-Grids: There are ongoing activities in the development of mini grids as well.** The Government of Scotland funded two renewable energy projects during 2015 to 2018 including the Sustainable Off-grid Electrification of Rural Villages project. The project aims to electrify rural households, businesses, and community energy infrastructure. In addition, the Powering Development in Mulanje off-grid electrification project is meant to catalyze social and economic development of poor communities around Mulanje. The European Union is funding several renewable energy projects in Malawi including the supply and installation of solar-powered stations to deliver electricity to households, businesses, and irrigation systems. The United Nations Development Programme (UNDP) supported the development of a mini-grid in Mulanje that has a 60 kW micro-hydro generation scheme that supplies 280 households. The Geospatial Least-cost Electrification Plan has identified mini-grid locations for investment, the Government will need to work towards establishing the regulatory framework and business model to attract the private sector into this space.

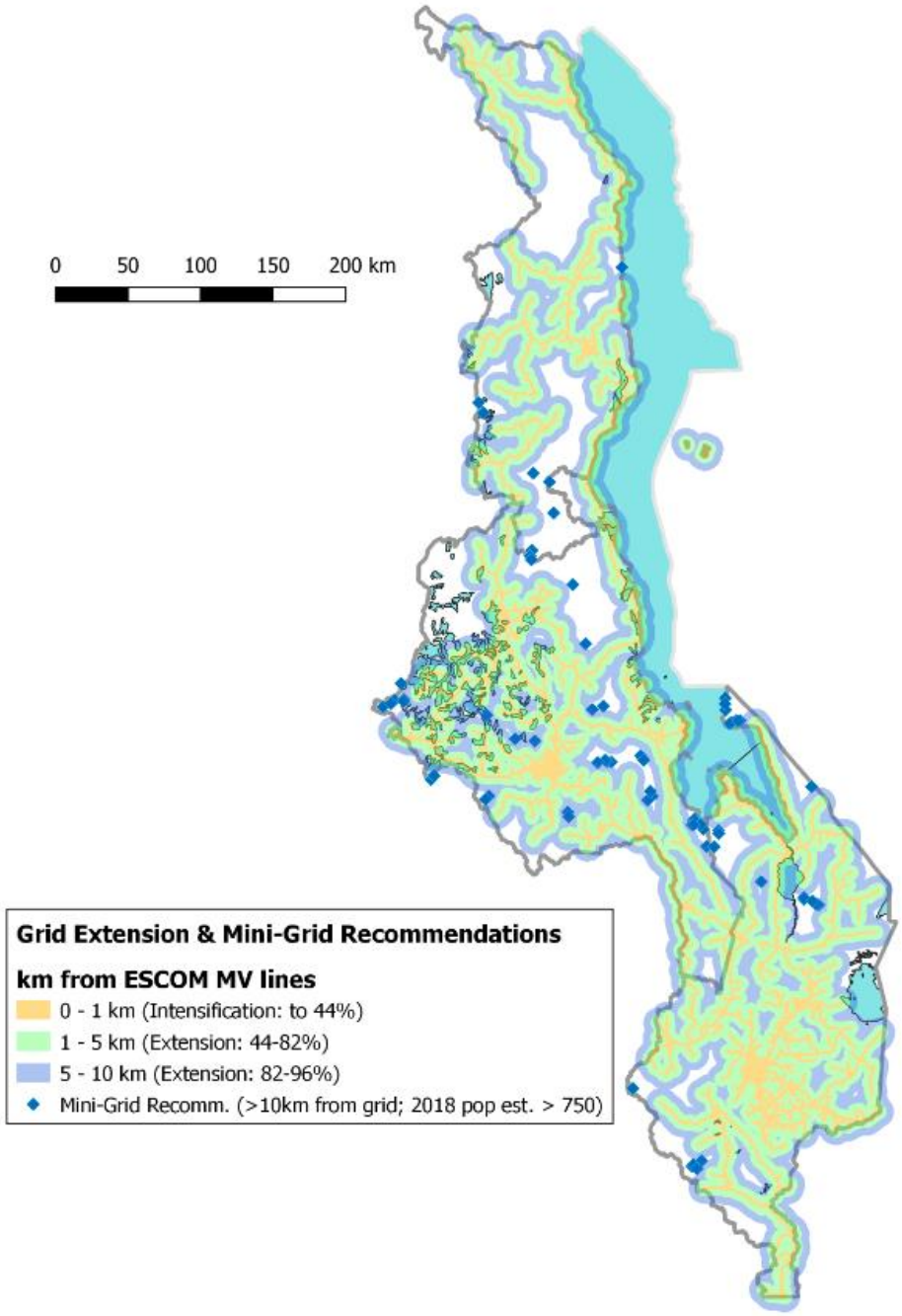
21. **The proposed project will bring a transformative change to the energy value chain in Malawi by supporting a rapid scale-up of the country's electricity access agenda**, by meeting the investment needs of an ambitious distribution expansion plan, and by promoting private sector participation for the deployment of solar home systems (SHS) and mini-grids. Malawi reports an electrification rate that is much lower even by Sub-Saharan African standards, and access expansion is expected to reach lower-income groups and contribute to the shared prosperity agenda. According to the SDG 7 tracking report,[20] the top 10 countries with the lowest electrification rates (including Malawi) represent as much a target of intervention as top 10 countries with the highest access deficit. Underpinned by a Geospatial Least-cost Electrification Plan, the proposed project seeks to creating an enabling environment for private sector to be operators, financiers, and service providers. The proposed project represents the first suite of financing for the NEP and establishes a blueprint for other development partners and private sector investors to contribute to the GoM's ambitious access vision to reach 80 percent electrification rate by 2035.

22. **The proposed project will more than double the existing electrification rate and create a platform to rapidly scale up access to electricity.** The proposed project provides financing to connect 280,000 households, small and medium enterprises, schools, administrative buildings, and health facilities

[19] This is attributable to several factors, including high cost of funds especially for small financial institutions, high perceived risks of MSMEs and consumer lending, and high operational costs.
[20] https://trackingsdg7.esmap.org/.

within close proximity to the existing grid network (see Figure 3). This will increase the electrification rate from the current 11 percent to 20 percent by the project's completion in 2024. In addition, through the off-grid market rollout, at least 200,000 households will access electricity, increasing the overall access rate by another 6 percent. However, the market rollout promoted by the project will have a much larger transformative impact for reaching the households that will not be connected to the grid in the foreseeable future by creating an environment for solar companies to scale. In addition, the project will promote an affordable and sustainable business model and conducive regulatory environment for mini-grids.

Figure 3. Grid Extension and Mini-grid Locations



C. Relevance to Higher Level Objectives

23. The proposed project directly contributes to the Country Assistance Strategy (CAS) for Malawi FY13–FY16,[21] especially to Theme 1: Promoting Sustainable, Diversified, and Inclusive Growth (*Outcome Indicator 1.2: Improved ease of doing business, through improved economic infrastructure, regional integration, and better access to demand-responsive skills development*) by providing the necessary critical infrastructure investments for improving the ease of doing business. Increased access to reliable electricity supply will not only lower costs and improve the profitability of business enterprises but also be key to enabling the setup of new private sector-led enterprises which stimulate GDP growth. It also increases opportunities for poor rural and remote households to pursue income-generating opportunities, stimulating off-farm activity and economic interaction, and hence can lead to more inclusive growth.

24. The proposed project contributes to CAS Theme 2: Enhancing Human Capital and Reducing Vulnerabilities (*particularly Outcome Indicator 2.1: Improved access to quality education, reliable nutrition, HIV/AIDS services, and sustainable water supply and sanitation services*) by increasing access to electricity services for poor households, particularly in rural areas contributing to raising the quality of life, improving access for social services such as educational and health facilities as well as information technology (IT), and promoting awareness on HIV/AIDS and other diseases. Expansion of low-emission renewable energy will reduce women's exposure to indoor air pollution.

25. Energy is also one of five main pillars of MGDS III (2017–2022), which is the five-year medium-term implementation plan of Malawi's Vision 2020. The proposed project is aligned with SDG 7, Sustainable Energy for All (SE4ALL), and the World Bank's Energy Sector Directions Paper (ESDP) 15. SDG 7, SE4ALL, and the ESDP all aim to 'ensure access to affordable, reliable, sustainable, and modern energy for all'. Finally, the project is aligned with the MFD agenda with IDA concessional resources being strategically deployed to present de-risked opportunities to the private sector to participate as service providers or financiers and contribute to the GoM's access vision.

II. PROJECT DESCRIPTION

A. Project Development Objective

PDO Statement

26. The development objective of the project is to increase access to electricity in Malawi.

PDO Level Indicators

- People provided with electricity (number) (Corporate Results Indicator)

[21] The CAS was extended by PLR by one year through end FY 17. The World Bank Group's new Country Partnership Framework (CPF) for Malawi is from FY20-24. The CPF is expected to focus on growth and resilience, human development, and institutions for implementation. It will support the MGDS III (2017–2022), which has five priority areas: (a) agriculture and climate change; (b) education and skills development; (c) energy, industry, and tourism development; (d) transport and information and communication technology infrastructure; and (e) health and population.

- People provided with access to electricity under the project by household connections (grid) (number) (Corporate Results Indicator)
- People provided with access to electricity under the project by household connections (off-grid) (number) (Corporate Results Indicator)

B. Project Components

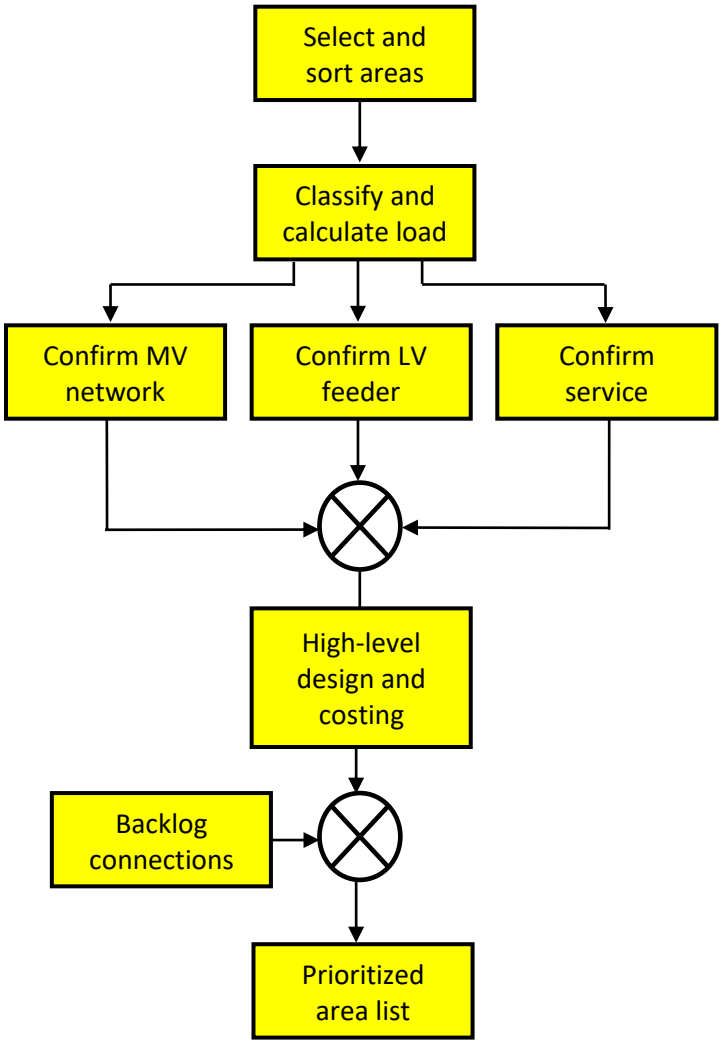
Component 1: Grid electrification (US$105 million IDA Credit)

27. **Grid densification/extension.** This component will finance cost-effective, priority investments in grid electrification by providing electricity supply to households living in close proximity to an existing distribution infrastructure leveraging on the geospatial analysis to maximize the number of connections under the financing. Specifically, the component will finance LV extensions, service drops, and prepayment meters. Some of the new connections may also require reinforcing hardware elements of the supplying MV feeder for ensuring quality and reliability of supply for new connections. The project will also support the elimination of connection barriers due to unaffordable internal wiring costs by providing ready boards to low-income households that cannot afford internal wiring costs.

28. **Demand-side management.** This project will also support the GoM's efforts in introducing energy-efficient appliances, and include the targeted distribution of free energy-efficient light emitting diode (LED) bulbs to enhance the affordability and reduce household electricity consumption. This will save consumers the cost of procuring compact fluorescent lamps or incandescent bulbs of wattage ranging between 20 W and 100 W. Each household will receive 2–3 LED bulbs of 7 W each, and through this initiative, household electricity consumption (particularly for low-income households) will be reduced by about 20 percent.

29. **Project selection methodology.** According to the selection methodology developed by ESCOM, project areas will be identified on the basis of clusters of potential customers within 500 m of a service transformer. Each cluster point will be linked to a service transformer and feeder, to gauge the number of connected customers per cluster point, transformer, and feeder using ESCOM meter data. The potential load per cluster point will be determined using household density and associated After Diversity Maximum Demand (ADMD). The impact of this load on the MV network will be determined through a load flow analysis while a simple LV feeder model will be used to check LV feeder voltages and loading. If the network has the capacity to supply the additional customers, the quantity of material and associated costs will be determined using design indicators based on the area density. The list of projects will be prioritized based on cost per connection and added to the current list of backlog projects (of currently 26,919 customers). The final list will be a combination of new and backlog projects. The proposed methodology is summarized in Figure 4.

Figure 4. Selection Methodology



30. **Productive uses.** The World Bank has been working on various methodological enhancements to the typical geospatial planning modelling approaches, including incorporating better estimation of productive uses of electricity, especially from agricultural activity. Inclusion of agricultural electricity demand can enhance the richness of the geospatial electrification planning process, by developing more comprehensive estimates of electricity demand in rural communities, while at the same time, opening the door towards better planning around increased productivity from mechanization of agricultural activities. Such methodological enhancements are already being piloted in other countries in the region – Zambia, Ethiopia and Mozambique. Given the importance of a productive agricultural sector to the economy of Malawi, the methodology will also be incorporated into the update of the geospatial planning model developed for the country. Prioritizing rural electrification by considering areas with existing or potentially high levels of agricultural production and related energy demand may help: (a) improve the financial viability of access expansion through higher revenues for the utility; (b) deliver greater economic benefits from electrification to rural areas; (c) facilitate the agricultural electrification for irrigation and other agricultural activities in rural areas.

31. **Power adequacy.** The investments and connection targets under the project are aligned with the GoM's generation expansion plans. The power adequacy analysis demonstrates that the additional load to be expected as a result of 280,000 connections is within the generation capacity forecasts. The analysis shows that even with some delays in some of the planned capacity additions, a connection rate of 75,000 customers per year can be supported as long as the Mozambique-Malawi interconnector is operational. This analysis is conservative in that the hydro generation levels assumed have been exceeded 70 percent of the time, based on the recent historical record.

32. **Connection policy.** According to ESCOM's connection policy, for every new electricity consumer within the radius of an existing secondary (LV) substation in the urban, peri-urban, and major rural centers, ESCOM will fund the construction of LV lines at its own costs and the consumer will pay a standard connection charge of MWK 25,000 (US$34). This capital contribution represents around 31 percent of the connection cost of MWK 79,000 (US$107) for a service drop and 12 percent of the connection cost of MWK 200,000 (US$280) for a one-pole service excluding the cost of grid extension (that is, average cost per connection including grid extension is about US$410). The balance is recovered through the tariff with a return on investment. Other charges that are paid by the consumer include a service fee of MWK 10,000 (US$16) and inspection fee of MWK 5,000 (US$8). For new electricity consumers connected in MAREP centers, the capital contribution charge is MWK 5,000 (US$8). Consumers under the project will fall in one of these two payment segments. New consumers outside urban centers and MAREP trading centers pay the full capital contribution depending on the distance from the nearest connection point. Evidence shows that the up-front connection charges of US$34 are not affordable to a larger part of the consumers targeted under this project (that is, low-income households). Under the design of this project, new consumers will have the option of financing the connection charges with repayment through the tariff in installments over a defined period. ESCOM will take up the initial cost of wiring and connecting the households. This will further support the elimination of connection barriers to electrification. The World Bank and other development partners shall advise ESCOM under the TA component on developing an updated connection policy that will ensure affordability for this new consumer group.

33. In terms of affordability of the tariff for the low-income consumers, the new tariffs approved by the regulator MERA have provided for a lifeline tariff of MWK 46 per kWh (US$0.06 per kWh) for the first 50 kWh of electricity consumed by domestic households.

Component 2: Off-grid market development fund (US$30 million: US$24 million IDA Credit and US$6 million equivalent IDA Grant)

34. The component will address the challenges to scaling up the off-grid market. As detailed in Annex 4, the high interest rates offered currently in Malawi to end consumers and small and medium enterprises (SMEs) due to high perceived risk, poor financial literacy resulting in high default rates as well as macroeconomic factors have restricted the off-grid market. At the same time, limited access to financing (mostly in the form of equity or grants) has restricted upscaling the off-grid market.

35. The Off-Grid Market Development Fund will provide financing through three windows - a working capital window, a results-based financing (RBF) window, and a mini-grid window. The first two windows will be available to OGS companies and the third window will be available to mini-grid developers.

36. **Working Capital and Results Based Financing for Solar Companies:** The arrangements for allocating working capital and RBF windows to OGS companies will be laid out in the project operations manual (POM). The windows will support Malawian businesses that can credibly demonstrate a capacity to sell or provide services with Lighting Global-approved products, commit to honor warranties for end consumers, and demonstrate how awarded funds have translated to new customer connections. The terms of financing (that is, pricing of loans), eligibility criteria of companies and their respective business plans as well as minimum RBF criteria will be defined in the POM, which is a disbursement condition of Component 2, that is, the POM for Component 2 shall be finalized prior to disbursements of loans and grants to solar off-grid companies. The POM shall be approved by MoNREM prior to its submission to IDA. The fund will also require OGS companies to use customer mapping technology as a layer of the geospatial mapping, to track customers to allow for third-party verification. The fund manager will need to coordinate reporting and ensure compliance.

37. The fund will also provide technical support to solar companies to build successful business models.[22] The project will facilitate partnerships between financial institutions, OGS companies, and business development providers that could lead to deployment of credit products that do not currently exist in the market. For example, to address the challenge of lack of collateral, technical support could be provided to financial institutions to offer asset-based lending (using PAYG receivables as assets) or cash flow-based lending.

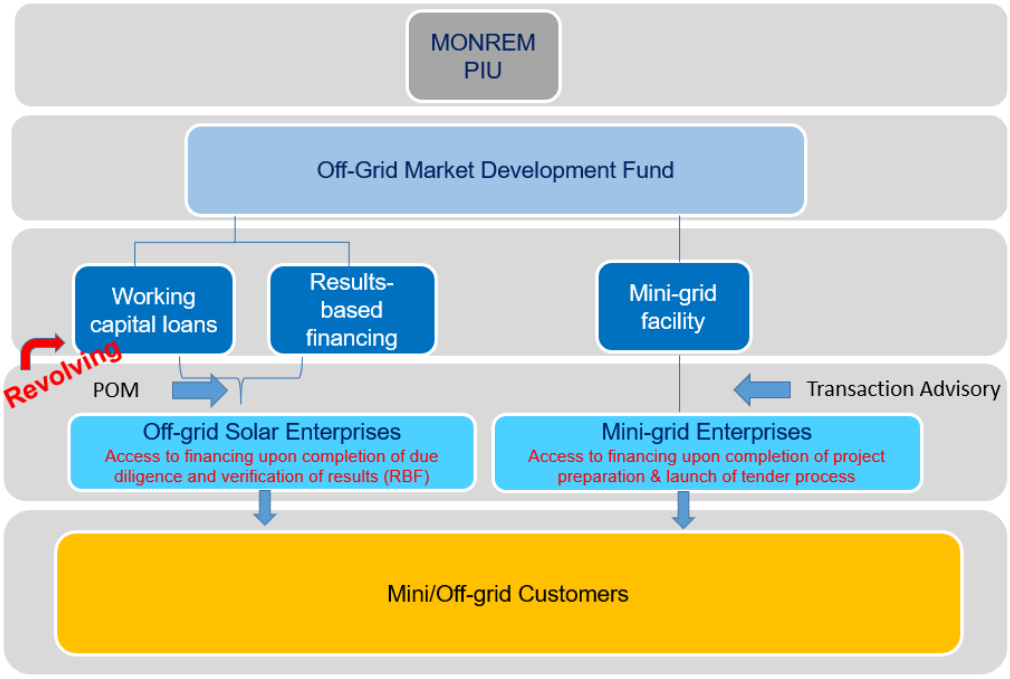
38. The RBF window is designed towards companies reaching out to poorer and remote rural locations. The RBF window will provide the necessary incentives to OGS companies to expand their businesses into these areas by financing the additional costs linked to the expansion of distribution channels. An affordability analysis was conducted as part of the off-grid market assessment. Results show that 60 percent of the population can afford a Tier 1 or 2 system. Affordability is further increased by promoting PAYG solutions allowing households to pay for systems over time. This window is also aligned with a recent United States Agency for International Development (USAID) initiative**.** The USAID through its Power Africa program has launched in January 2019 a similar off-grid facility with an RBF component of US$1.5 million. The USAID facility, and the World Bank's Off-Grid Market Development Fund were designed in close cooperation with the latter being defined as a follow-on, significantly scaled up initiative to support a growing off-grid market sector.

39. **Financing for Mini-Grid Developers:** A separate window for mini-grid developers will support financing for mini-grids prioritizing agriculture loads, schools, health facilities and enterprises in peri-urban and rural areas. It is expected that this window will open in a phased manner following the two windows described above considering the upstream work needed to develop a suite of bankable mini-grid projects as well as the business model to invite private sector participation. Depending on the upstream work, the GoM may tender out the mini-grid sites as public-private partnerships with the financing from the fund contributing to a minimum subsidy or viability gap funding to ensure a win-win situation of cost recovery for private developers; affordability of consumers; and limited fiscal impact on Government. Such upstream work will be funded from the TA Component 3. Following the identification of the potential mini-grid sites in the Geospatial Least-cost Electrification Plan, the TA under Component

[22] Technical support could also be provided to help OGS companies effectively manage their operations (including monitoring and evaluation [M&E]) as well as financial obligations, including future forex requirements for periodic importation of stock through market hedging instruments, for example, through simple foreign exchange forward contracts.

3 will support the design of the regulatory and financing framework leading up to the preparation of technical studies and tendering modality. The window will be activated once the tendering modality for the sites has been launched and the winning mini-grid developers could tap into this window. Given the importance of a productive agricultural sector to the economy of Malawi, mini-grid will be prioritized based on existing or potentially high levels of agricultural production and related energy demand.

Figure 5. Off-grid Market Development Fund



Component 3: Technical assistance and capacity building (US$15 million IDA Credit)

40. This component will finance various TA and capacity-building activities related to institutional culture and performance to ensure ESCOM, MoNREM, and other sector stakeholders have adequate technical, planning, and operational capacity to implement the electrification rollout activities and effectively undertake activities under Components 1 and 2 of the project. This will entail two subcomponents.

41. **Subcomponent 3.1: Technical assistance to ESCOM (US$5 million).** This will mainly finance activities to support ESCOM to effectively implement Component 1, including support for detailed project design, planning, and supervisory oversight, and related PIU expenses. More specifically, the subcomponent will finance (a) capacity building and implementation support for the Project Implementation Unit (PIU) in ESCOM related to core functions including FM, procurement, safeguards, and M&E; (b) preparation of a Program Operations Manual (POM) informed by a least-cost geospatial rollout plan; (c) training at ESCOM's training facility of ESCOM frontline construction supervision management personnel and private sector contractors for implementing a scaled-up on-grid connections program; (d) mainstreaming, more broadly, of selective high-impact demand-side management (DSM) measures; (e) geographic information system (GIS) platform for network reticulation planning and design;

(f) system-wide MV feeder-specific upgrading Master Plan through 2030, including affordable new connections fee policy; (g) preparation and implementation of a gender-sensitive capacity-building plan and program; (h) design of a recruitment, mentoring, and leadership development program targeting potential, new, and existing female employees at ESCOM; and (i) establishment and implementation of a Grievance Redress Mechanism (GRM).

42. **Subcomponent 3.2: Technical assistance to MoNREM (US$10 million).** This subcomponent will support (a) capacity strengthening of the PIU in MoNREM tasked with oversight and implementation of activities under Component 2; (b) mini-grid development - technical studies for up to 10 mini-grid locations and transaction advisory to design a tender process; (c) fund management fee under Component 2; (d) TA for off-grid market development like targeted government policy and regulation, quality assurance, and gender-informed consumer awareness and TA for financial institutions; (e) institutional design of a semiautonomous Rural Electrification Agency and Fund including repositioning MAREP's role going forward with focus on mini grids; and (f) sector studies and training.

C. Project Beneficiaries

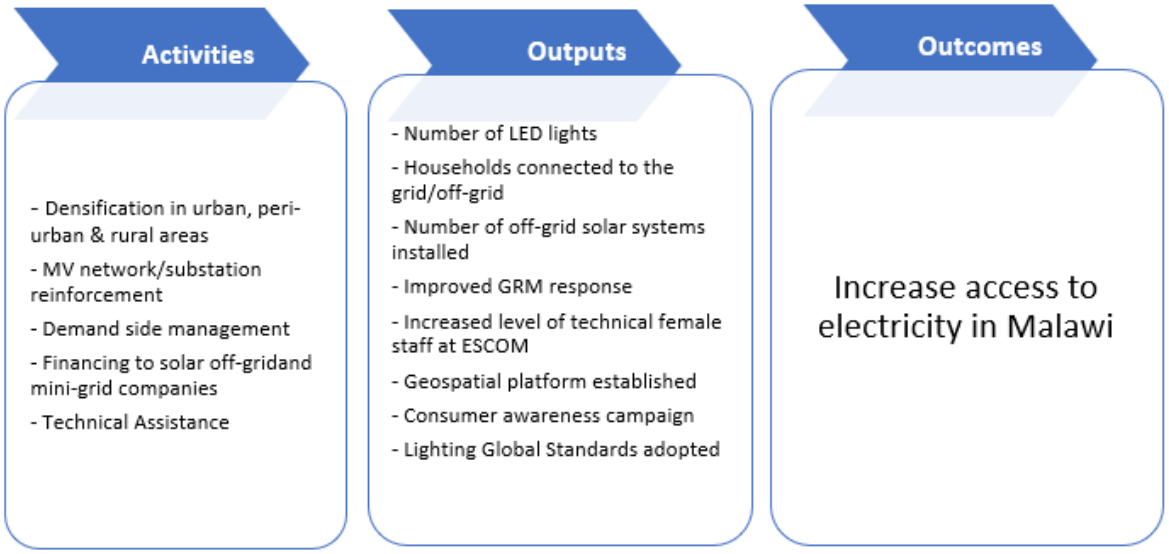
43. The beneficiaries of the project will include the following:

- **Households.** Access to electricity contributes to an improvement in the quality of life by enabling newly connected consumers to undertake productive and income-generating activities (less time spent on fetching traditional sources of energy and clean water) and enhanced access to information/communication (through phone, radio, television, and so on). Empirical evidence also points to health benefits owing to the reduction of indoor air pollution due to reduced kerosene consumption.
- **Health facilities, schools, and water pumping stations.** Improvements in the quality of public service delivery are expected through increased electricity connections, especially of public facilities such as schools, clinics, hospitals (for example, for cold chain, vaccine and medicine refrigeration, lighting, and sterilization), and water pumping stations (for example, for safe drinking water) used by poor and vulnerable households.
- **Enterprises.** Improved access to electricity supply will contribute to increased productivity and income of enterprises (particularly for MSMEs) and will assist them in reducing their dependency on expensive diesel generation that has a substantially higher per unit cost. In addition, increased access to electricity can boost productivity and reduce sales and equipment losses.
- **Electricity sector institutions.** The sector institutions, especially MoNREM and ESCOM, are expected to benefit from the strengthening of planning and implementation capacity, which could translate into improved institutional performance as well as cost-effectiveness, efficiency, transparency, and accountability of the sector.
- **OGS companies.** The solar companies will benefit through increased access to financing for business development support and working capital allowing them to expand their businesses by building inventory, widening distribution channels, increasing training for distribution agents, improving after-sales services through increasing technicians and

introduction of trouble-shooting technologies, extending their product line, and introducing innovations.

- **Gender-differentiated benefits.** Providing rural households, social services, and enterprises with electricity has the potential to promote gender equality, create employment and business opportunities for women, and improve development outcomes regarding, for example, education. Under the project, gender-differentiated considerations will be mainstreamed as part of the utility's operations.

D. Results Chain



E. Rationale for World Bank Involvement and Role of Partners

44. The proposed operation provides public sector financing for electrification initiatives where commercial financing is not considered viable. Experience worldwide amply confirms scale-up in electricity access cannot be achieved without substantial and sustained public support since recovery of the capital expenditure associated with the access program through retail tariff and front-end connection charges makes access unaffordable to most potential beneficiaries.

45. **Maximizing Finance for Development.** In the proposed project, IDA concessional resources are strategically deployed to present de-risked opportunities to the private sector to participate as service providers or financiers and contribute to the GoM's access vision. Public funding provided under Component 2 is supporting the development of a solar market by providing financial resources that are currently not available for solar companies, allowing these companies to scale up their businesses and new market players to come in. Through the working capital window, companies will get more comfortable with commercial borrowing while the RBF window will allow companies to improve and expand their business channels. In addition, the TA provided under the project will provide training and awareness raising for financial institutions, especially commercial banks, on solar technologies and the market, allowing the financial intermediaries (FIs) to become more comfortable over time to lend to solar companies – contributing to enabling environment for private sector. Technical support is being provided

by the World Bank Group's Lighting Africa Initiative that focuses on catalyzing commercial markets for the delivery of clean, affordable, and reliable energy services.

46. **Rationale for World Bank involvement.** World Bank financing would add comparative value given the World Bank's position to draw upon global experience and expertise in areas directly related to the investments and TA. Achievements from the successful implementation of the ongoing World Bank-supported operations in energy access also provide a strong background upon which to prepare the proposed operation. Particularly, the World Bank's involvement can (a) ensure that electrification program design and corresponding policy reform reflect principles of sustainability; (b) support best-practice analytics, such as the Geospatial Least-cost Electrification Plan; (c) enable pooling of resources from diverse donors for access expansion; (d) advise on effective competitive procurement processes that provide added benefit during project implementation; and (e) draw on global experiences in utility operations and utility management to support the design of a robust electrification program.

47. **Role of development partners.** The presence of developing partners in the electricity sector is scarce. Following the recent completion of the US$350.7 million Malawi compact by the MCC, no specific donor commitment has been secured for on-grid electrification. In the off-grid space, the largest support so far has been provided by the United Kingdom Department for International Development (DfID) with a US$2 million contribution to the African Enterprise Challenge Fund (AECF) for concessional loans and grants to solar companies and financial institutions in Malawi. Following AECF's recent call for business proposals, three companies, and one savings and credit cooperative (SACCO) were selected for a combination of loans and grants that now have to be matched on a 1:1 basis with other financial resources. Energizing Development Partnership (EnDev) has been providing support to solar companies for awareness raising and marketing campaigns implemented by its local partner institution Maeve. USAID has set up a US$1.5 million facility targeted at entry of international solar companies to the Malawian market. The proposed fund under Component 2 is the first systematic and large-scale effort to build a platform for solar companies to scale up operation as well as allow new players to enter the market. Additional support by other development partners can be channeled through the facility to further expand in future phases. In the mini-grid space, a few development partners (i.e. UNDP and the Government of Scotland) have been implemented mini-grid systems. About 16 projects are currently under construction or in planning phase. All of these projects could be considered pilots, with 100 percent of their investment cost funded with grants and tariffs set low to recover only costs associated with operation and maintenance. Most of these schemes are planned to be managed by social enterprises. The fund design takes into account experiences of previous and ongoing support from development partners. Coordination and alignment of efforts by other development partners will continue to be ensured through the donor energy sector working group.

F. Lessons Learned and Reflected in the Project Design

48. Recent experience demonstrates the potential impact of consistent World Bank support, for example, in Indonesia, Kenya, and Rwanda. In Indonesia, the World Bank supported the national electrification rollout program implemented by Indonesia's national utility Perusahaan Listrik Negara that managed to increase electricity connections by 2 million per year. In Kenya and Rwanda, implementation of their respective national electrification programs has been guided by a comprehensive Geospatial Least-cost National Rollout Plan (for coordinated grid and off-grid activities), and the financing gap has been filled by the Government-led syndication with participation from a wide range of development

partners. More broadly, experience worldwide with best-practice access scale-up programs amply confirms that no nation has achieved substantial scale-up in electricity access without significant and sustained public support, especially since recovery of the CAPEX associated with the access program (network rollout - MV, LV, service drops, and final connections) through retail tariff and front-end connection charges makes access unaffordable to most potential beneficiaries who are poor.

49. On the off-grid side, the project has been informed by experiences in countries across the globe, including Bangladesh, Ethiopia, and more recently Zambia. In Bangladesh, the Infrastructure Development Company Limited has been providing a combination of results-based grants and soft loans as well as TA to eligible partner organizations (POs) implementing the SHS program. POs select customers, extend loans, install the systems, and provide after-sales service. Implemented since 2003, the program has to date ensured supply of solar electricity to 18 million people, 12 percent of the country's total population who previously used kerosene lamps for lighting purpose. The program has been acclaimed as the largest off-grid renewable energy program in the world. In Ethiopia, the Development Bank of Ethiopia with financing from the World Bank has been providing working capital and consumer financing through two credit lines to eligible private sector enterprises and MFIs. More than 1 million households have benefited from the program. More recently in Zambia, the Swedish International Development Agency has set up the US$25 million Beyond the Grid Fund managed by the Renewable Energy and Energy Efficiency Partnership that intends to speed up market access and market development by providing RBF. Specific lessons from these examples include the following:

- **Flexible facility design.** Technologically and geographically neutral facilities allowing for a wider range of solutions and flexible business models in one country are needed to respond to the diverse needs of varied population of different characteristics, the geographic population density and housing patterns, and income segments. The new technologies, falling costs, and innovative business models provide an opportunity to reach a much wider spectrum of population, including the poor, by catering to a much broader range of technology options, business approaches, and intervention mechanisms, which can be provided in parallel. This also allows leveraging transaction costs over larger disbursement volumes and to scale up off-grid project ambition.
- **Quality control matters.** It is crucial to establish quality assurance of product performance at the beginning of a project to establish credibility and consumer confidence. The need for quality assurance for SHSs was determined early in the Bangladesh project. Procurement of the SHSs was the responsibility of the MFIs and nongovernmental organizations, which were to follow established commercial practices. Stringent quality standards were set, including a five-year warranty for batteries, and these quality standards were strongly enforced. In Mongolia, the design included adoption of international standards for SHSs as well as robust after-sales service and warranties. As a result, the credibility of these products in the eyes of the consumers was enhanced. The impressive efforts of Lighting Africa in establishing and certifying products have been instrumental in kick-starting the East African market. At the same time, in the fast-evolving technology environment, it is important that the quality standards adapt to reflect the latest available technologies so that they do not become a barrier to introducing more efficient technologies.
- **Sustainability of mini-grids.** One of the key challenges in the past mini-grid operations has been their sustainability, especially in community-based mini-grids, which often resulted in

tariffs that were insufficient to cover the costs of operations and maintenance and eventual mini-grid expansion. The private sector-driven mini-grids on the other hand tended to result in high user tariff, which limited the household electricity usage and impact, and often led to community and political discontent, due to the high difference between the main grid and mini-grid tariffs. Most governments and donors are therefore exploring public-private partnerships which rely on public resources to reduce the mini-grid costs and thereby reducing user tariff. Results-based financing (RBF) approaches (e.g. a specified US$ amount paid against connection or against service delivered) in particular appear to be suitable for mini-grid financing. Mini-grid financial sustainability can further be increased by promoting day-use of energy. In particular, support for productive uses should be an inherent part of mini-grid development.

III. IMPLEMENTATION ARRANGEMENTS

A. Institutional and Implementation Arrangements

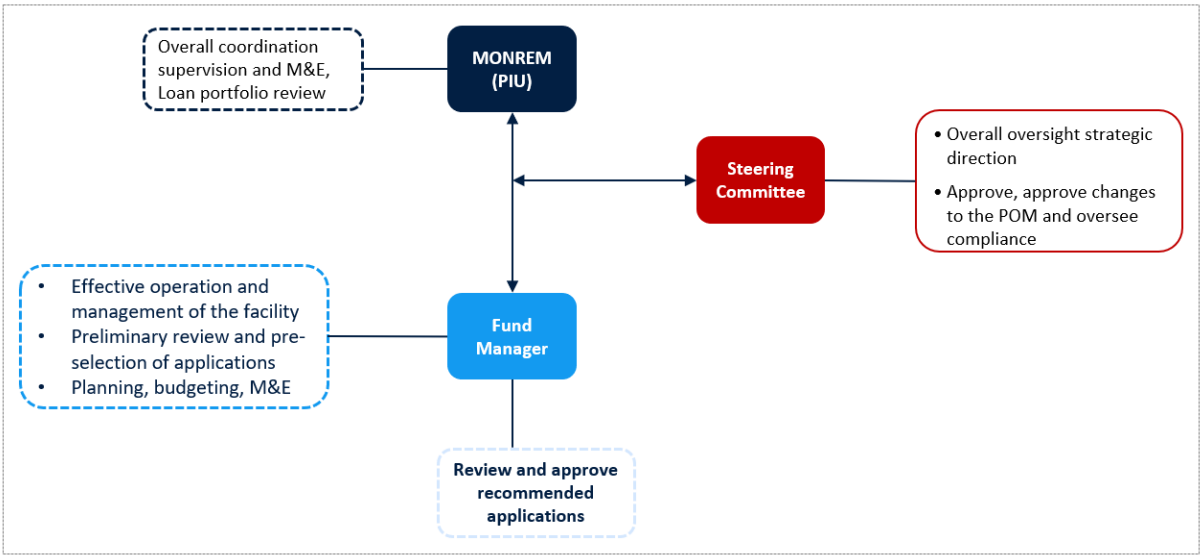
50. **Implementing arrangements.** There will be two implementing agencies for the project. ESCOM will be the main implementing agency for Component 1, while Component 2 will be implemented by MoNREM. Both entities will implement Component 3. Two PIUs will be created within (a) the ESCOM Projects Department and (b) the Department of Energy in MoNREM that will be tasked with project administration, contract management, M&E, and reporting of all project-related matters. A project Steering Committee with Principal Secretary MoNREM as Chair, will meet with the two PIUs to gauge monthly progress. The Steering Committee will also be responsible for preparing the semi-annual progress report.

51. **Component 1.** ESCOM will appoint an internal project coordinator for the overall coordination across all units and stakeholders during project preparation and implementation. Network planning, technical design, and feasibility studies of subprojects fall under the responsibility of ESCOM's System Planning Unit. The ESCOM Planning and Development Division in collaboration with ESCOM's Finance, Commercial, and System Planning Units will be responsible for preparing the proposed investment budget for the project. Several regional project offices under the central PIU would be responsible for managing the construction and operation of their respective subprojects. ESCOM's regional project offices will be responsible for preparing the project safeguards documents including environmental and social management plans (ESMPs) and resettlement action plans (RAPs). ESCOM is experienced in implementing World Bank-funded and other donor-funded projects. However, in the past, ESCOM has been heavily relying on qualified international consulting firms for implementation of these projects. An international project supervision engineering firm will be engaged for Malawi Electricity Access Project (MEAP) Component 1, and shall be responsible for preparing detailed designs, and for supervising project implementation in coordination with ESCOM's PIU and the above departments during the first two years of the project. The firm will include as part of the technical team an Environmental and a Social Specialist. Project supervision responsibility shall be transferred to ESCOM during year 2 of project implementation, once sufficient capacity and staffing is available to assume those functions. A capacity building and transition plan shall be agreed upon with ESCOM prior to effectiveness. In addition, the PIU will have to strengthen its capacity with regard to core functions, including FM, procurement, safeguards, and M&E.

This support is provided through Component 3. In addition, as part of the reform process, an extensive TA package is included in the project to strengthen its capacity and capability to implement the NEP.

52. **Component 2.** The responsibilities under Component 2 require niche and specialized skills that are not available within the ministry. Hence, the off-grid market development fund will be managed by a qualified fund manager tasked with (a) effective operation and management of the fund windows, including planning, FM, budgeting, and M&E; and (b) preselection of the applicants based on the criteria determined in the POM. The fund manager, potentially an accounting/consulting firm or commercial bank, will be competitively selected. MoNREM's PIU will be tasked with the procurement of the fund manager, overall supervision, and monitoring (including safeguards), especially reviewing the loan portfolio. A Steering Committee will provide overall project oversight and strategic direction and will approve the POM, changes, and compliance. MoNREM is experienced in handling World Bank-funded and other donor-funded projects. The Department of Energy in MoNREM has been overseeing the bidding process and implementation of projects under MAREP. This experience is relevant for the planned recruitment of the fund manager. Throughout project implementation, the PIU will be sufficiently staffed in all core functions relevant for project implementation (especially procurement, FM and safeguards). In addition, the project will provide necessary TA to strengthen MoNREM's capacity of these functions. This support is provided through Component 3.

Figure 6. Fund Implementing Arrangement



53. **Project implementation manuals.** The project's implementation will be guided by two implementation manuals:

(a) A project-level implementation manual (PIM), which will set out detailed institutional, administrative, financial, technical, and operational guidelines and procedures for the implementation of the project, including detailed safeguards, FM, and procurement arrangements as well as M&E. The PIM needs to be prepared, adopted by the Borrower, and sent to the World Bank Task Team for no-objection before the project's effectiveness.

(b) The fund manager procured under Component 2 will prepare a fund-level POM, which will detail the selection and eligibility criteria based on which companies are being selected under the facility, the loan and grant terms, the FM arrangements of the fund (including detailed fund flow) in compliance with World Bank policies for financial intermediaries, and a monitoring and verification system for the fund.[23] The POM will be approved by MoNREM and adopted by the fund manager and hence only be available after its recruitment. The POM will not be available by the project's effectiveness. However, disbursements of funds (Component 2 disbursement category) will only be allowed after the adoption of the POM. With regards to the mini-grid window, disbursements will be allowed upon completion of preparation and launch of the tender process.

B. Results Monitoring and Evaluation Arrangements

54. While MoNREM will be tasked with the overall project coordination and reporting on results achieved under the NEP, ESCOM will report achievements of its tasked activities under Component 1 of the project. ESCOM already monitors its key performance indicators. ESCOM prepares quarterly and monthly reports for its board and MoNREM. The utility also has a grievance-handling mechanism in place and carries out routine customer satisfaction surveys. Capacity to monitor results will be key to ensure the success and effectiveness of the project and NEP. The proposed operation will support the strengthening of the existing M&E system, which is needed to track and monitor progress against the NEP targets. In addition, ESCOM through funding under the TA component shall complete a multitier framework energy access survey.

C. Sustainability

55. Sustainability of Component 1 depends on the following factors: (a) the availability of sufficient generation capacity; (b) the financial health of the utility; and (c) affordability of connections by consumers to be connected under MEAP. Investments under this component are thoroughly identified based on a selection methodology developed taking into account the Least-cost Electrification Plan as well as the technical capacity of the network. The power adequacy analysis confirms that additional load to be expected as a result of 280,000 connections is within the generation capacity forecasts.

56. Sustainability of Component 2 rests on the ability of the fund to develop a market by providing financial resources that are currently not available for solar companies allowing these companies to scale up their businesses and new market players to enter. The TA provided under the project will provide training and awareness raising for financial institutions, especially commercial banks, on OGS technologies and the market, allowing the FIs to become more comfortable over time to lend to solar companies. Encouraging the use of platforms like Angaza will further assist companies to borrow from commercial banks as asset-based financing considering the receivables from outstanding PAYG payments as assets.

[23] During project implementation, MoNREM will retain an independent verification agency (IVA) under ToRs acceptable to the World Bank to verify the achievements under the RBF window. The IVA will conduct surveys with an agreeable sample size for connections made by OGS companies (i.e. 5 percent). Verification will be carried out on a quarterly basis. During implementation, the World Bank will carry out periodic reviews of IVA reports, as necessary, and evaluate the overall appropriateness of the verification arrangements, taking mitigation measures, as needed. The IVA needs to be in place 180 days after effectiveness of the project.

Finally, the POM will include terms of warranty and after-sales services that companies and manufacturers have to provide under the project.

IV. PROJECT APPRAISAL SUMMARY

A. Technical, Economic and Financial Analysis

Technical Analysis

57. Component 1 will support the works and procurement of equipment for extending and upgrading MV and LV lines as well as service drops and metering and does not represent any unusual technical or operational challenges. The metering and construction equipment used represents proven technology, known and sufficiently tested in Malawi. Project costs are based on estimates for connections and line extensions used in the recently concluded Geospatial Least-cost Electrification Plan. Meter connections and grid extensions shall be outsourced to private contractors to accelerate connections and enhance efficiency in the operations. These contractors will have been certified by ESCOM and will also undergo refresher training on occupational health and safety (OHS) as well as on environmental management to ensure compliance with World Bank safeguard policies and gender-based violence (GBV) guidelines. Procurement of major cost items (that is, meters and accessories, conductors, and poles) shall be done in bulk by ESCOM to gain cost reductions and ensure quality of materials across the board. The major challenge that could present a technical bottleneck for the implementation of the project relates to the limited load capacity of the existing network load flows for the MV feeders, which shall be verified, and transformer capacities for the priority areas to be electrified, which shall be assessed; and recommendations shall be made where necessary for upgrade of distribution infrastructure.

58. A power adequacy modeling analysis of the Malawi power system was undertaken using a dispatch optimization model over a five-year duration from 2017/18 (baseline) through 2021/22. Two energy demand scenarios were configured, defined by the scale of the new connections rollout program superimposed on the Integrated Resource Plan (IRP) demand forecast: (a) base case for access rollout, defined by ESCOM's corporate plan for 90,000 new connections per year (cumulatively 360,000 connections by 2021/22) and (b) demand sensitivity case—75,000 connections per year (cumulatively 300,000 connections by 2021/22). The results show that if the GoM's investment plan for generation expansion materializes, both demand scenarios can be met with high reliability (less than 0.1 percent of unmet demand or less than 5 minutes of load shedding per day in 2021/22) for the high demand scenario which could be alleviated with imports. In addition, a sensitivity scenario, which considers a 2–3-year delay of planned new generation plants was also modeled to evaluate the potential loss in reliability. This scenario shows that reliability is compromised at the base case, (90,000 connections per year) leading to 3.8 percent of unmet demand or 2.6 hours per day of outages in 2021/22, even with additional imports; but reliability remains within reasonable levels at lower connection rates (75,000 connections per year) at 1.1 percent of unmet demand or 40 minutes of outages per day. The detailed analysis is provided in Annex 3.

59. Component 2 will support connecting households with off-grid technologies such as SHSs and mini-grids. This does not present a major technical challenge but assistance for supporting enhanced technical capacity for providing after-sales services will be mobilized under Component 2 (see Annex 2 for

details). To ensure quality of service delivery and after-sales service, the POM will specify the certification requirements (that is, Lighting Global) for technologies financed under this component as well as the defined minimum warranty and after-sales service requirements.

Economic analysis

60. **Rationale for public financing.** The rationale for public sector financing for investments in the project is based on the major factor that the access rate in Malawi is very low at 11 percent and electrification initiatives using commercial financing are not considered viable. Experience worldwide amply confirms that scale-up in electricity access cannot be achieved without substantial and sustained public support; because recovery of the CAPEX associated with the access program (network rollout - MV, LV, service drops, and final connections) through retail tariff and front-end connection charges make access unaffordable to most potential beneficiaries. The NEP supports a complementary pathway to universal electrification using both public and private resources. The project is also looking at private sector-led initiatives in the off-grid component. Public resources in the form of IDA credits will be strategically deployed to present de-risked opportunities to the private sector to participate as financiers, operators, and contractors.

61. **World Bank's added value.** World Bank financing would add comparative value given the World Bank's position to draw upon global experience and expertise areas directly related to the investments and TA in accelerating electricity access. The World Bank Group has supported on-grid and off-grid electrification initiatives in other Sub-Saharan African countries. Lessons and technical expertise from these existing operations can be used for the benefit of the project. Through geospatial electrification planning, the country has already benefited from having a proper design of the electrification program guided by analytics for on-grid and off-grid electrification.

62. **Project economic analysis.** An economic analysis has been carried out to assess the economic viability of the project using standard cost-benefit methodology. It confirms the economic viability of the project, with an economic internal rate of return (EIRR) of 20 percent and a net present value (NPV) of approximately US$65.51 million (at 8.47 percent discount rate). The EIRR and NPV by components are presented in Annex 5. The economic viability is further enhanced by including greenhouse gas (GHG) abatement benefits, and the project is expected to result in net emission reduction of approximately 13 million tCO_2 over the project's economic life over 25 years. Most of the GHG reduction will materialize through grid connection, which will replace tradition fuels and private diesel power generation with hydro-based grid electricity. The high value of GHG emissions is attributed to the very low diesel/fossil fuel generation mix as Malawi's generation is predominantly hydro -based.

Table 1. NPV and EIRR of the Project

	Economic NPV (ENPV) (US$, millions)	**EIRR (%)**
Project without GHG	65.51	20.3
Project with GHG		
Low carbon shadow price (on-grid)	274.6	64
High carbon shadow price (on-grid)	496.1	143.0

63. The key factors affecting the project's net economic impacts would be (a) increase in CAPEX; (b) increase in operating expenditure (OPEX); and (c) decrease in economic benefit. The EIRR and NPV of the project would remain robust under all sensitivity scenarios. In particular, the project will be economically viable if the CAPEX (on-grid connection costs) does not exceed 80 percent of the initial estimation. The project will also remain economically viable as long as the economic benefit (avoided cost) does not decrease by more than 10 percent during the lifetime of the project.

64. A sensitivity analysis of the entire project was also done with the inclusion of the mini-grid component using illustrative assumptions. This component will require upstream technical studies to emerge with a list of projects and demand assessment. The EIRR and NPV were found to be robust. However, as a stand-alone, the mini-grid component is not economically viable, and it would require subsidies. Such an inference is consistent with experience of mini-grids thus far in Sub-Saharan Africa.

Financial Analysis

65. The financial analysis presented in this section evaluates the net financial return of Component 1 of the project. The financial analysis confirms that Component 1 will be financially viable. Component 1 offers a financial internal rate of return (FIRR) of 5.6 percent and a financial NPV of US$29.9 million.

66. Component 1 is assumed to generate cash inflows by selling electricity (new customers) at the weighted average retail tariff (domestic and general) while cash outflows are represented by the investment costs, the O&M costs, billing and commercial costs, and the cost of energy sold. The total energy sold is split among three different customer categories (Domestic – Low income (62 percent), Domestic – Moderate income (32 percent), and Domestic – High Income (6 percent)).

67. Overall, the FIRR and financial net present value (FNPV) of the project would remain robust under all sensitivity scenarios. The scenarios analyzed include (1) increase in capital expenditures; (2) decrease in tariff; (3) increase in cost of energy supply; (4) increase in transmission and distribution losses; (5) increase in distribution and commercial cost; (6) increase in operations and maintenance cost; (7) decrease in collection rate; and (8) decrease in unit consumption rate.

68. However, the viability of the Component 1 of the project is critically dependent on the level of tariff, the cost of energy supply, and the collection rate. A decrease beyond 6 percent in weighted average tariff, an increase beyond 11 percent in the cost of energy supply, a decrease beyond 6 percent in collection rate will each make the project financially unviable.

69. An assessment of the project's impact on ESCOM's financial condition was carried out and it showed that the project will have a positive impact on ESCOM's net earnings (Net Income) and Cash Flows, starting from 2020 onwards when commercial operations commence. Table 2 summarizes the impact assessed.

Table 2. Project's Impact on ESCOM's Net Income and Cash Flows - Base Case (US$, millions)

	2020	2021	2022	2023	2024	2025	2026	2027	Cumulative on Project life (15 years)
US$ millions	Proj.	Proj.	Proj.	Proj.	Proj.	Proj.	Proj.	Proj.	**Proj.**

Project Net Income	0.79	1.01	1.27	1.56	1.18	1.27	1.37	1.48	**20.3**
Project Cash Flows	2.19	3.81	5.47	7.16	8.18	4.83	4.94	5.04	**73.4**

70. An assessment of ESCOM's ability to service the proposed IDA credit was undertaken. The main findings of the financial assessment are that in the event ESCOM were to improve operating efficiency, its revenue collection performance, its working capital management, along with retiring its high-interest working capital loans, and receive tariff increases at the levels approved recently, it will generate sufficient liquidity to service the proposed IDA credit. The results of ESCOM's corporate financial analysis are provided in the project files.

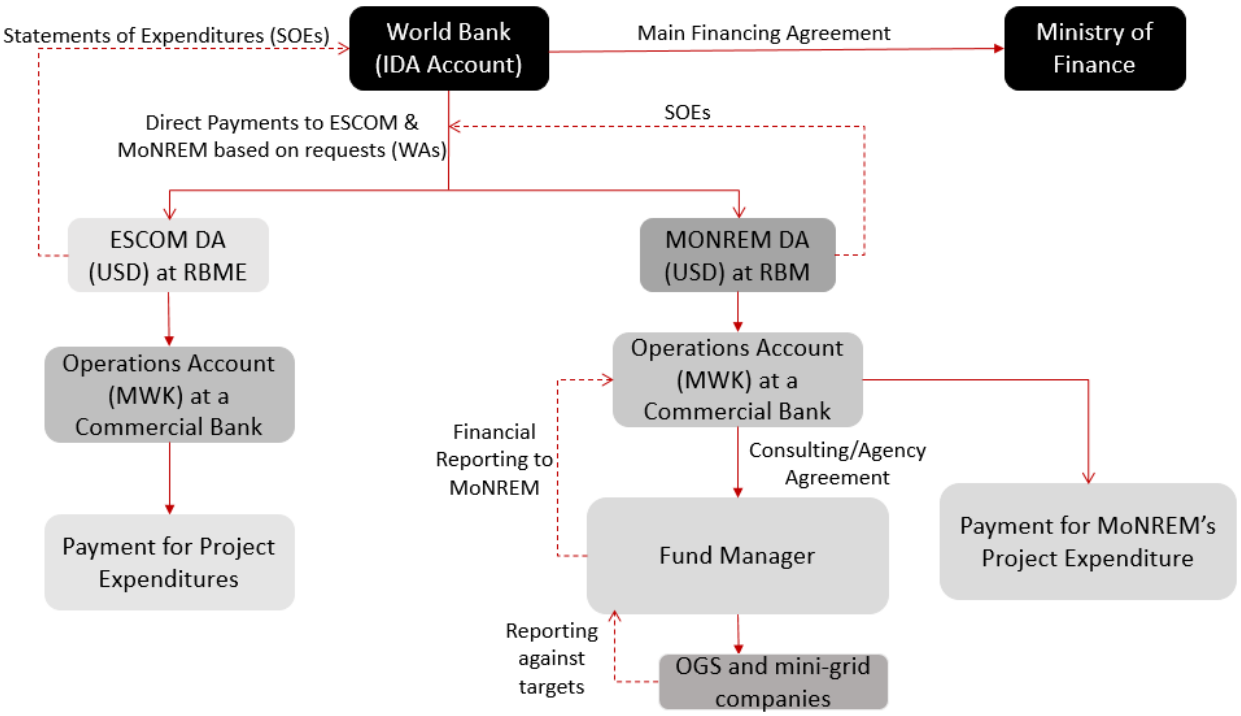
B. Fiduciary

(i) Financial Management

71. Implementation of the FM arrangements will be anchored under the respective oversight of the directors of finance of MoNREM and ESCOM respectively. The inclusion of project expenditures as part of the overall budget of the implementing institutions will be the responsibility of MoNREM and ESCOM. The accounting for the expenditures and their reporting will fall within the remit of the project FM specialists. MoNREM will utilize the IFMIS or a customized accounting software, while ESCOM will use its own management information system for the purposes of the project. The audit of the project will be done using the national system by independent auditors as may be agreed by the National Audit Office, on terms of reference (ToR) acceptable to the World Bank.

72. The funds flow arrangement according to the disbursement categories, will be aligned to the project components. The project will maintain (a) two segregated Designated Accounts (DAs) that is, U. S. dollar DAs for ESCOM and MoNREM each and (b) two separate Malawi kwacha project bank accounts, for the centralized systems for ESCOM and MoNREM each. The DAs will be opened in the Reserve Bank of Malawi (RBM) and the project accounts will be opened in commercial banks, acceptable to the World Bank. Transfers from IDA credit will be made into the DAs held at the RBM or commercial bank. Funds from DAs will be transferred to commercial bank accounts held in Malawi kwacha to defray the project expenses. ESCOM and MoNREM will apply the interim financial report (IFR)based disbursement method and submit cash flow forecast projection for six months to receive the initial deposit into the U.S. dollar DA. Figure 7 shows the funds flow arrangement. The project provides for the use of advances, direct payment, reimbursement, and special commitments as applicable disbursement methods, and these will be specified in the DFIL. As part of Component 2, the project will set up a financing facility hosted by a qualified fund manager that will provide access to loans and grants to eligible solar enterprises offering quality assured solar systems and financing for mini-grid developers. MoNREM will disburse part of its allocated funds for the project to a fund manager, to be competitively selected by the project. The fund manager will implement agreed upon programs including through the disbursement of loans and grants to solar companies. Funds will be disbursed to the fund manager from MoNREM's project accounts on an advance basis. The fund manager will submit monthly financial reports to MoNREM for the liquidation of the advances. Subsequent disbursements to the fund manager will be based on satisfactory liquidation of prior advances.

Figure 7. Proposed Fund Flow



73. MoNREM and ESCOM have adequate staffing capable of carrying out the FM activities of the project including budgeting, accounting, and reporting, and will aggregate and segregate the project expenditures as part of its annual budget, derived from work plans and budgets. The project FM specialists shall submit quarterly IFRs to the World Bank within 45 days after the end of each quarter, authorized by the project directors/managers. The IFRs will consist, at a minimum, of (a) Statement of Sources and Uses of Funds (summary of expenditures shown under the main program headings and by main categories of expenditures for the period); (b) a Summary Statement of Expenditures According to Categories/Components; (c) DA Reconciliation Statement; (d) Bank Reconciliation Statements; (e) List of Assets Procured Using the Project Fund; and (f) List of Contracts and Commitments. The IFR template has been agreed at negotiation between the GoM and the World Bank.

74. The Central Internal Audit Unit will assign its staff in MoNREM, while the ESCOM internal unit will be responsible for the internal activities of the project in MoNREM and ESCOM respectively, to strengthen systemic controls in the project. The internal auditors will follow up with management to implement the audit recommendations as highlighted by internal and external auditors. A clear segregation of duties for the processing of project expenditures will be documented in the PIM and also in the FM Manual.

75. The project will, within four months into effectiveness, select the external auditors, based on ToRs acceptable to the World Bank. The annual audited project financial statements and the Management Letter thereof shall be submitted to the World Bank not later than six months after the end of each fiscal year. Submission of audited financial statements as well as interim unaudited financial statements are included as legal covenants under the proposed project.

76. A description of the project's FM arrangements indicates that they satisfy the World Bank's minimum requirements under the guidelines of the World Bank Directive: FM Manual for World Bank (IPF) Operations (Catalogue Number OPCS5.05-DIR.01) Issued (Retrofitted) February 4, 2015 and effective from March 1, 2010 and World Bank Guidance: Reference material - FM in World Bank IPF Operations (Catalogue Number OPCS5.05- ID.02) issued and effective February 24, 2015**.** The overall FM risk is assessed as Substantial.

77. **Supervision plan.** Consistent with the risk rating, an annual FM implementation support mission will be carried out for the project. The FM supervision missions' objectives will include reviewing the adequacy of the FM systems maintained for the project at MoNREM and ESCOM.

(ii) Procurement

78. Public Procurement in Malawi is governed by the Public Procurement and Disposal of Public Assets Act, 2016, which has decentralized procurement responsibilities to the ministries and departments responsible for the award of contracts. Procurement under the project will be carried out and led by MoNREM and ESCOM, and a dedicated Project Support Team will be recruited by effectiveness and will be responsible for all procurements, reporting to the Head of Procurement in the respective PIUs. MoNREM and ESCOM have Internal Procurement and Disposal Committees (IPDCs) which are responsible for the award of contracts and these committees would be responsible for the award of contracts under the project. For each contract to be financed under the project, the procurement or consultant selection methods along with the need for pre-qualification, estimated costs, prior review requirements, and time frame will be agreed upon between MoNREM/ESCOM and the World Bank in the Project Procurement Strategy for Development (PPSD) and in the Procurement Plan (PP). ESCOM has indicated that it may contribute toward the cost of electricity connections from funds available under the National Accelerated Electrification Program (AEP). These funds would be used to finance connections beyond the 280,000 proposed under the project. In the event ESCOM's funds are made available, a single procurement for proposed contracting services shall be undertaken through a cofinancing arrangement with ESCOM.

79. **Applicable Procurement Regulations.** Procurement shall be carried out in accordance with the requirements in the World Bank Procurement Regulations for IPF Borrowers: Goods, Works, Non-Consulting Services and Consulting Services dated July 1, 2016 (Revised November 2017 and August 2018); Guidelines on Preventing and Combating Fraud and Corruption in Projects Financed by IBRD Loans and IDA Credits and Grants (revised July 1, 2016); and the provisions stipulated in the Financing Agreement.

80. **PPSD and PP.** According to the requirement of the Procurement Regulations, the Borrower has developed a PPSD, based on which a PP will be prepared including contracts that will require a Contract Management Plan. The PP (a) provides a brief description of the activities/contracts for the goods, works, non-consulting services, and/or consulting services; (b) the selection methods and market approaches including open national, and open international approaches, to be applied (there are sufficient number of bidders and considerable market interest); (c) estimated cost of each individual contract; (d) time schedules; (e) World Bank review requirements; and (f) any other relevant procurement information. The PP will be updated at least every 12 months, or as required, to reflect the actual project implementation needs. Each update of the PP shall require World Bank approval. All PPs will be publicly disclosed in accordance with the World Bank disclosure policy. A market sounding can be considered under the PPSD.

81. The World Bank's system (Systematic Tracking of Exchanges in Procurement [STEP]) will be used to prepare, clear, and update PPs and conduct all procurement transactions for the project. As part of the preparation, staff from the relevant implementing agencies shall undergo STEP training.

82. **Procurement templates.** The World Bank's Standard Procurement Documents (SPDs) shall be used for procurement of goods, works, and non-consulting services under International Competitive Procurement. National Bidding Documents may be used under the National Procurement Procedures (NPPs) subject to the exceptions stipulated in the textual part of the PP. Similarly, selection of consultants shall use the World Bank's SPDs, in line with procedures described in the Procurement Regulations.

83. A procurement risk assessment of the capacity of ESCOM and Department of Energy (MoNREM) to implement procurement activities under the project was carried out**.** The assessment included a review of the organizational structures, functions, staff skills and experience, and adequacy for implementation of the project. The assessment revealed several issues, including (a) procurement staff lacking experience in undertaking procurement using the New Procurement Framework; (b) an ineffective procurement filing and record management system and lack of staff dedicated to procurement records management; and (c) poor contract management leading to delays in completion of contracts. The overall project procurement risk rating is assessed as Substantial. The risks identified, and the mitigation measures are detailed in the PPSD, which has also been summarized in Annex 1.

84. **Fiduciary oversight by IDA.** IDA shall prior review contracts as provided in the PP. All contracts not covered under prior review by IDA shall be subject to post review during implementation support missions and/or special post review missions, including missions by consultants hired by the World Bank.

85. Prior review contracts will include (a) all contracts estimated to cost the equivalent of US$10 million or more for works and US$2 million or more for goods and non-consulting services; (b) consulting service contracts provided by a firm estimated to cost the equivalent of US$1 million or more; (c) and each contract for the employment of individual consultants estimated to cost the equivalent of US$300,000 or more.

C. Safeguards

(i) Environmental and Social Safeguards

86. The project is proposed to be assigned EA Category B because the project has potential adverse environmental and social impacts which are site-specific, temporary in nature and scope, and can be easily mitigated and reversed. Environmental risks include forests/trees, grasslands, soil, quality of air, hygiene and sanitation, and waste management issues while social risks include construction-related impacts and incidents arising from construction activities, disruptions to local communities from the presence of foreign labor, possibility of encountering physical and cultural resources, land acquisition, and displacement of livelihoods and economic activities within the physical footprint of the investments. Though the nature of risks in the proposed investments can largely be mitigated and reversed, the risk rating for environmental and social safeguards for the operation is given as High based on risk assessment undertaken on the project, which determined the extensive scope of the operation (countrywide) and the well-documented and considerable capacity gaps of the implementing agencies on social safeguards management.

87. The exact locations of investments are not yet defined and a framework approach to safeguards has been adopted. Potential social impacts and related mitigation measures are captured in the Environmental and Social Management Framework (ESMF) and the Resettlement Policy Framework (RPF) prepared by ESCOM and MoNREM that have been publicly disclosed in country by ESCOM on March 20, 2019, by MoNREM on March 22, 2019 and on the World Bank's external website on April 3, 2019.

(ii) Safeguards Capacity

88. The project will be implemented by ESCOM and MoNREM both of which will set up PIUs that will have overall responsibility for safeguards, oversee preparation of safeguard instruments (ESMPs and RAPs), and enable implementation. Based on the assessment of safeguards implementation in preceding projects, that is, the ESSP (P099626), both ESCOM's and MoNREM's capacity to manage social safeguards is deemed inadequate. ESCOM has committed to a corporate reorganization plan that will fully staff the Environment and Social Unit and maintain experienced safeguards officers. However, this has not been done to date and is unlikely to be in place by the time this project commences.

89. The following is therefore recommended to enhance safeguards capacity in the context of this project:

(a) ESCOM recruits two qualified staff to fill the positions of environmental and social safeguards specialists or hires consultants to manage environment and social safeguards for the lifetime of this project.

(b) MoNREM designates/hires one consultant to manage safeguards within Component 2.

(c) The project sets aside funds for safeguards capacity building of implementing agencies on environmental and social sustainability, including national regulations and requirements, World Bank operational policies on safeguards, preparation and implementation of safeguards instruments, and compliance monitoring and reporting. Evidence of the necessary capacity put in place to support this project has been reviewed at appraisal. Staffing of safeguards specialists at ESCOM is a condition for disbursements under Component 1.

(iii) Gender and Citizen Engagement

90. During project preparation, a gender gap assessment was prepared narrowing down the gender-disparities at national, household, and institutional level. While female-headed households constitute 26 percent of all households only 7.6 percent of female-headed households have access to electricity in their dwelling units when compared to 12 percent of male-headed households. Most female household heads are widowed, separated, or divorced, and carry a higher burden of caring for children and elders when compared to male-headed households. Further, many female-headed households are dependent on agricultural production for income, but due to increased climatic uncertainties, the lack of a stable income contributes to persistent cycles of poverty. Also, women are more likely to be financially excluded than men. As the 2014 FinScope Survey highlights, around 49 percent of women in Malawi are currently financially excluded.

91. While Malawi has no gender disparities in the labor force participation rate, the employment rate is higher for males at 78 percent compared to 67 percent for females. At the institutional level, only 10 percent of ESCOM staff are female; the proportion of women in engineering and technical fields within ESCOM is even less (7 percent). The pool of potential employees studying science, technology, engineering, and mathematics (STEM) in higher education institutions is also limited by the gender disparities in graduation and enrollment rates. In 2017, only 32 percent of the students enrolled in STEM fields were female. The detailed gender gap assessment conducted during project preparation is attached in Annex 7.

92. The project will address gender-related issues on a household, institutional, and project level through the following interventions:

(a) **Gender capacity-building program.** To close institutional gender gaps, the project will provide TA in designing and implementing a gender capacity building plan and designing a recruitment, mentoring, and leadership development program targeting potential, new, and existing female employees at ESCOM. The interventions will be implemented throughout the employee's life cycle at the utility company [24] by targeting

- **Female technicians** - train female technicians in ESCOM's training centers;
- **Recruits** - target the recruitment of women pursuing tertiary education in STEM fields;
- **New employees** - provide a leadership development and mentoring program that will focus on new female employees at ESCOM; and
- **Current employees** - recruit female employees currently in engineering and technical fields within ESCOM to be mentors to the new female employees, as part of the retention strategy.

Under Component 2, options will be explored on how to increase female technicians recruited by solar companies by including targeted female technicians' trainings; female technicians could be used for wiring and installing off-grid electricity in female-headed households. This will be further developed in the POM.

(b) **Targeted consumer education and awareness program**: The consumer education and consumer awareness campaigns financed under the TA component will specifically target female-headed households and women in households and enterprises. This will include information on how to access grid and off-grid electricity; potential financial assistance and installment payments; technical matters related to placement and proper use of ready boards; the use of PAYG technology; usage of prepaid meters; and management of energy consumption.

(c) **Gender-disaggregated M&E.** The project will carefully monitor gender-disaggregated data with regard to grid electricity for households and enterprises as well as staffing at the utility. The indicators are included in the Results Framework in Section IV.

[24] Adopted from USAID's Engendering Utilities model.

93. **GBV.** In Malawi, about 47 percent of women and girls are married before the age of 18. There is also an increased risk of transmission of sexually transmitted diseases, such as HIV/AIDS, and human trafficking. Approximately 30 percent of women have experienced physical violence since the age of 15 by both relatives and non-relatives; and 14 percent of the women have experienced sexual violence (Malawi Demographic and Health Survey [DHS] 2015–16). Influx of outside workers recruited by contractors in large-scale infrastructure projects can increase the risk of GBV such as sexual exploitation and abuse of women and girls in local communities. Based on the GBV risk assessment tool and considering that the project will entail installation of MV and LV extensions, as well as use local labor, the risk of GBV is considered low. However, as the project forms part of the overall sector engagement of the World Bank, it will (a) provide TA to ESCOM's Social and Gender Inclusion Department to ensure the establishment and operationalization of codes of conduct (CoCs) with contractors and consultants as well as increased staff capacity on prevention and response to GBV; (b)ensure adequate reflection of GBV risks and mitigation measures in key safeguard instruments such as the ESMF and ESMP; (c) ensure the establishment and availability of an effective GRM with multiple channels to initiate complaints; and (d) ensure clarity on GBV requirements and expectations in contractor and consultant bid documents, including the requirements for CoC which address GBV. Specifically, staff capacity will be increased through GBV clinics and other related trainings focused on enhancing prevention and response to violence both at the project and institutional levels. In addition, TA will be provided for community information sharing and sensitization in project areas and will increase availability of information on issues of GBV to project-affected communities.

94. **Citizen engagement**: The PIM will include a specific section on citizen's engagement highlighting methods to be used by the implementing agencies to effectively communicate with stakeholders who may be affected by the project, including information and education campaigns as well as consultations that reach groups that typically do not have access to information (women, youth, and disadvantaged groups). Citizens and civil society organizations (CSOs) are key partners in the planning and implementation of project activities and will be involved in monitoring and assessing implementation. Women´s groups and gender-focused nongovernmental organizations and community-based organizations will also be consulted and involved in project implementation.

95. Through TA provided under Component 3, the project will support a multi-year program for consumer education and citizen engagement to customers serviced by solar off-grid companies, who will not likely receive a grid connection in the short to medium-term. Consumers in off-grid areas are unlikely to understand the value proposition of OGS technologies versus grid connections, be aware of the new technologies being presented and might feel left behind if provided with an OGS system instead of a grid connection. These customers will benefit from information about the services provided by the technologies, explanation about how the services can be accessed, and the opportunity to interact with service providers to share their feedback and concerns. The citizen engagement and consumer awareness activities will provide beneficiaries with the necessary guidance on how to get the best out of products in the way they use and maintain them; these activities will also help service providers better understand the needs and concerns of their customers. The citizen engagement program will employ a variety of messaging tools and personal interaction to reach various audiences while ensuring opportunities for two-way dialogue.

(iv) Grievance Redress Mechanisms

96. The project will establish a project-level GRM to facilitate individuals and communities voice/express complaints, concerns, queries, clarifications, and feedback even that which is not necessarily related to safeguards. Currently, ESCOM has a utility-based engagement mechanism in place that functions adequately for issues arising from service delivery to and feedback from customers and this has been in use as a GRM for the present. This existing GRM has been assessed for adequacy for this project and recommendations have been made on how to address existing gaps as well as revamp and expand it to incorporate the broader citizen engagement processes. This revamped mechanism will serve as a platform for beneficiary feedback throughout project implementation.

97. Additionally, specific RAPs will outline GRMs through which project affected people and local communities will systematically raise grievances and concerns specifically related to land acquisition, resettlement and compensation and how these will be effectively resolved and monitored. These GRMs will be aligned to the overall ESCOM/project-level utility-based mechanism.

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

99. The project will ensure that there is a strengthened GRM and other monitoring mechanisms for safe and ethical reporting systems to alert people to cases of GBV.

V. KEY RISKS

100. The overall risk rating of the proposed operation is 'Substantial'. Key risks that might affect the achievement of the Project Development Objective (PDO) relate to (a) political and governance; (b) macroeconomic; (c) technical design of the project; (c) institutional capacity for implementation and sustainability; (d) fiduciary; and (e) environmental and social safeguards; and (f) financial viability. Key project-level risks and their proposed mitigation measures are listed below.

101. **Political and governance.** Over the past decades, the country's development progress has been negatively affected by weak governance, which has been an obstacle to policy reforms and development of the country and has led to suspension of donor budget support in the past. The new Government elected in May 2014 is committed to prudent macroeconomic policies and launched reforms to restore public FM controls and to address the challenges in public service provision. While political and

governance risk appears to be declining through these reforms, in view of the political uncertainty typical of presidential elections (in May 2019) and, subsequently, its public acceptance, the risk remains High. **Mitigation measures:** To mitigate these risks and to ensure ownership by all key stakeholders, the project is developed through broad-based consultations with all line ministries, civil society, and key development partners and within the framework of the NEP. In addition, Component 2 focuses on enhancing the role of institutions outside of the Government by strengthening the position of the private sector and developing a transparent market.

102. **Macroeconomic.** Macroeconomic instability over the years and the predominantly agricultural economic structure, have contributed to the slow pace of poverty reduction. Medium-term economic prospects appear positive as the country recovers from the two years of weather-induced shocks. Real GDP growth picked up to 4 percent in 2017. Inflation has now fallen to single digit levels recording a headline year-on-year rate of 7.8 percent 10 percent in February 2018[25]. **Mitigation measures**: The decrease in inflation has positively impacted the fiscal regime in Malawi. There is no foreseen impact on the project. Mitigation measures are largely outside the control of the project.

103. **Technical design of the project.** Malawi's hydropower resources are highly vulnerable to climate and hydrological variability that has led to severe droughts and reduced water levels and, therefore, prolonged load shedding in the past. Assessing the future demand growth and supply will form the basis for establishing power adequacy matching the increase in grid connections envisioned under the NEP and the proposed project. For the off-grid component, sustainability of the project's design will depend on whether Malawian commercial banks will start lending to OGS companies in the future once these companies have built a solid track record of systems sold and have developed borrowing capacity. Currently, commercial banks have limited knowledge of the off-grid sector and little to no experience in partnering with SHS distributors. **Mitigation measures:** The GoM is aggressively expanding its generation and transmission capacity in the near-to-medium term to ensure power supply adequacy and by matching demand growth and grid expansion plans through three major initiatives: (a) immediate additional power from 108 MW of emergency diesel generation and 120 MW of solar PV from IPPs; (b) interconnecting to the SAPP through the Mozambique-Malawi Regional Interconnector transmission line, which will initially allow for an additional 50 MW of imported capacity from 2021 onward; and (c) increasing domestic generation through IPPs by embarking on reforms that attract more private investment in generation. These combined efforts along with investment in priority energy projects under the IRP including coal and hydro are aimed at mitigating the risk of supply deficit. As part of the TA provided to the GoM, the World Bank is preparing a power adequacy assessment. Preliminary results show that even with some delays in some of the planned capacity additions, a connection rate of 75,000 customers per year—as envisioned under MEAP—can be supported as long as the Mozambique-Malawi interconnector is operational. Finally, the project's combined approach of grid and off-grid connections reduces the risk of supply in traditional grid extension projects. To mitigate risks related to banks' limited knowledge of the off-grid sector and not lending to OGS companies in the future, technical training on technologies and business models will be provided to commercial banks as part of Component 3.

104. **Institutional capacity for implementation and sustainability.** While ESCOM is experienced in implementing large capital investments in transmission and distribution system expansion and upgrade financed by the World Bank and other development partners, the capacity of the utility is overstretched.

25 National Statistical Office.

ESCOM is in need of dedicated and experienced staff to support the ambitious rollout plan. **Mitigation measures:** The TA provided under Component 3 of the proposed project will address capacity challenges through provision of training and staffing for dedicated PIUs in ESCOM and MoNREM.

105. **Fiduciary.** Under the ongoing ESSP, the entity's financial audit of the fiscal year ended June 30, 2016, had received a qualified opinion due to limited evidence provided for validating some of the items in the financial statements. In addition, the auditors had also raised several control and accountability issues including unreconciled cash amounts, bank balances recognized as expenditure, and an unexplained difference in consultancy fees paid. **Mitigation measures:** ESCOM has addressed the shortcomings raised in the audited opinion and resolved the same. In addition, under the proposed project ESCOM is planning to engage an FM consultant who will work full-time on monitoring compliance with the project's FM requirements, and provide timely reporting of the same.

106. **Environmental and social safeguards.** Environmental and social risk for this project has been rated high because the capacity of ESCOM with regard to environmental and social safeguards management and its knowledge of the safeguard requirements of World Bank-financed projects is limited. Personnel and capacity available are inadequate to ensure proper preparation, supervision, and implementation of environmental and social safeguards instruments. **Mitigation measures:** With regard to this project, ESCOM will fill in the current capacity gaps through recruitment and/or assignment of two additional safeguards (social and environment including OHS) personnel. MoNREM will designate/hire a consultant to support safeguards within Component 2. Additional measures will include providing for budget within the project for continuous capacity enhancement of implementing agencies on environmental and social sustainability. A capacity assessment and development of a safeguards capacity-building plan has been undertaken as part of the preparation of the initial environmental and social framework instruments.

107. **Financial viability (other risks).** With a vast majority of the investments going into Component 1, it will be crucial to ensure that grid electrification investments are not posing additional constraints on the stressed financial situation of the utility. **Mitigation measures:** The financial sustainability of the proposed network expansion and new connections program hinges upon ESCOM's system planning and corporate finance functions working in tandem to ensure the long-term viability of the access agenda. As a profit-making parastatal, ESCOM had concentrated primarily on connecting high net worth individuals in urban areas, mainly to improve ESCOM's financial condition and ability to sustain its financing program. The project's financial analysis has confirmed that the additional 280,000 connections targeted under MEAP will not put additional financial burden on ESCOM's financial performance even if, going forward, ESCOM will be expanding its network densification program to target customers in peri-urban areas that are largely poor and have lower consumption demand. ESCOM has received regulatory approval to increase tariffs by 30 percent over the next four years. Finally, TA (for example, through the MCC compact) is being provided for the financial restructuring program for ESCOM.

VI. RESULTS FRAMEWORK AND MONITORING

Results Framework

COUNTRY: Malawi

Malawi - Electricity Access Project

Project Development Objectives(s)

The development objective of the project is to increase access to electricity in Malawi.

Project Development Objective Indicators

Indicator Name	DLI	Baseline	Intermediate Targets	End Target
			1	
The development objective of the project is to increase access to electricity in Malawi				
People provided with electricity - CRI (Number)		0.00	1,000,000.00	2,064,000.00
People provided with access to electricity under the project by household connections (grid) - CRI (Number)		0.00	140,000.00	280,000.00
People provided with access to electricity under the project by household connections (off-grid) - CRI (Number)		0.00	100,000.00	200,000.00

Intermediate Results Indicators by Components

Indicator Name	DLI	Baseline	Intermediate Targets					End Target
			1	2	3	4	5	
Grid electrification								

Indicator Name	DLI	Baseline	Intermediate Targets					End Target
			1	2	3	4	5	
Female headed households connected to grid electricity (Percentage)		0.00	20.00					30.00
Number of schools connected (Number)		0.00	500.00					1,030.00
Number of small and medium sized enterprises connected (Number)		0.00	500.00					1,000.00
Number of administrative buildings connected (Number)		0.00	100.00					200.00
Submission of ESCOM's annual investment plan (Yes/No)		No	Yes	Yes	Yes	Yes	Yes	Yes
Number of LED lights distributed under the project (Number)		0.00	450,000.00					900,000.00
Off-grid market development								
Number of off-grid solar systems installed (Number)		0.00	100,000.00					200,000.00
Portfolio at risk (PaR30) (Percentage)		0.00	15.00					15.00
Female headed households connected to off-grid electricity (Percentage)		0.00	20.00					30.00
Technical Assistance								
Percentage of female technical and engineering staff at ESCOM (Percentage)		10.00	15.00					18.00
Development and Implementation of		No	Yes					Yes

Indicator Name	DLI	Baseline	Intermediate Targets					End Target
			1	2	3	4	5	
Recruitment, Leadership Development and Mentoring Program targeting females in STEM fields in ESCOM (Yes/No)								
Technical studies for minigrids completed (Number)		0.00	5.00					10.00
Geospatial analysis and planning platform established and operational (Yes/No)		No	Yes					Yes
Response rate to GRM complaints (Percentage)		0.00	90.00					100.00
Consumer awareness campaign for off-grid market development completed (Yes/No)		No	Yes					Yes
Lighting Global quality standards for solar home systems adopted and published (Yes/No)		No	Yes					Yes

Monitoring & Evaluation Plan: PDO Indicators					
Indicator Name	**Definition/Description**	**Frequency**	**Datasource**	**Methodology for Data Collection**	**Responsibility for Data Collection**
People provided with electricity - CRI	The indicator measures the number of people provided with new or improved electricity service.	Annual	PIUs	The number of connections (grid and off-grid) are multiplied with the household size of 4.3 (Integrated household survey 2016/17).	ESCOM/MoNREM
People provided with access to electricity under the project by household connections (grid) - CRI	The indicator measures the household connections made under component 1.	Annual	PIU ESCOM		ESCOM
People provided with access to electricity under the project by household connections (off-grid) - CRI	The indicator measures the number of households connected under component 2.	Annual	PIU MonREM (data provided by fund manager)		MonREM

Monitoring & Evaluation Plan: Intermediate Results Indicators					
Indicator Name	**Definition/Description**	**Frequency**	**Datasource**	**Methodology for Data Collection**	**Responsibility for Data Collection**
Female headed households connected to grid electricity	The indicator measures the percentage of female headed households connected to electricity (grid).	Annual	ESCOM PIU	ESCOM report on new customer connections under the project	ESCOM

Number of schools connected	The indicator measures the number of schools connected under component 1.	Annual	ESCOM PIU	ESCOM report	ESCOM
Number of small and medium sized enterprises connected	The indicator measures the number of enterprises connected to the grid.	Annual	ESCOM PIU	ESCOM report	ESCOM
Number of administrative buildings connected	This indicator measures the number of administrative buildings connected to the grid.	Annual	ESCOM PIU	ESCOM report	ESCOM
Submission of ESCOM's annual investment plan	The indicator captures ESCOM's timely submission of annual investment plans outlining the necessary MV/LV extension/rehabilitation and substation investments needed to fulfill the connection target under component 1. Investment plans need to be submitted prior to the beginning of each fiscal year.	Annual	ESCOM	Methodology described in the PAD.	ESCOM
Number of LED lights distributed under the project	The indicator measures the number of LED lights distributed as part of component 1.	Annual	ESCOM PIU	ESCOM report	ESCOM
Number of off-grid solar systems installed	This indicator measures the number of solar off-grid systems installed under component 2 as part of	Annual	MonREM PIU	Report from fund manager	MonREM

	loans and RBF windows of the fund.				
Portfolio at risk (PaR30)	This indicator measures the percentage of loan portfolio at risk under component 2.	Annual	MoNREM PIU	Report from fund manager	MoNREM
Female headed households connected to off-grid electricity	This indicator measures the percentage of female headed households connected to off-grid electricity under the project.	Annual	OGS companies	Reports from OGS companies	MoNREM
Percentage of female technical and engineering staff at ESCOM	The indicator measures the percentage of women in technical and engineering positions at ESCOM.	Annual	ESCOM PIU	ESCOM report	ESCOM
Development and Implementation of Recruitment, Leadership Development and Mentoring Program targeting females in STEM fields in ESCOM	The indicator captures whether a Recruitment, Leadership Development and Mentoring Program has been developed and is being implemented.	Annual	PIU ESCOM	ESCOM report	ESCOM
Technical studies for minigrids completed	This indicator measures the number of completed technical studies for mini-grid sites.	Annual	MoNREM	MoNREM report	MoNREM
Geospatial analysis and planning platform established and operational	The indicator captures whether a geospatial analysis and planning platform was established and is operational	Annual	ESCOM	ESCOM report	ESCOM
Response rate to GRM complaints	This indicator measures the response rate (in percentage) of the GRM.	Annual	ESCOM report		ESCOM

Consumer awareness campaign for off-grid market development completed	This indicator captures whether the consumer awareness campaign for off-grid market development was completed	Annual	MoNREM	MoNREM report	MoNREM
Lighting Global quality standards for solar home systems adopted and published	The indicator measures whether Lighting Global quality standards for solar home systems were adopted and published	Once	MoNREM website	website publication	MoNREM

ANNEX 1: IMPLEMENTATION ARRANGEMENTS AND SUPPORT PLAN

COUNTRY: Malawi
Malawi - Electricity Access Project

Strategy and Approach for Implementation Support

1. The strategy for implementation support has been developed based on the nature of the project and its risk profile. Implementation support has been designed to guarantee efficient and flexible support to the client and facilitate implementation of the risk mitigation measures. The objective is to ensure that the implementing agencies implement the project successfully to achieve the PDO. It also ensures that the World Bank's resources and staff are sufficient to supervise and support project implementation. The World Bank team members will be based at headquarters, in the region, and in the Malawi Country Office to ensure timely and continued coordination with the Borrower, perform close project implementation support, and provide advice on implementation issues as they arise.

Implementation Support Plan

2. Technical implementation support will focus on ensuring timely establishment of the PIUs at ESCOM and MoNREM and the preparation of the POM outlining the implementation and operational modalities of the project. ToR for staff required for the PIUs positions at MoNREM and ESCOM are being prepared by the client and shall be reviewed by the World Bank to ensure that tasks are appropriately defined, and the required qualifications and experience are adequate to perform the key functions required for project implementation. The PIUs' immediate task after effectiveness will be the tendering of the major infrastructure packages (under Component 1) and the launching of the procurement process for the fund manager (under Component 2). During supervision, the World Bank team's support will focus on monitoring of the construction process, contracts management, disbursements, and effectiveness of capacity-building and TA activities. The World Bank team will include staff and consultants, complemented with specialized expertise as required.

Procurement and Technical Aspects

3. The World Bank procurement specialists will regularly participate in implementation support missions to assist in monitoring procurement procedures and plans. The World Bank team will include World Bank staff engineers, complemented with specialized expertise, depending on the nature and scope of each component, to review project technical designs, specifications, and proposals. Field visits will be carried out to the construction sites to monitor progress, including environmental and social safeguard implementation. During the regular implementation support missions, the PPs 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 least once annually.

4. **The World Bank undertook a procurement capacity and risk assessment of MoNREM and ESCOM during the preparation of the project to check their readiness and capacity to undertake procurement under the project.** The procurement risk rating using Procurement Risk Assessment and Management System is Substantial as staff are not familiar with the IPF regulations, which the project will

be using, including use of STEP; there are no adequate procurement staff within the PIUs to implement the number of activities in the project; and contract management was not properly handled in the past leading to excessive delays in completion of contracts. Table 1.1 lists the risks that have been identified under the project, and the mitigation measures that have been proposed.

Table 1.1. Identified Procurement Risks and Proposed Mitigation Measures

S. No.	Risk	Risk Factor		Mitigation Measure	Time Frame	Responsibility
		Impact	Likelihood			
1	Fiduciary risk relating to main principles of the World Bank Procurement Guidelines not being followed	Major	Unlikely	Recruit dedicated procurement specialists experienced in World Bank Procurement Regulations	Project duration	MoNREM/ESCOM
				• Attend training on World Bank procurement. • Conduct training on new World Bank procurement procedures. • Conduct regular supervision support and monitoring.	Project duration	MoNREM/ESCOM/World Bank
2	Record keeping and documentation not maintained	Major	Unlikely	• Design and maintain a robust procurement records system. • Use STEP to upload, submit, and store all procurement related data.	Project duration	MoNREM/ESCOM
3	Delays in completion of contracts due to capacity constraints of contractors to procure connection materials	Major	Likely	Ensure bulk procurement of connection materials by ESCOM and supply to contractors for installation.	Project duration	ESCOM
4	Inefficiencies and delays in procurement process especially preparation of ToRs and schedule of requirements/technical specifications.	Major	Likely	• Conduct regular monitoring through the PP. • Ensure timely preparation of ToRs and specifications for requirements. • Train technical staff in the preparation of ToRs and bidding documents. • Sensitize IPDC to prioritize meetings for approving procurement decisions.	Project Duration	GoM and World Bank
				Engagement of TA for network reticulation planning, design, and preparation of bill of materials	Project duration	ESCOM
5	Insufficient competition in bidding process	Major	Unlikely	Carry out market sounding, before invitation of bids, to gauge the interest of potential bidders to finalize contract strategy and packaging.	Project duration	PIU and GoM

S. No.	Risk	Risk Factor		Mitigation Measure	Time Frame	Responsibility
		Impact	Likelihood			
				• Correct procurement packages to ensure attractiveness of expected contracts. • Ensure fair bidding periods, terms of contract, and timeliness in payment. • Encourage standardization of specifications for requirements and use of generic specifications.	Project duration	
6	Contract management not properly fulfilled.	Major	Likely	• Ensure users are clearly identified for each contract signed. • Train users and procurement staff in contract management. • Prepare Contract Management Plans for complex contracts and Contract Implementation Schedules for all contracts. • Use CSOs for tracking delivery of contract deliverables.	Project duration	MoNREM/ESCOM
7	Procurement staff turnover in government common service	Major	Likely	Principal Secretary to continue dialogue with the Government to retain trained staff in the PIU.	Project duration	MoNREM
8	Fraud and corruption risks (including collusion and outside interference in contract processing)	Major	Likely	• Disclose the PP. • Ensure evaluation team members sign Declaration of Interest or Oaths of Secrecy. • Disclose contract awards. • Disclose fraud and corruption incidences. • Conduct regular reviews such as post procurement review, internal audit, and external audit.	Project duration	MoNREM/ESCOM
9	Late hearing and resolution of complaints	Major	Likely	• Enforce rules and regulations to fast-track hearing and resolution of complaints. • Disclose complaint redress procedure available in the Public Procurement and Disposal of Assets Authority (PPDAA). • Produce quarterly reports of all complaints received and actions taken. • Use STEP to register and track complaints.	Project duration	MoNREM/ESCOM

5. **Based on the risks identified above, the following procurement arrangements are proposed.**

6. **Approach to market.** Based on experience and available local market, the following threshold (Table 1.2) will be used for open national/international and request for quotation (RFQ) bidding:

Table 1.2. Thresholds for Procurement Approaches and Method (US$, millions)

Works			Goods, IT, and Non-Consulting Services			Short List of National Consultants	
Open International ≥	Open National <	RFQ ≤	Open International ≥	Open National <	RFQ ≤	Consulting Services ≤	Engineering and Construction Supervision ≤
7	7	0.2	1	1	0.1	0.2	0.3

7. **An open, competitive approach to the market is the World Bank's preferred approach as it provides all eligible bidders/proposers with timely and adequate advertisement of project requirements and provides equal opportunity to provide the required goods or services.** The use of World Bank SPDs for contracts under Open International Bidding Procedures beyond thresholds that will be defined in the PP will be mandatory. For procurements involving national competition below the defined thresholds, the GoM Procurement Law and associated bidding documents, which have been reviewed and found acceptable by the World Bank, would be used with exceptions stipulated in the PPSD and textual part of the PP.

8. **All procurements below US$7 million for works and below US$1 million for goods and non-consulting services will use NPPs as agreed in the PP and will be carried out in accordance with the Public Procurement and Disposal of Public Assets Act, 2017.** Requirements for national open competition shall include the following: (a) the procurement opportunity is openly advertised at the national level; (b) the procurement is open to eligible firms from any country; (iii) the request for bids (RFB)/request for proposal shall require a signed acceptance at the time of bidding to be incorporated in any contract confirming compliance with the World Bank's Anticorruption Guidelines including the World Bank's right to sanction, inspection, and audit rights; (d) procurement documents include provisions, as agreed with the World Bank, intended to adequately mitigate against environmental, social (including sexual exploitation and abuse and GBV), health and safety risks and practices; (e) contracts should have appropriate allocation of responsibilities, risks, and liabilities; (f) contract awards should be published; (g) the World Bank reserves the right to review procurement documentation and activities; (h) an effective complaints mechanism must be in place; and (i) records of the procurement process should be maintained. Other national procurement arrangements such as limited/restricted competitive bidding, RFQs/shopping, and direct contracting are consistent with the World Bank's Core Procurement Principles, Anticorruption Guidelines, and Sanctions Framework and justified in the PPSD.

9. **All procurement of goods and non-consulting services above US$1 million will use International Competitive Procurement.** Goods to be procured will include various electricity connection materials and IT-related equipment. All items to be procured are in the PP.

10. **Selection methods.** For goods, works, and non-consultancy services, RFB, RFQ, and DIR will be used as appropriate. For consultancy services, the preferred method would be Quality- and Cost-Based Selection; however, other methods including Direct Selection would be used, as stipulated in the PP. For National Open Competitive Procurement, NPPs will be used, subject to conditions laid down in the PP.

11. **MoNREM and ESCOM shall publish on the World Bank's website, their own websites, PPDAA website, and in at least one newspaper with national circulation the PP, its updates, and all awarded contracts.** Details of contract awards shall also be published though STEP in accordance with the World Bank Regulations and using World Bank templates. Procurement Monitoring Reports shall be submitted on a quarterly basis as part of the quarterly Project Progress Reports.

12. **MoNREM and ESCOM shall maintain contract registers and adequate records of all procurement processes—contract by contract.** Each contract file shall contain the complete paper trail of procurement process.

13. **Contract strategy.** Goods, services, and civil works will be packaged in economical packages to attract bidders who are qualified and can offer good prices and complete contracts within the stipulated period resulting in value for money. The package for connections densification shall be split into bulk procurement of connection materials to mitigate the risk of poor quality of materials procured by contractors as well as the risk of delaying the connections due to challenges that may be faced by potential contractors in procuring the materials due to inadequate capacity.

14. A PP has been developed that includes the summary of the procurement arrangements for the contracts covering the first 18 months of project implementation. Under the project PP, no contract has been identified as complex requiring a mandatory Contract Management Plan.

M&E Aspects

15. In addition to monitoring the impact of the project on the ground, the World Bank team will regularly review the overall sector performance as a result of all the investments in the sector.

Financial Management Aspects

16. FM implementation support will start by assessing the progress of the project management unit staffing and reviewing the plan in place to execute disbursements following FM guidance. This supervision will take place before contracts are awarded in case improvement measures need to take place before disbursement. The FM supervision will also review quarterly progress and financial audits. A field-based FM specialist will dedicate at least eight weeks per year to the project for implementation support.

Environmental, Social, and Gender Aspects

17. Environmental safeguards support will include regular 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. Senior environmental and social safeguard specialists from the region will supervise and support the implementation of the project

and contribute to building the capacity of the client. The World Bank's gender specialist will provide TA and advisory assistance to support the development of the gender-targeted interventions.

Audit

18. The World Bank's project team will closely monitor FM activities to identify, in advance, potential delays in the preparation of the financial and audit reports and undertake corrective measures. The project financial statements will be audited by an external auditor hired under the project under ToR acceptable to the World Bank.

Overall Implementation Support Needs

19. The World Bank team should be composed of a mix of skills and experience for successful project implementation. Table 1.3 and Table 1.4 outline the expected staff weeks and travel required to make sure the actions and schedule are appropriately resourced.

Table 1.3. World Bank Implementation Support

Time	Focus	Skills Needed	Resource Estimate (US$, thousands)
First 12 months	Preparation of procurement documents Implementation of ESIA and RAP	Engineering, procurement, FM, environmental, social, and gender	200
12–48 months	Review of progress in construction and capacity building, review of sector technical and financial performance, procurement, M&E, safeguards, and FM	Engineering, sector regulatory and planning, M&E specialist, financial analyst, environmental, and social	300

Table 1.4. Skills Mix Required

Skills Needed	Number of Staff Weeks	Number of Trips per Year	Comments
Team leader	8	4	From headquarters
Off-grid energy specialist	8	4	From headquarters
Financial sector specialist	4	2	From the region
Procurement specialist	6	0	Field staff
FM specialist	5	0	Field staff
Environmental specialist	6	0	Field staff
Social specialist	6	0	Field staff
Gender specialist	4	2	From headquarters/region
Specialized technical experts	2	As required	—
Administrative support	3	0	Field staff

ANNEX 2: DETAILED PROJECT DESCRIPTION

Table 2.1. Overview of Components

Components	Implementing Agency	Amount (US$, millions)
Component 1: Grid electrification	ESCOM	**105.0**
Component 2: Off-grid market development	MoNREM/fund manager	**30.0**
Component 3: Technical assistance		**15.0**
Subcomponent 3.1: Technical assistance to ESCOM		
• Institutional culture and performance, project coordination and planning - grid rollout planning, design, and implementation support and related ESCOM PIU expenses	ESCOM	1.0
• GIS platform for network reticulation planning, design, and bill of materials	ESCOM	1.5
• Systemwide MV feeder-specific upgrading Master Plan through 2030, including affordable new connections fee policy	ESCOM	1.5
• Closing gender gaps in the energy sector	ESCOM	0.5
• Other TA, including technical training of private contractor personnel to implement scaled up connections program	ESCOM	1.0
Subcomponent 3.2: Technical assistance to MoNREM		
• Institutional culture and performance, project coordination and planning	MoNREM	1.0
• Mini-grid development - standardized framework and design standards	MoNREM	2.5
• Off-grid market development	MoNREM	2.5
• Fund management fee	MoNREM	2.0
• Sector studies (including institutional design of a semiautonomous rural electrification agency and fund)	MoNREM	2.0

Component 1: Grid electrification (US$105 million)

1. **The component is expected to drastically increase the number of connections per year by financing 280,000 connections, which will nearly double the current access rate in the country from 11 percent to 20 percent.** In the past five years, ESCOM has only been able to connect 34,300 households annually. Under Component 1, connections will be increased to 75,000 annually. This component will finance cost-effective, priority investments in grid electrification by providing households living in close proximity to an existing distribution infrastructure. Specifically, the component will finance LV extensions, service drops, and prepayment meters. Some of the new connections may also require reinforcing of hardware elements of the supplying MV feeder for ensuring quality and reliability of supply for new connections. This component will also include free distribution of LEDs.

2. **The investments identified under the component will be prioritized based on cost-effectiveness maximizing the number of connections under the project per U.S. dollar invested.** A detailed selection methodology has been prepared. As part of the TA provided to the GoM, a Geospatial Least-cost

Electrification Plan[26] was prepared (a) to undertake a GIS mapping of population settlement patterns nationwide, with attention to proximity to existing MV grid infrastructure; (b) to develop first-order estimates of the unit CAPEX for connectivity based on-grid extensions; and (c) to identify select off-grid/mini-grid sites where the grid is unlikely to reach in the near term. The purpose of the analysis is to inform the subsequent design and detailing. This includes identification of near-term targets for grid access particularly through expanding access by densification/intensification of connections to beneficiaries settled in areas near the existing grid infrastructure and thus marked by low unit CAPEX. The overwhelming majority of Malawi's current and future population lives close to existing ESCOM MV grid lines. Over 60 percent of the country's people (12 million) reside within 2.5 km of an existing grid, and more than 80 percent (15 million) reside within 5 km. Major access gains can be achieved by 'intensification' (connecting those in range of existing transformers). An estimated 1.1 million households reside within 500 m of existing ESCOM transformers and 1.5 million within 1 km. Of these, only about 280,000 households are connected, which is 20–30 percent of the possible total. A geospatial analysis prioritizing MV grid extension recommends a set of 109 'high' or 'very high' priority locations with over 100,000 households. Priority in this analysis is based on settlement size and distance from existing ESCOM grid lines. CAPEX for grid connections can be reduced at least 25 percent under best practices of a national electrification plan. This is accomplished largely by increasing coverage near the grid, distributing costs for the MV 'backbone' among more connections.

3. The scope and sizing of the component is determined by the following factors: (a) the availability of sufficient generation capacity; (b) the financial health of the utility; and (c) affordability of consumers to be connected under MEAP.

4. **Availability of generation capacity.** While Malawi currently faces a supply constraint, the GoM is aggressively expanding its generation and transmission capacity in the near-to-medium term to ensure power supply adequacy by matching demand growth and grid expansion plans through three major initiatives: (a) obtaining immediate additional power from 108 MW of emergency diesel generation and 120 MW of solar PV from IPPs; (b) interconnecting to the SAPP through the Mozambique-Malawi Regional Interconnector transmission line, which will initially allow for an additional 50 MW of imported capacity from 2021 onward; and (c) increasing domestic generation through IPPs by embarking on reforms that attract more private investment in generation. Despite the ambitious program, the power adequacy analysis demonstrates that the additional load to be expected because of 300,000 connections is within the generation capacity forecasts. The analysis shows that even with some delays in some of the planned capacity additions, a connection rate of 75,000 customers per year can be supported as long as the Mozambique-Malawi interconnector is operational. This analysis is conservative in that the hydrogeneration levels assumed have been exceeded 70 percent of the time, based on the recent historical record. Annex 3 provides the detailed analysis.

5. **Impact of the connection program on the financial health of the utility.** The project's financial analysis has confirmed that the additional 280,000 connections targeted under MEAP will not place an additional financial burden on ESCOM's financial performance even when considering that, going forward, ESCOM will be expanding its network densification program to target customers in peri-urban areas that

[26] While this 'first-order' geospatial analysis focused primarily on prioritization of grid and off-grid connections, there are additional insights to be gained from a geospatial approach, both from a much more localized analysis using the same dataset and approach, or an additional national analysis using algorithmically optimized least-cost planning techniques.

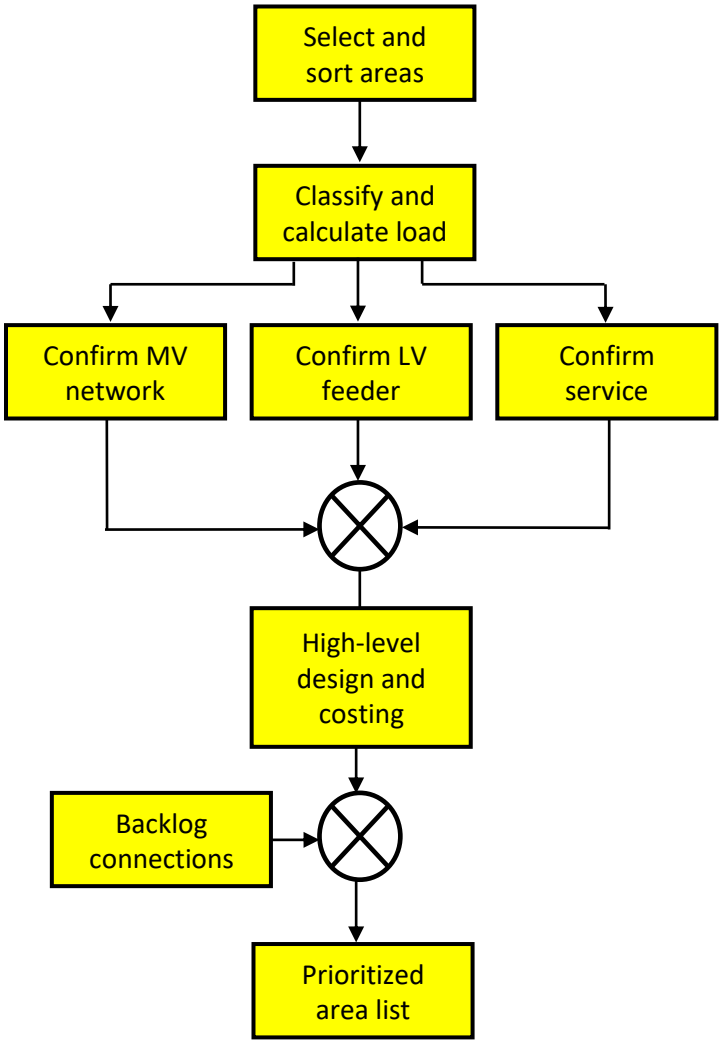
are largely poor and have lower consumption demand. In addition, ESCOM has received regulatory approval to increase tariffs by 30 percent over the next four years. Ongoing TA support provided by the World Bank and other development partners (that is, tariff methodology, financial restructuring, and RPP) will ensure that grid-based connections will not further burden ESCOM's financial situation.

6. **Affordability of the consumer and elimination of barriers to connection.** According to ESCOM's connection policy, for every new electricity consumer within the radius of an existing secondary (LV) substation in the urban, peri-urban, and major rural centers, ESCOM will fund the construction of LV lines at its own costs and the consumer will pay a standard connection charge of MWK 25,000 (US$34) regardless of the scope. This capital contribution represents around 31 percent of the connection cost of MWK 79,000 (US$107) for a service drop and 12 percent of the connection cost of MWK 200,000 (US$280) for a one-pole service excluding the grid extension costs (that is, average per connection cost is about US$410). The balance is recovered through the tariff with a return on investment. Other charges that are paid by the consumer include a service fee of MWK 10,000 (US$16) and inspection fee of MWK 5,000 (US$8). For new electricity consumers connected in MAREP centers, the capital contribution charge is MWK 5,000 (US$8). Consumers under the project will fall in one of these two payment segments. New consumers outside of urban centers and MAREP trading centers, pay the full capital contribution depending on the distance from the nearest connection point. Evidence shows that the up-front connection charges of US$34 are not affordable to a large part of the consumers targeted under this project (that is, low-income households). Under this project, new consumers will have the option of paying for the connection charges in installments over a defined period. This will remove the biggest barrier to electrification. The other barrier to connection is the cost of internal wiring of the households. The project includes the provision of ready boards for low-income households that cannot afford internal wiring costs. The World Bank and other development partners are advising ESCOM to develop a revised connection policy that will ensure affordability for this new consumer group. An affordable new connections fee policy will also be developed under Component 3 (Technical assistance) of the project.

7. In terms of affordability of the tariff for low-income consumers, the new tariffs approved by the regulator MERA have provided for a lifeline tariff of MWK 46 per kWh (US$0.6 per kWh) for the first 50 kWh of electricity consumed by domestic households. The affordability of the tariff has been enhanced further in the project design by the introduction of demand-side management measures through the provision of free energy-efficient LED bulbs for each household that will be connected to reduce household electricity consumption. The project design also provides for TA for consumer awareness on energy efficiency.

8. **A selection methodology was developed to prioritize the investments under Component 1.**

Figure 2.1. Selection Methodology



Area Selection and Customer Classification

9. The cluster points as defined in the Geospatial Plan will be used as the starting point for the selection methodology. This plan identified approximately 700,000 households that are within 0.5 km of a service transformer. These areas will be sorted based on distance from a transformer, assuming that proximity to the transformer is indicative of connection cost. Each cluster point will be linked to a service transformer and feeder using the cluster point GIS dataset. This will then be used to calculate the number of connected customers per cluster point, transformers, and feeders using ESCOM meter data. The difference between the total number of households and connected households will yield the potential number of connections. Each cluster point will be categorized using the criteria shown in Table 2.2.

Table 2.2. Classification Criteria Based on Density

Customer Category	Household Density
Urban domestic - high density	< 0.0025 households per m^2
Urban domestic - medium density	0.0025 households per m^2 < X < 0.001 households per m^2
Urban domestic - low density	> 0.001 households per m^2
Rural domestic	Will be defined by district

10. The assumption with this approach is that density is an indication of income level that is, high density corresponds to low-income areas while low density indicates high-income areas. The load for each cluster point will be calculated using the ADMDs listed in Table 2.3. At the end of this process the total potential load per cluster point, service transformer, and feeder will be determined.

Table 2.3.[a] ADMD for Various Domestic Categories

Customer Category	ADMD (kVA)
Rural domestic	0.5
Urban domestic - high density	0.6
Urban domestic - medium density	2.0
Urban domestic - low density	4.0

Note: a. The customer categories are used for planning purposes and do not reflect the tariff categories.

MV Network Capacity

11. Before assessing the capacity on the MV network, the current loading on the network needs to be ascertained. There are currently two sources for obtaining this data. The first is from the Supervisory Control and Data Acquisition system at the regional control center and the second is from feeder load values recorded at each substation. The preference is to use the former, but it should be noted that the majority of feeders do not have smart metering. The latter is a load estimate that is based on data recorded by the operator before load shedding. There is no metering of loads at service transformers and the current ESCOM practice is to apportion the feeder load based on the service transformer-installed capacity. The service transformer loads will be added to the current transformer load and these will be provided to the system planner to check feeder loading and voltage performance. If there are no constraints, the analysis will move on to the next step. Where there are constraints, the strengthening requirements needed will be first determined. If the constraint is voltage-related, the solution will be to install a voltage regulator on the network. For cases where the constraint is related to loading, the option of upgrading sections of the constrained network or splitting the feeder by introducing a new infeed point will be considered. The second analysis that will be done is to determine the number of cluster points that need to be removed before the feeder performance is within limits. The cluster points will be removed based on distance from the service transformer that is, the points farthest from the transformer will be removed first. The costs associated with strengthening the network will be assigned to these points.

Service Transformer Capacity

12. Constraints on the service transformers will be determined based on the earlier network calculations. The remedial action will be to upgrade the transformer when the calculated load exceeds 80 percent. The associated cost will be apportioned to the cluster points supplied by the transformer.

Upgrading of distribution transformers will be linked to upstream activities i.e. upgrading of Transmission transformers.

LV Feeder Capacity

13. LV feeders are currently not being modeled by ESCOM. In addition, there is limited data available in the GIS on the extent of the LV network. The following assumptions will therefore be made to obtain a high-level impression of feeder performance.

- 100 mm^2 all aluminum conductor (AAC) is the standard conductor being used on the LV network
- The number of the LV feeders per transformer is given in Table 2.4.

Table 2.4. Assumed Number of Feeders per Transformer

Transformer	Number of LV Feeders
50 kVA	2
100 kVA	2
200 kVA	3
315 kVA	3

- The transformer load will be split equally between the feeders
- The feeder will be split into five sections and the load distributed equally at each section

14. The voltage, loading, and fault- level performance will be checked on this feeder model to ensure performance is within limits.

High-level Design and Costing

15. The costing per area will be based on the indicators in Table 2.5.

Table 2.5. Costing Design Parameters

Customer	LV Poles/Customer	Pole Top Box/Customer	LV Cable/Customer (m)	Service Cable/Customer (m)
Urban domestic: Low Density	2.00	1.00	70	35
Urban domestic: Medium Density	0.70	0.50	20	
Urban domestic: High Density	0.33	0.33	10	
Rural domestic	0.70	0.50	20	

16. Where necessary the component costs in Table 2.6 will be used:

Table 2.6. Component Costs

Component	Cost (US$)
16 mm^2 service cable perm	0.47
95 mm^2 aerial bundled cable	6.00
50 mm^2 AAC	0.66
50 mm^2 AAC PVC	0.53
Prepayment meter (split) and accessories	279.00
Ready board	80.00
Wood LV pole 9.0 m	98.00
Pole top box (4 way)	34.00
Pole top box (2 way)	21.00
50 kVA 11 kV/400 V	1,435.00
100 kVA 11 kV/400 V	2,173.00
200 kVA 11 kV/400 V	3,246.00
315 kVA 11 kV/400 V	4,247.00
50 kVA 33 kV/400 V	2,818.00
100 kVA 33 kV/400 V	3,688.00
200 kVA 33 kV/400 V	5,237.00
315 kVA 33 kV/400 V	6,691.00

17. For cases where strengthening of the MV network is required the costs in Table 2.7 will be used.

Table 2.7. Costs for Strengthening the MV Network

Line Type	Cost per km (US$)
11kV overhead line	33,333
33kV overhead line	41,333

18. The output of this task will be a material list and associated cost per area, feeder, and region.

Final Project List

19. The output will be a list of projects including all backlog connections. The backlog refers to customers who have requested a connection from ESCOM and investigations were completed, costs computed, and the necessary connection fees have been paid to ESCOM. These connections will be subtracted from the annual connection target.

Component 2: Off-grid market development fund (US$30 million)

20. The component will address the challenges to scaling up the off-grid market. As detailed in Annex 4, the high interest rates offered currently in Malawi to end consumers and SMEs due to high perceived risk, poor financial literacy resulting in high default rates as well as macroeconomic factors have restricted the off-grid market. At the same time, limited access to financing (mostly in the form of equity or grants) has restricted upscaling the off-grid market.

21. The Off-Grid Market Development Fund will provide financing through three windows - a working capital window, a results-based financing (RBF) window, and a mini-grid window. The first two windows will be available to OGS companies and the third window will be available to mini-grid developers.

22. **Working Capital and Results Based Financing for Solar Companies:** The arrangements for allocating working capital and RBF windows to OGS companies will be laid out in the program operations manual (POM). The windows will support Malawian businesses that can credibly demonstrate a capacity to sell or provide services with Lighting Global-approved products, commit to honor warranties for end consumers, and demonstrate how awarded funds have translated to new customer connections. The terms of financing (that is, pricing of loans), eligibility criteria of companies and their respective business plans as well as minimum RBF criteria will be defined in the POM, which is a disbursement condition of Component 2, that is, the POM for Component 2 shall be finalized prior to disbursements of loans and grants to solar off-grid companies. The POM shall be approved by MoNREM prior to its submission to IDA. The fund will also require OGS companies to use customer mapping technology as a layer of the geospatial mapping, to track customers to allow for third-party verification. The fund manager will need to coordinate reporting and ensure compliance.

23. The fund will also provide technical support to solar companies to build successful business models.[27] The project will facilitate partnerships between financial institutions, OGS companies, and business development providers that could lead to deployment of credit products that do not currently exist in the market. For example, to address the challenge of lack of collateral, technical support could be provided to financial institutions to offer asset-based lending (using PAYG receivables as assets) or cash flow-based lending.

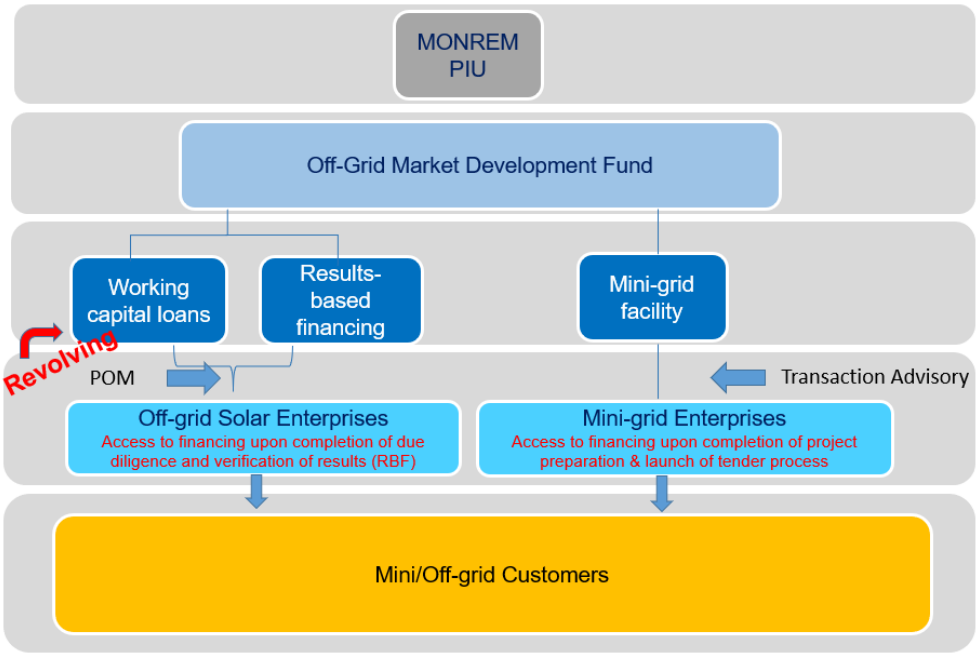
24. The RBF window is designed towards companies reaching out to poorer and remote rural locations. The RBF window will provide the necessary incentives to OGS companies to expand their businesses into these areas by financing the additional costs linked to the expansion of distribution channels. An affordability analysis was conducted as part of the off-grid market assessment. Results show that 60 percent of the population can afford a Tier 1 or 2 system. Affordability is further increased by promoting PAYG solutions allowing households to pay for systems over time. This window is also aligned with a recent USAID initiative**.** The USAID through its Power Africa program has launched in January 2019 a similar off-grid facility with an RBF component of US$1.5 million.

25. **Financing for Mini-Grid Developers:** A separate window for mini-grid developers will support financing for mini-grids prioritizing agriculture loads in peri-urban and rural areas. It is expected that this

[27] Technical support could also be provided to help OGS companies effectively manage their operations (including M&E) as well as financial obligations, including future forex requirements for periodic importation of stock through market hedging instruments, for example, through simple foreign exchange forward contracts.

window will open in a phased manner following the two windows described above considering the upstream work needed to develop a suite of bankable mini-grid projects as well as the business model to invite private sector participation. Depending on the upstream work, the GoM may tender out the mini-grid sites as public-private partnerships with the financing from the facility contributing to a minimum subsidy or viability gap funding to ensure a win-win situation of cost recovery for private developers; affordability of consumers; and limited fiscal impact on Government. Such upstream work will be funded from the TA Component 3. Following the identification of the potential mini-grid sites in the Geospatial Least-cost Electrification Plan, the TA Component 3 will support the design of the regulatory and financing framework leading up to the preparation of technical studies and tendering modality. The window will be activated once the tendering modality for the sites has been launched and the winning mini-grid developers could tap into this window. Given the importance of a productive agricultural sector to the economy of Malawi, mini-grid will be prioritized based on existing or potentially high levels of agricultural production and related energy demand.

Figure 2.2. Off-grid market development fund



26. **The fund will also provide technical support to local OGS companies to build successful business models.** As part of an exit strategy, the project will also work to link growing OGS companies with financial service providers and build their capacity to understand and design appropriate financial solutions for OGS companies/the market. The project will facilitate partnerships between financial institutions, OGS companies, and business development providers that could lead to development of credit products that do not currently exist in the market. For example, to address the challenge of lack of collateral, technical support could be provided to financial institutions to offer asset-based lending (using PAYG receivables as assets) or cash flow-based lending. A large local commercial bank is already considering offering such solutions for their overall SME-lending business and could be leveraged/encouraged to extend financial solutions to the OGS market. Based on the impact of these efforts in growing the portfolio of loans to the OGS companies, and the need for interest of financial institutions, risk mitigation instruments (for

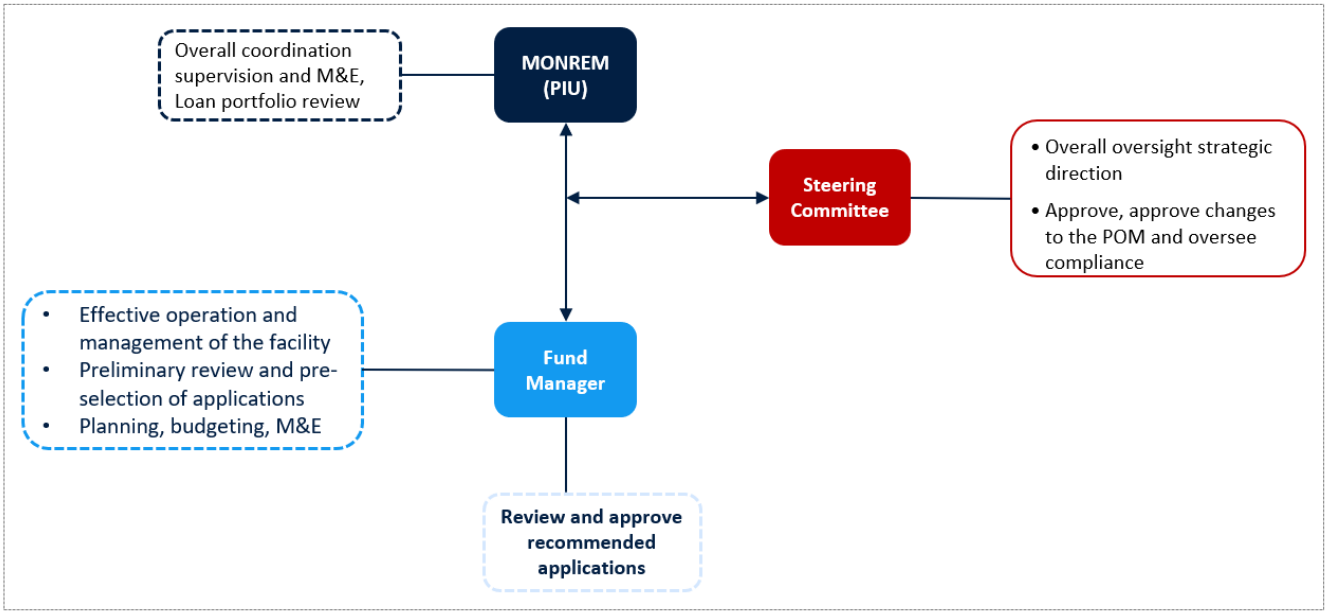
example, a loss sharing facility) may be considered to incentivize expansion of lending to targeted companies.

27. **Size of the component.** The funding allocation under the proposed component was based on the results from the off-grid market assessment, which has confirmed that a US$30 million facility is appropriate to kick-start off-grid market development in Malawi and reflects the current financing needs of companies. The size of the off-grid market is 3.7 million households requiring an investment of US$265 million or US$22 million a year over the next 12 years suggesting that there will be sufficient absorption capacity in the market.

28. **Productive uses.** The fund will allow solar companies to expand and upgrade their product line. Specific incentives for products promoting agricultural productive uses (for example, for irrigation, drying, and cooling) may be provided through the grant facility with potentially more beneficial RBF terms for promotion of these technologies. This shall be further assessed as part of the POM preparation. As agriculture is at the heart of the rural economy in Malawi, the development of productive uses of electricity in farming and agro-processing will not only improve the economic impact of electrification for the consumer but it will also improve the viability of off-grid systems. Productive use development is becoming an integral part of rural electrification efforts in Sub-Saharan Africa and elsewhere. In recognition of this, there is increasing entry of off-grid PAYG productive energy products in the market such as solar irrigation pumps, milling, incubators, cooling units, and cold storage. Agricultural productive use development will also be informed by the inclusion of agricultural demand for electricity into subsequent updates to the geospatial electrification planning.

29. **Implementing arrangements.** The working capital and RBF windows for OGS companies under the off-grid market development facility will be managed by a qualified fund manager. The fund manager will be tasked with (a) effective operation and management of the fund windows, including planning, FM, budgeting as well as M&E and (b) preselection of the applicants based on the criteria determined in the POM. The fund manager, potentially an accounting/consulting firm or commercial bank, will be competitively selected. MoNREM's PIU will be tasked with the procurement of the fund manager, overall supervision, and monitoring, especially reviewing the loan portfolio. A Steering Committee will provide overall project oversight and strategic direction and will approve the POM and its changes and compliance.

Figure 2.3. Fund Implementing Arrangement



30. **Fund manager.** The fund manager will be selected competitively according to World Bank policies by the PIU under MoNREM, whose procurement capacity is generally satisfactory. The OGS companies will use working capital loans to procure inventories, and the RBF to fund a variety of operating expenses including but not limited to works at new distribution centers and training of new sales agents, in accordance with the provisions of the Operating Guidelines and preapproved company business plans. The fund manager will also be required to satisfy financial intermediary financing requirements that are prescribed under the World Bank Policy on IPF. These include adequate licensing, governance quality, good standing with supervisor, capital adequacy, profitability, availability of policies and risk management functions, asset quality and provision, availability of internal audit and controls, and an adequate MIS.

31. **Financial Intermediary Financing compliance review.** As part of project preparation, a Financial Intermediary Financing compliance review was undertaken. This review ensures that the project does not contradict financial sector policy dialogue with the national authorities and does not promote unsustainable practices (such as using financial institutions that do not meet soundness requirements, loan designs that do not include good practices design elements, poor client selection, subsidized interest rates, or ineffective loan contract enforcement). The grant window is not included in this review. The project complies with the World Bank Policy on IPF requirements. However, while the macroeconomic situation is stable, the underlying inflationary pressure makes many types of lending difficult and potentially unaffordable.

32. The main challenges that need to be addressed include (a) the on-lending interest rate; (b) the selection of the fund manager; and (c) the SHS market being an unknown space for financial institutions, who may be in the best position to eventually take on credit risk. Interest rates should be set to cover all costs and provide a small profit margin. The fund manager will serve as a financial services agent, selecting the OGS companies, delivering and monitoring the loans, collecting the payments, and providing reports

to MoNREM. For the approach to be sustainable, the fund manager will monitor portfolio quality and delivery costs, so that sustainable financial institutions will be enticed to lend to this sector. The credit risk will be taken in the short term by the project, with the fund manager acting as an agent for a performance-based fee. Throughout the project, financial institutions (banks, SACCOs, and MFIs) will be engaged to move to a more sustainable model in the future. Finally, the Results Framework includes an indicator of portfolio quality, which will monitor the viability and performance under the financing facility.

33. **Eligible OGS companies.** Companies accessing project funds will be subject to strict eligibility criteria and be required to maintain minimum performance criteria over the course of the project. All participating firms will have to prove up front the professionality of their operations (for example, quality of staffing, robust IT accounting systems and financial planning, adequate after-sales service, and so on) and that funds will strictly be used to support the sale of Lighting Global quality-verified products. Firms that provide products to consumers on credit (that is, through PAYG schemes supported under the project) will be subject to additional requirements, namely regarding past and present quality of their portfolio and portfolio management systems. The POM will set out additional eligibility requirements. This is a disbursement condition under Component 2 i.e. the POM for Component 2 shall be finalized prior to disbursements of loans and grants to solar off-grid companies.

34. **Relationship with other World Bank operations.** The project will be complemented with the second phase of the World Bank's Financial Sector Technical Assistance Project (FSTAP II) which will support the Government to resolve pending financial sector-wide market failures and expand financial access and inclusion. FSTAP II will, among other things, (a) ensure effective implementation of initiatives started under FSTAP I including establishment of a collateral registry and moveable collateral legal framework to allow use of immovable collateral by financial institutions; (b) establish an interoperable central national switch for processing payments, which connects banks and mobile network operators; and (c) implement an MFI Hub—a shared IT platform that can be used by MFIs and SACCOs as a core banking solution and later help connect MFIs and SACCOs to the national switch.

35. **Alignment to engagement of development partners.** The presence of development partners in the off-grid space in Malawi is scarce. The largest support so far has been provided by DfID with a US$2 million contribution to the AECF for concessional loans and grants to solar companies and financial institutions in Malawi. Following the AECF's recent call for business proposals, three companies and one SACCO were selected for a combination of loans and grants that now have to be matched on a 1:1 basis with other financial resources. A follow-up call for proposals is currently not envisioned. EnDev has been providing support to solar companies for awareness-raising and marketing campaigns implemented by its local partner institution MAEVE. USAID is in the process of setting up a US$1.5 million facility targeted at international solar companies to enter the Malawian market. The proposed facility under Component 2 is the first systematic and large-scale effort to build a platform for solar companies to scale-up operation as well as allow new players to enter the market. Additional support by other development partners can be channeled through the facility to further expand in future phases. The fund design considers experiences of previous and ongoing support from development partners. Coordination and alignment of efforts by other development partners will continue to be ensured through the donor energy sector working group. USAID through its Power Africa Program is preparing a similar off-grid facility with an RBF component of US$1.5 million. The facility is planned to be launched in January 2019. Power Africa has proposed that interventions by donors in the Malawi off-grid electrification space be phased with the World Bank's contribution immediately following the delivery of the Power Africa Program as a Phase II activity. The

complementarity of the two programs and alignment of objectives and delivery modalities is being determined during program design.

36. **Sustainability.** The sole objective of the fund is to develop a market by providing financial resources that are currently not available for OGS companies allowing these companies to scale up their businesses and new market players to enter. The grant and loan structure and pricing will be carefully assessed and detailed in the POM to avoid distortion of the market and enable off-grid companies to move toward borrowing on commercial terms. The TA provided under the project will provide training and awareness raising for financial institutions (FIs), especially commercial banks, on OGS technologies and the market, allowing the FIs to become more comfortable over time to lend to solar companies. If at any given point commercial banks show strong interest and are able to show a pipeline of potential OGS loans, the facility can assist through a risk-sharing/guarantee window. Encouraging the use of platforms such as Angaza, will further assist companies to borrow from commercial banks as asset-based financing considering the receivables from outstanding PAYG payments as assets.

Component 3: Technical assistance (US$15 million)

37. This component will finance various TA and capacity-building activities to ensure ESCOM, MoNREM, and other sector stakeholders have adequate technical, planning, and operational capacity to implement the electrification rollout activities and effectively undertake activities under Component 1 and 2 of the project. This will entail the activities detailed in the following paragraphs.

38. **ESCOM TA** (**US$5 million**): This component will finance various TA and capacity-building activities in ESCOM related to its institutional culture and performance, including the following.

- **Project Coordination and Planning - Grid-Rollout Planning, Design, and Implementation Support** (**US$1 million**). This activity will support ESCOM to effectively undertake Component 1, including detailed project design, planning, and supervisory oversight, and cover related PIU expenses. Activities will include (a) additional requirements related to core functions, including (FM, procurement, safeguards, and M&E); (b) preparation of a POM informed by a Geospatial Least-cost Rollout Plan; (c) training at ESCOM's training facility of ESCOM frontline construction supervision management personnel, and private sector contractors for implementing a scaled-up on-grid connections program; and (d) mainstreaming, more broadly, selective high impact DSM measures; and (e) establishing and implementing a grievance redress mechanism.

- **GIS platform for network reticulation planning, design, and bill of materials** (**US$1.5 million**). The scope of this TA is to establish a GIS-based rapid design capability in ESCOM consistent with relevant good practice; to undertake on an ongoing basis, detailed ground-level feeder-by-feeder specific updated implementation plans, on a rolling two-year forward horizon basis, as critical inputs (a) for procurement and stocking of materials; (b) for connections rollout consistent with the high-level GIS rollout plan strategy; and (c) to support budgeting, securing funds, and reporting. The supporting GIS data layers would be updated on an ongoing basis by newly constructed MV extensions, LV reticulation, and critical network components that are essential elements to build future extensions, reticulation, and connections rollouts.

- **Systemwide MV feeder-specific upgrading Master Plan through 2030 including affordable new connections fee policy (US$1.5 million) including identification, bill of materials, costing, and feeder-specific upgrading plan.** The scope of this TA component is to conduct an assessment and mapping of all existing MV feeders and considering the results from the comprehensive high-level Geospatial Least-cost Rollout Plan—grid and off-grid—to conduct the relevant analysis, to develop a least-cost feeder-specific upgrading implementation plan and staging of the NEP rollout nationwide. This ground-level distribution Master Plan would be designed to ensure that ESCOM's MV distribution network is capable of delivering power economically, efficiently, and reliably to all existing and projected new loads geospatially identified, and as projected from each bulk supply delivery point onward downstream.

- **Closing gender gaps in the energy sector (US$0.5 million).** As part of the World Bank's overall energy sector engagement, TA will be provided to bridge existing gender gaps at the institutional and project level. The TA will be provided for (a) designing a recruitment, mentoring, and leadership development program targeting potential, new and existing female employees at ESCOM; (b) Introduction of gender-disaggregated M&E; (c) establishment and operationalization of CoC at ESCOM with contractors and increased staff capacity on prevention and response to GBV; and (d) community mobilization in project areas and increased availability of information on issues of GBV.

- **Other TA (US$0.5 million), including technical training of private contractor personnel to implement a scaled-up connections program**. The scope of this TA is to strengthen ESCOM's training facility capabilities and reach, to implement on an ongoing basis through 2030 and beyond, ground implementation of the NEP grid connections rollout program. The training program shall not be limited to training and certifying frontline crews and supervisors, but will support a growing construction program for LV, service drops, meters installations, and so on to be competitively recruited from private contractors that would be managed and supervised closely by ESCOM staff.

39. **MoNREM TA** (**US$10 million**). Institutional culture and performance, technical, planning, and operational capacity to implement the electrification rollout activities including the following:

- **Project Coordination and Planning (US$1 million)** will strengthen the capacity of the PIU in MoNREM tasked with oversight and implementation of part of the investments under Component 1 and the activities planned under Component 2. This will mainly include capacity building of core functions relevant for project implementation, including procurement, safeguards, and M&E.

- **Mini-grid Development - Standardized Framework and Design Standards (US$2 million).** The TA will support key activities to identify and design specific mini-grid sites and establish an enabling policy environment for implementation of mini-grid projects. Specifically, the TA will (i) Carry out technical studies for up to 10 sites, identified from the least-cost geospatial plan. The screening process for identifying the sites will take into account agricultural demand to prioritize agricultural productive uses for the mini-grids (specifically, irrigation and agro-processing) and (ii) Support the design of a tender process for mini-grids. This

activity will involve coordination among the active donor partners to harmonize existing and planned mini-grid initiatives to emerge with a customized framework for Malawi.

- **Off-grid Market Development (US$2 million).** It will support establishing an enabling environment for OGS market development in Malawi through (a) targeted government policy and regulation; (b) quality assurance; (c) consumer awareness; and (d) TA for financial institutions. TA will help MERA establish an adequate policy and regulatory framework for the OGS sector, with the intention of providing clear rules to companies and their investors; protecting consumers; and ensuring optimized subsidy and taxation regimes. The consumer education and consumer awareness campaigns will be specifically targeting female-headed households and women in households and enterprises. This will include information on how to access on-grid and off-grid electricity; potential financial assistance and installment payments; technical matters related to placement and proper use of ready boards; the use of PAYG technology; usage of prepaid meters; and management of energy consumption. Training will also be provided to commercial banks to raise awareness of solar technologies and the bankability of solar companies in the market. TA activities will be closely coordinated with existing donor initiatives in the off-grid space.

- **Fund management fee (US$4 million).** MoNREM will competitively source a fund manager in charge of overseeing the fund under Component 2. Additional technical support, for example, a technical partner to support the fund manager in preparing the POM and selecting companies, can also be provided through this TA.

- **Sector studies and training (US$1 million).** This activity will finance a variety of sector studies as needed. For example, an assessment on the institutional design of a semiautonomous Rural Electrification Agency and Fund that the Government is currently considering under the NES.

ANNEX 3: POWER ADEQUACY ASSESSMENT

1. This annex presents details of the modeling analysis of the Malawi power system to evaluate the adequacy of supply to meet different rates of demand growth. The analysis used a simple dispatch optimization model to simulate optimal dispatch and estimate supply shortfalls over a five-year duration—from 2017/18 (baseline) through 2021/22. Operational constraints (reserves, ramp rates, and so on) were not modeled, but the current and expected generation is largely flexible except for a proposed coal plant.

2. The following two energy demand scenarios were configured, defined by the scale of the new connections rollout program superimposed on the IRP demand forecast:

- Base case for access rollout - defined by ESCOM's corporate plan for 90,000 new connections per year (cumulatively 360,000 connections by 2021/22)
- Demand sensitivity case - 75,000 connections per year (cumulatively 300,000 connections by 2021/22)

3. The following two generation expansion scenarios were also modeled:

- Base-case generation capacity additions projected - conforming to the GoM and ESCOM's official plan
- Sensitivity analysis which considers 2–3-year delay in the commissioning of selected planned new generation plants

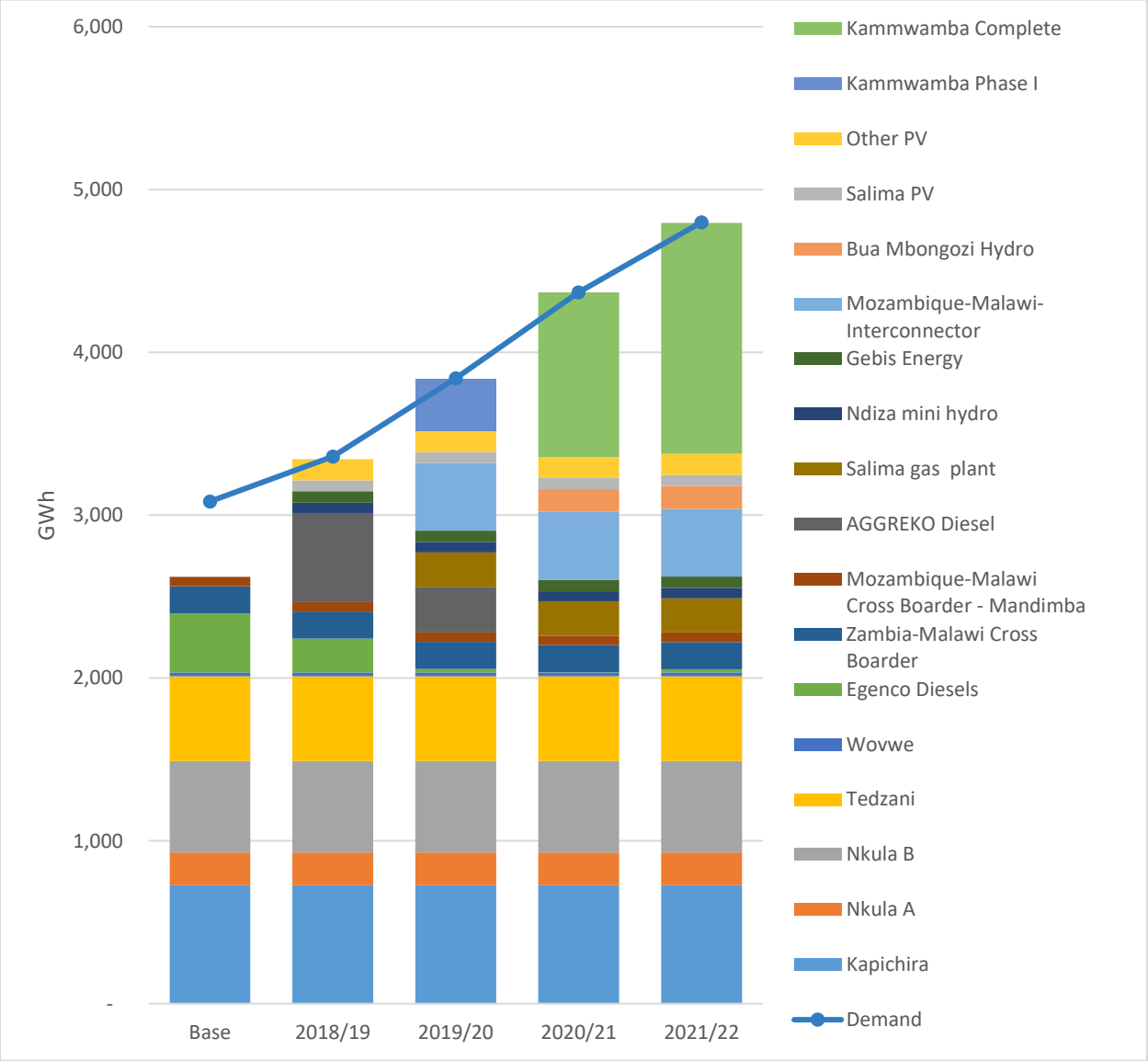
4. The power adequacy modeling results are summarized by the following two output metrics:

- **Unserved energy on average.** Expected GWh per day unserved for each year, both absolute magnitude and as percent share of total energy demand
- **Expected duration of curtailment on average.** Expected MW and hours per day of load shedding for each year

5. Both indicators are simplified to provide consistent measures of comparison across the scenarios. The unserved energy on average is a simple average of total unmet demand in a year divided by the days in the year. The expected MW of load shedding per day is calculated by dividing average unserved energy in a day by 10 hours of load shedding per day; and the hours of load shedding per day by 190 MW. This is based on information that in 2017/18, the peak time supply shortfall was estimated at 135 MW (or ~40 percent of peak) with customers currently experiencing an average of up to 10 hours of load shedding a day.

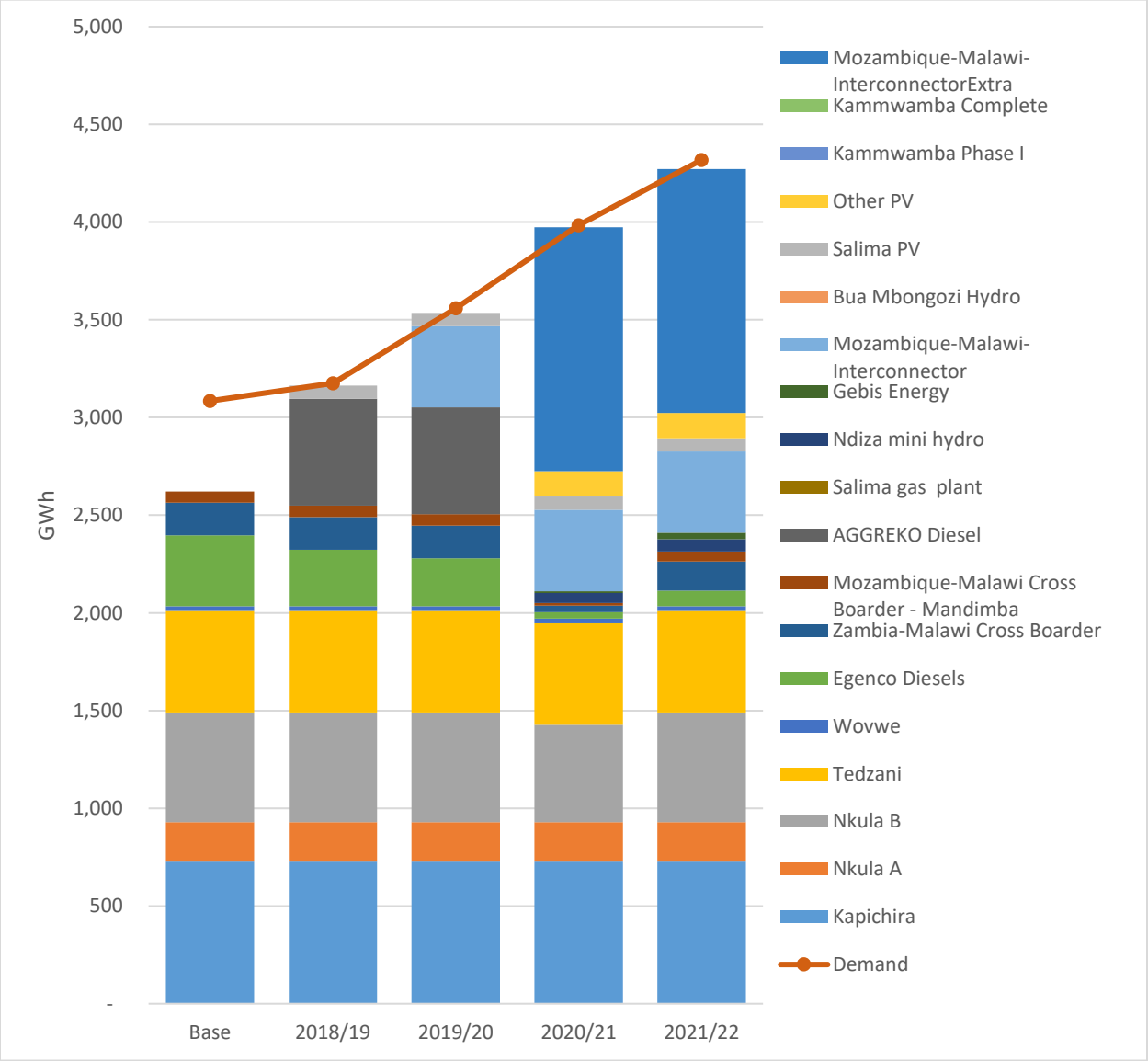
6. Under the base-case generation and base-case access, unmet demand over the four-year period is 2.5 percent of projected demand. Beyond the base year, there are minimal outages (less than 5 minutes in 2021/22). This is under the assumption that the monthly capacity factor for hydro plants is maintained for all years.

Figure 3.1. Base-Case Generation (90,000 Connections per Year)



7. The analysis shows, however, that even with a 2–3-year delay in planned capacity additions, a connection rate of 75,000 customers per year can be supported as long as the Malawi-Mozambique interconnector is operational by 2021 with imports at 1,664 GWh per year (see Figure 3.2). This analysis is conservative in that the hydro generation levels are assumed to have been exceeded 70 percent of the time, based on the recent historical record.

Figure 3.2. Delayed Generation (75,000 Connections per Year)



8. Table 3.1 summarizes the average unserved energy per day for all four scenarios. Planned capacity additions eliminate unmet demand substantially by 2020/21 for both demand scenarios. With the higher rate of connections, demand begins to outpace generation once more from 2021/22, but unmet demand is limited to 0.1 percent compared with 0.5 percent in 2018/19. Should key projects get delayed, the rate of connections will need to be reduced from 90,000 customers per year as this would result in 1.2–4.9 percent of unmet demand. In the event of generation project delays, up to 75,000 connections per year can be supported with unmet demand being under 1 percent in all years except 2021/22 when there is a marginal increase in unmet demand to 1.1 percent of projected demand.

Table 3.1. Expected Average Unserved Energy per Day

AVERAGE UN-SERVED ENERGY PER DAY								
	Base line: Current generation plan				Sensitivity: Delayed generation projects			
	90k connections/yr		Demand sensitivity		90k connections/yr		Demand sensitivity	
	MWh	%	MWh	%	MWh	%	MWh	%
2017/18	1261.4	14.9%	1261.4	14.9%	1261.4	14.9%	1261.4	14.9%
2018/19	48.5	0.5%	13.0	0.1%	340.8	3.7%	35.5	0.4%
2019/20	9.3	0.1%	0.0	0.0%	514.2	4.9%	63.3	0.6%
2020/21	0.0	0.0%	0.0	0.0%	149.3	1.2%	29.7	0.3%
2021/22	13.4	0.1%	0.0	0.0%	499.3	3.8%	126.5	1.1%

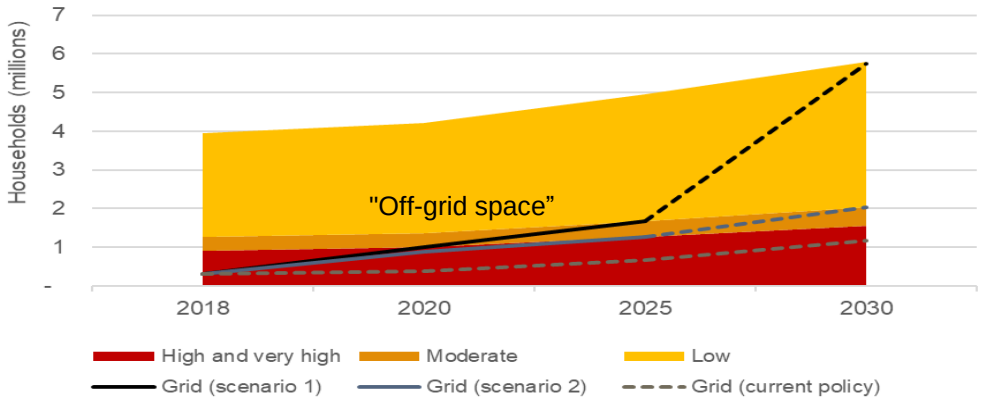
ANNEX 4: OVERVIEW OF THE OGS SECTOR

Context

1. **While grid electrification represents the least-cost electrification option for Malawi, OGS represents a viable solution for pre-electrification.** Currently, the electricity access rate stands at 11 percent with severe disparities between urban (42 percent) and rural areas (4 percent).[28] Most of the population depends on torches for lighting and biomass for cooking.[29] In rural areas, equipment and appliances are running on petroleum-based fuels. Expenditures for lighting represent up to 30–50 percent of household income. The main conclusion of the Geospatial Least-cost Electrification Plan is that the overwhelming majority of Malawi's current and future population lives close to existing ESCOM MV grid lines.[30] The implication for electricity access planning is that the grid is likely to be the dominant least-cost electrification technology for Malawi. Considering the high population growth rate in Malawi, most of the households, especially in rural areas, are unlikely to have their homes connected to the grid in the foreseeable future. Off-grid electrification will, in the near term, focus on 'pre-electrification' for sites that will likely wait several years (5–10) for grid access. Figure 4.1 shows grid expansion scenarios (number of connections) in comparison to the total population (number of households in Malawi). The portion of the population above the grid connection curves is the off-grid population. According to this estimation, there will be 3.7 million households requiring OGS solutions by 2030. Given the fact that energy demand for rural households will be low for at least a couple of years before they start using higher power consuming appliances,[31] solar is the best and fast next alternative. In the absence of grid electricity and sufficient power supply, households have already started switching to off-grid solutions.[32]

[28] Kojima, M., and C. Trimble. 2016. "Making Power Affordable for Africa and Viable for Its Utilities."
[29] National Statistics Office. 2017. Integrated Household Survey 2016–2017. Sample size: 12,480 households.
[30] 82–83 percent of Malawi's population resides within 5 km of existing ESCOM lines. If this distance is extended to 10 km, the population percentage rises to more than 95 percent.
[31] Demand is usually limited to a few lamps, radio, and/or television; these products can easily be powered by solar systems.
[32] In 2016, the BIF conducted a small off-grid lighting and phone charging study capturing a snapshot of household technologies, habits, and expenditure in Malawi. The study highlights that 13 percent of off-grid households use solar lighting, 9 percent portable solar lights, and 4 percent fixed solar lights.

Figure 4.1. Grid Expansion Priorities and Connections



Note: Specifically, two scenarios are presented. In the first scenario, universal access to the grid is achieved by 2030 (99 percent grid and 1 percent off-grid). The second is a more realistic scenario of providing an electricity connection to all settlements of minimum 250 people within 5 km of the grid.

Off-grid Market

2. Table 4.1 estimates the market size taking into consideration the number of off-grid households (3.7 million households) and affordability of households.[33] This results in 3.7 million solar products at an average price of US$70 per unit (that is, a US$265 million market, or US$22 million a year for a 12-year period).

Table 4.1. Addressable Market for SHS and Lanterns

Household Income Range (MWK, thousands per month)	% of Households	# of Off-grid Households	Average Household Expenditure on Lighting[a] (MWK per month)	Total Expenditure over 2 Years (MWK)	Affordable Solar Product (US$ per unit)	Total Amount per Category (US$)
<10	40%	1,505,205	362	8,680	12	17,971,889
10–20	26%	950,656	1,085	26,041	36	34,052,000
20–50	24%	911,045	2,532	60,762	84	76,144,055
50–250	9%	316,885	10,850	260,408	358	113,506,666
>250	1%	39,611	18,084	434,013	597	23,647,222
Totals		**3,723,401**				**265,321,832**

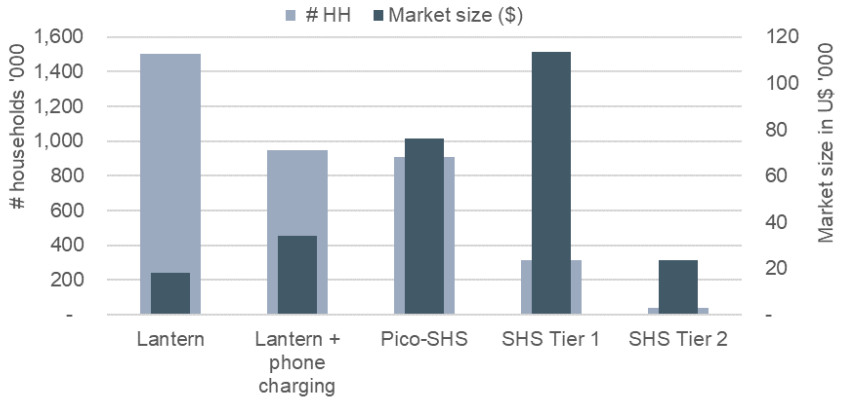
Note: a. 7 percent of the medium value of the income range of each income category.

3. Figure 4.2 presents the addressable market by type of product. This shows that 40 percent of the off-grid population cannot afford more than a solar lantern (without phone charging) (for example, the SM 100 sold by Sunny Money at MWK 5,500, cash). Of the off-grid population, 26 percent could afford

[33] The average expenditure on lighting (and phone charging) was estimated at 7 percent of household income, which is higher than the 4 percent resulting from the BIF in 2016 surveys, but lower than other references (GOGLA 12 percent and SolarAid 9 percent).

lanterns equipped with phone charging (for example, OV Pilot X by Sunny Money or d.light US$300 sold by Total, MWK 17,500 and MWK 25,000, respectively, cash). Of the off-grid population, 24 percent could afford pico SHS with multiple lights and phone charging (for example, Sun King Home 60 sold by Total and CEM at about MWK 61,000 [cash], or Biolite 620 sold by Yellow Solar at MWK 77,000 [cash, but PAYG option available]). Of the off-grid population, 9 percent could afford SHS (>10 W) with multiple lights and other basic appliances (for example, Kwacha 4 and Kwacha 6 kits sold by ZUWA [cash or PAYG offers]). Only 1 percent of the off-grid population could afford Tier 2 SHS (>50 W) equipped with TV and other appliances (for example, Macheza kit sold by ZUWA [cash or PAYG offers]).

Figure 4.2. Addressable Market by Type of Product



Note: HH = Household; Important limitations of this preliminary analysis are (a) the market size measured in U.S. dollars (US$265 million) does not take into consideration that certain households will replace lighting products once or more before 2030. This figure is therefore not equivalent to the total sales that could be achieved by 2030; (b) The same figure does not take into consideration sales to customers that fall under the grid electrification segment (that is, population with very high, high, or moderate priority) that may buy solar products as grid backup or before they are connected.

4. **The Lighting Global certified household solar market is growing and changing in Malawi.** There are over 80 solar energy companies operating in Malawi. These include (a) solar energy traders and installers (there are 71 renewable energy companies registered with MERA as of August 2018) and (b) importers and distributors of lanterns and SHS. These companies are trading in the plug-and-play household solar market such as CEP Energy, Kuwala, MEGA, M-PAYG, RIOTEC, Solar Africa, Sunny Money, Sustainable Options Limited, Total, and Yellow Solar. Looking at the GOGLA biannual reports of 2016, 2017, and 2018, levels of sales of Lighting Global certified systems per semester are between about 17,000 and 23,000 solar products. The average unit price for a project has increased from US$18 per product to US$31 per product. This suggests that systems sold in Malawi are becoming larger and that the share of lanterns in the total volume of products sold is decreasing. Data for the first half of 2018 show that the number of PAYG products has started to exceed the number of 'cash' products. The total value of the market in 2017 was slightly above US$1.26 million, whereas, after nine months in 2018, it has already reached a value of US$1.07 million. The average value per month is therefore US$105,000 in 2017 versus US$119,000 in 2018. Several factors play a role in this development: (a) market players are entering the market (M-PAYG, Yellow Solar, ZUWA, and so on); (b) market players are now providing relatively low-cost SHS; and (c) SHS are now available on credit or on PAYG.

Financial Sector Assessment

5. **Access to finance is a major challenge for MSMEs in Malawi (though they make up over 97 percent of enterprises in the country).** The challenge is more pronounced for MSMEs in the emerging OGS market, which is an unknown territory for financial institutions. Importer-retailers of solar systems raise funds primarily through private equity or development grants. Domestic investors have not invested in the market; reasons cited include lack of awareness of the market potential and perception of high associated risks. Most of the small businesses and individuals that are financially included are served by MFIs (deposit-taking microfinance banks, non-deposit-taking microfinance companies, and financial cooperatives) but hold a small fraction (2.2 percent) of financial sector assets.

6. **Although improving, the past unstable macroeconomic situation which was reflected in high interest rates and government arrears has significantly affected MSME access to finance and the willingness of the financial sector to lend to this segment.** The substantial increase in inflation (reaching 24 percent in 2015), following the devaluation of the Malawian kwacha in the recent past and increase in policy rate of the RBM to 27 percent had a significant impact on the already high cost of credit. This had a significant negative impact on the ability of firms to repay loans, hence increasing the level of bad/nonperforming loans (NPLs) in the market.[34]

7. **Given the high NPLs (averaging 18 percent) and high perceived risk of lending, financial institutions have been diverting funds to invest in more attractive (and risk-free) government securities (T-bills rates reached almost 30 percent in 2016).** Macroeconomic conditions have recently eased (inflation, RBM policy rate, and T-bills rates are currently at 8.9 percent, 16 percent, and 14.5 percent, respectively[35]), but these have not yet been reflected in the cost of credit as financial institutions are still pricing in higher risks due to higher NPLs. The T-bills market is still crowding out investments in loans—especially among medium and small banks which usually have more focus on MSMEs. In 2017, income from investments in government securities and other investments among medium and small banks exceeded interest income from loans.

8. **As a result, banks are currently liquid—lending is only about 28 percent of total banking assets.** Less than 50 percent of deposits are lent compared to the Sub-Saharan African average of 60–80 percent. In the case of Standard Bank (the second largest bank), the loan to deposit ratio is merely 13 percent. Overall, the banking sector growth has slowed, particularly in loans and advances. Annual growth of assets, deposits, and loans dropped at the end of 2016, compared to the end of 2015. Although nominal annual growth rates of assets, deposits, and loans were positive, these rates were negative in real terms in part due to persistently high inflation, economic uncertainties, and tighter bank lending conditions. However, by March 2017, real growth of assets and deposits was positive, but loan growth remained negative, reflecting low risk appetite of banks as well as the drag of problem banks.

9. **Cost of funds and operational costs are among the key drivers of the cost of credit.** On the funding side, banks are generally funded by deposits, which are cheaper and more stable sources of funds. The largest banks with a wide network can mobilize cheaper customer deposits, currently costing 8

[34] The average level of NPLs in the market is currently 18 percent with majority of financial institutions having NPLs above 15 percent.
[35] RBM, Monthly Economic Review, May 2018.

percent. SACCOs which also mobilize savings from members also have cheaper sources of funds, though limited by the size of their membership. However, small and some medium-size banks and non-deposit-taking MFIs have high cost funds as they borrow from larger banks at a rate of about 14.4 percent and use own equity, which is more expensive than borrowed money.[36] While the cost of funds for the two largest banks may be lower than 15 percent, medium and small banks have higher cost of funds (18–20 percent). Small and some medium banks and MFIs also have high cost of operations due to the lack of scale, the cost of serving small customers in the case of MFIs, inadequate and expensive infrastructure (IT, transport, and telecommunications), and the cost of regulatory compliance, which is especially costly for smaller banks relative to the size of their assets.

10. **Consequently, the base lending rate is currently around 23 percent.** When the risk premium and operational cost (which is usually higher for MFIs) are taken into account, effective lending rates by commercial banks average 30 percent (for larger and less-risky MSMEs), and for MSMEs that are served by MFIs, interest rates average 70–100 percent. These rates make it extremely difficult to run any profitable business. This also lowers affordability of loans, which increases NPLs, lowers profitability, and weakens capital positions of financial institutions. The appetite of MSMEs (including OGS companies) for commercial credit is also low. Solar companies in Malawi are mainly financed by own equity and/or grant financing. For example, Sunny Money received a start-up grant capital from SolarAid (a U.K. charity). Since then, the company has been financing its growth through internally generated funds, which limits its ability to respond to market needs and expand. In the case of ZUWA, the stock for the pilot stage (80 systems which sold off within seven months) was financed by own equity and, in early 2018, the company (together with one of its largest distributors—Kuwala Energy) received a matching grant and an interest-free loan from the AECF.

11. **The financial system shows vulnerabilities which reduce the appetite and the capacity of financial institutions to grow the lending business.** Most banks have NPL ratios above 15 percent while some banks have ratios above 40 percent. For example, NBS Bank has an NPL of 45 percent, which recently reduced from about 60 percent following measures to contain NPLs, while FINCOOP (one of the largest SACCOs in the country) was bailed out by the Government in 2017. Two banks have NPLs above 130 percent of their capital with low levels of provisions for losses. Although the banking sector appears to be well capitalized (with total capital ratio of above 20 percent and core capital ratio of 16 percent on average), low levels of provisions for losses in a number of banks raise concerns about capital adequacy levels. On average, the industry is profitable, although profits have been declining since 2014. However, profitability is driven by the two largest banks, with the medium banks barely making profits while all small banks are making losses. MFIs are also in a weak financial position; most are making losses with weak capital positions. The rate of returns for MFIs is not higher than 2 percent.

12. **The capacity of financial institutions to offer products that suit the needs of MSMEs is limited.** Products offered by financial institutions are basic—mainly simple transactional products and services, highly collateralized loans with real estate (excluding most of MSMEs without real estate), and overdraft facilities. Products that are better suited for MSMEs (for example, supply chain finance, cash flow-based lending, and so on) are missing in the market. Lending to OGS companies and to consumers is almost nonexistent, although one SACCO (FINCOOP) has piloted end consumer financing for OGS products. FINCOOP has secured US$350,000 from the AECF (US$100,000 in interest-free loans and US$250,000 in

[36] Interbank rate has recently declined to 14.4 percent (May 2018) from around 22 percent in the same period in 2017.

grants) to provide loans to end consumers for the purchase of solar equipment. FINCOOP collaborates with Sunny Money as a provider of solar systems through its teachers' programs and village service centers. So far, it has reached 600 households through teachers' programs and 100 additional village service centers. Teachers get a PAYG system for an interest of 24 percent per year to be repaid over a 12-month period.[37] NBS Bank (one of the medium-size banks) has also piloted consumer lending for solar products—mainly targeting salaried employees.

OGS Financing Facility

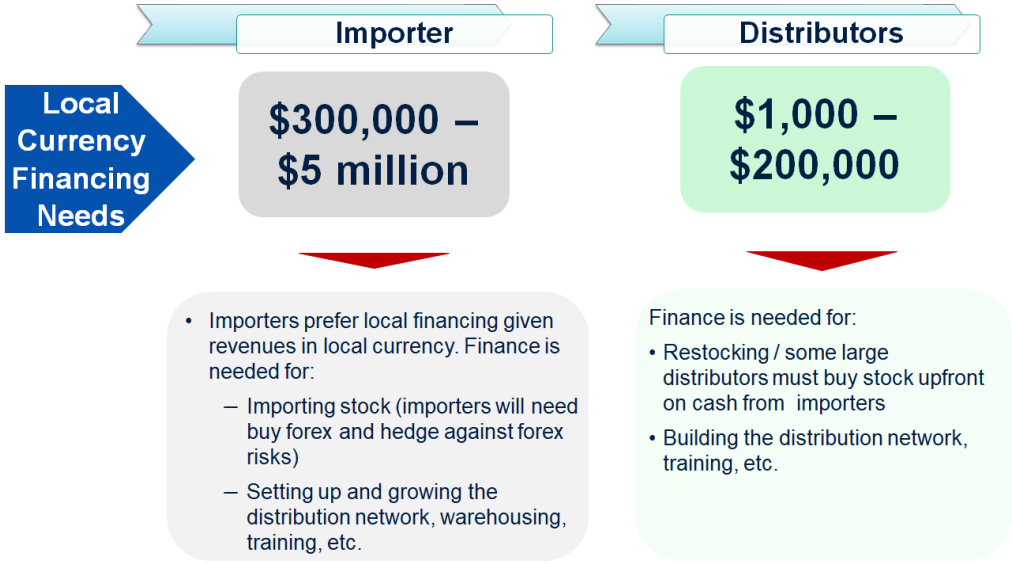
13. **The lack of access to finance, including investment and working capital, limits the expansion of solar companies despite the market potential.** Solar companies in Malawi are mainly financed by own equity and/or grant financing. Due to the lack of access to consumer financing, most companies are now offering PAYG systems, where the credit risk is taken by the companies—either importers or distribution agents. Companies use the Angaza platform, which helps them to register new customers, collect and store customer information, track sales and repayments from customers, track agents' finances, and troubleshoot products. Consumers pay 20 percent up front and repayments of minimum MWK 8,000 per month for a period of 12–18 months. The average household salary is about MWK 40,000. Customers are supplied with a keycode to enter into the keypad of the system's battery hub to activate or reactivate the system. Activation codes are sent by text message. Payments can be made through mobile money offered by Airtel or TNM Mpamba or at the offices.

14. **The assessment of the financial sector revealed that factors other than lack of liquidity are constraining access to finance for OGS enterprises.** These include lack of interest from financial institutions to lend to the nascent and an unknown off-grid market as well as exorbitant lending rates causing OGS enterprises to shy away from commercial credit. Consequently, an option to provide a line of credit to banks for on-lending to MSMEs was not viable. A sustainable line of credit requires a sound set of competitive financial institutions willing to lend to private sector firms, which is not the case in Malawi. A line of credit would add more value to small banks, some medium banks, and MFIs with high cost of funds; however, the counterparty risk at this level is high given existing vulnerabilities due to the high levels of NPLs.

15. **Consequently, there is a need to design an alternative financing mechanism that will offer result-based grants and loans to catalyze the growth of the OGS market.** Finance will be required for importers and distributors for working and investment capital to expand their reach to new customers and/or new areas. Figure 4.3 shows the current market players and their financing needs.

[37] FINCOOP Green Financial Services Strategy, 2018.

Figure 4.3. Market Players and Their Respective Financing Needs



16. The fund managed by a qualified fund manager will provide access to loans and grants to eligible enterprises offering quality-assured OGS systems. Solar companies will use funds to finance stock, develop business models, and build the distribution channels to reach consumers.

17. **Financial institutions may participate in the future once the project presents convincing results.** To create a commercial credit market for OGS, additional TA will be provided to support willing financial institutions (such as Standard Bank and the National Bank of Malawi) to pilot financial products for both MSMEs and consumers in the OGS market. For example, partnerships between financial institutions and solar companies could be formed to leverage the Angaza platform, which has rich data on PAYG customer and companies' receivables to pilot asset-based lending (backed by receivables), cash flow-based lending, and so on and leveraging customer data for behavior-based credit risk assessment. While the fund currently does not include a risk-sharing fund due to the early stage of the market, a risk-sharing window might be added after the midterm review to partially cover losses of financial institutions that will be willing to lend to OGS companies and consumers.

ANNEX 5: ECONOMIC ANALYSIS

1. This annex discusses the rationale for public financing of the project and the value added from World Bank support and presents the economic analysis of the project's development impact in terms of expected benefits and costs. The evaluation of the components is confined to the activities that generate benefits for which an economic value can be clearly identified and measured, notably benefits associated with investments under Components 1 and 2. Component 3 (TA) is excluded because of the difficulty in valuing the outcomes of TA.

Background

2. The project aims to increase access to electricity in the entire country. The recently concluded Geospatial Least-cost Electrification Plan showed that 60 percent of the population is within 2.5 km of the grid, 80 percent is within 5 km of the grid, and 95 percent within 10 km of the grid. Further analysis also showed that an estimate of 1,501,846 households live within 1 km radius of an existing transformer of which only 22 percent (294,518) have so far been connected. The analysis concluded that grid electrification would be the fastest way to electrify households with support of off-grid electrification where the grid will not reach in the short term. The economic analysis is based on cost-benefit analysis for investment components, namely (a) grid densification in the existing ESCOM urban and peri-urban centers and in the already connected rural trading centers under MAREP and (b) off-grid solutions that will be mainly private sector driven. Net benefits for the project were calculated by comparing total costs and benefits for the 'with project' and 'without project' scenarios. TA components are not included in this analysis, citing challenges in quantifying the cost of the benefits. Affordability analysis was carried out using data derived from the household expenditures in the Malawi Integrated Household Survey of 2017.

3. The project benefit arises from the economic utility of electricity use by newly connected users to the grid and those using OGS technologies. The economic benefits are quantified on the avoided cost of low-quality electricity and lighting options, that is, torches using batteries, kerosene, and candles, and the shift from charcoal to electricity for cooking. It will also look at the avoided cost of paying for services like phone charging.

4. The proposed project is expected to have additional benefits, which include improved health services and education, improved communications and connectivity, and potentially more business and income-generating opportunities. However, there are substantial uncertainties in the monetary quantification of these economic benefits and, thus, they have been excluded from the present analysis.

Grid Electrification Component

5. The on-grid component will finance grid densification in the urban and peri-urban areas and in the MAREP-connected trading centers. The component will include a connection subsidy with the aim of removing the barrier on connection fees. For the rural centers connected under MAREP, the investment shall also include basic internal wiring of households (or provision of ready boards) that do require wiring by certified ESCOM contractors. Each new connection will receive 2–3 LED bulbs with the aim of promoting lighting efficiency within the respective households. It was estimated that the average

connection cost for the densification exercise will be US$350[38] per customer due to advantages of bulk procurement of materials and potential customer proximity to existing transformers (based on the recent Geospatial Least-cost Electrification Plan). The investment costs do include the cost of basic internal wiring (or ready boards) for rural and low-income households that cannot afford the wiring cost (that is, 15 percent[39] of low-income households), and they also include the LED bulb costs. The cost items include a provision for O&M; taxes and duties are excluded from this analysis.

6. The project benefit arises from the economic utility of electricity use by newly connected users. The economic benefits are quantified on the avoided cost of low-quality electricity and lighting options, that is, torches using batteries, kerosene, and candles. It will also look at the avoided cost of paying for services like phone charging. Categorization of connections was done under ESCOM's classification of customers as low income (located in high-density areas), middle income (located in middle-density areas), and high income (located in low-density areas). The avoided cost for the low income and middle income was derived from the current average household consumption on alternatives for lighting and cooking for the respective categories. This was derived from a study funded by EnDev[40] on household expenditures within the rural-urban centers of Malawi and the Malawi Integrated Household Survey 2016. In Malawi, the most common source of fuel for lighting is torches (75 percent), electricity (11 percent), and candles (6 percent)[41] of which rural households reported a higher proportion of using torches (85 percent). For the case of cooking fuel, the main source in the urban areas is charcoal (62 percent), and in the rural areas, it is firewood (81 percent). Table 5.1 shows the household consumption items on energy for non-electrified households from which the avoided cost was derived.

Table 5.1. Household Consumption Items on Energy for Non-electrified Households for the Computation of Avoided Cost

Item	Low Income	Middle Income
Torch	✓	✓
Torch batteries	✓	✓
Candles	✓	✓
Phone charging	✓	✓
Radio batteries	✓	✓
Charcoal	×	✓

7. For the low income, it is assumed that electricity will be mainly used for lighting, phone charging, and radio usage, and for the middle income, it is assumed that electricity use will also include cooking purposes. The avoided cost for low-income households was computed as US$81.25 per year, and for the middle income, the avoided cost was computed as US$343.48 per year.

8. For the case of high-income customers, the avoided cost was derived on O&M costs for operating diesel generators at their premises. The avoided cost was computed as US$1,429.39 per year.

[38] Data from the draft final report - Geospatial Least-cost Electrification Plan for Malawi.
[39] Based on ESCOM data.
[40] MAEVE PicoPV Promotion Programme 2018 Survey Results.
[41] Malawi Integrated Household Survey 2016.

9. **Customer connections.** It is estimated that ESCOM will make 280,000 grid connections within the five years of the project. It is assumed the low-income customer base will take up the larger portion of connections at 62 percent, the middle income at 33 percent, and the high income at 5 percent. Each income category was allocated a consumption pattern, and this was based on historical consumption data from ESCOM's customer database. For this analysis, since the project is going to include the distribution of LED bulbs, the average consumption for the low-income and middle-income categories will reduce as a result of the benefits in efficiency. Table 5.2 shows the assumed consumption for each customer category.

Table 5.2. Summary of Customer Consumption per Income Category

Customer Category	Average Consumption per Month (kWh) Based on ESCOM Data	Average Consumption per Month (kWh) with Savings from LEDs
Low income	72	58
Middle income	288	274
High income	576	576

Note: It is assumed that average energy consumption will increase by 2 percent for all the income categories for the first 10 years and normalize thereafter.

10. **Economic discount rate.** The economic discount rate assumed is 8.47 percent. This was calculated using the World Bank's internal guidance that recommends using twice the prospective real per capita GDP growth as a proxy for the discount rate. For the case of Malawi; the growth forecast between 2018 and 2020 averages 4.23 percent based on the latest macroeconomic projections.

11. **Forex rates.** The exchange rate for this analysis has been set as US$1 equivalent to MWK 731. This was derived from the RBM average U.S. dollar foreign exchange rate for the period January to June 2018.

Table 5.3. Assumptions for On-grid Electrification

	Unit	
CAPEX	US$, million	105
Connection target	Households	280,000
Low income		62%
Middle income		33%
High income		5%
Average connection cost per household	US$	350.00
Value Added Tax (VAT)		17%
Connection cost per household net of VAT	US$	300.43
Internal wiring costs for households in low-income/ready board	US$	100.00
Internal wiring costs for households in low-income/ready board net of VAT	US$	86
Low-income households that will require internal wiring	Percentage	15%
Cost of energy supply	US$/kWh	0.10
O&M		2%
Diesel generator consumption	L/kWh	0.3

	Unit	
Economic benefit (avoided cost)		
Low income	US$/year	81.25
Middle income	US$/year	343.48
High income	US$/year	1429.39
Energy consumption (households)		
Low income	kWh/month	58
Middle income	kWh/month	274
High income	kWh/month	576
Annual increase in consumption		0.02

Note: VAT = Value added tax.

Off-grid Component

12. The off-grid component includes investments in the off-grid market scale-up for the SHS and development of mini-grids. The baseline economic analysis for the off-grid component includes the scale-up of the SHS; it does not include the mini-grid facility as background technical studies need to be completed to identify the suite of mini-grid projects in the early stages of project implementation to assess the business models and regulatory framework to be adopted under the project.

13. Through the off-grid market development fund, a number of SHSs will be offered under Tier 1 systems. This was based on a recent off-grid market assessment[42] for Malawi funded by the World Bank that showed 90 percent of the off-grid market can only afford Tier 1 systems. For this analysis, two types of Tier 1 systems shall be used: (a) the system for one light and phone charging at an average cost of US$36 and (b) the pico SHS < 10 W at an average cost of US$84. For this analysis, an average unit cost of US$100 was used on the assumption that there will be some purchases of larger units, that is, Tier 2 SHS. It is assumed that the fund of US$20 million that will be managed by a fund manager will result in sales of at least 200,000 units of Tier 1 OGS systems.[43] Given that the solar systems will replace the lighting expenditure, radio, and phone charging, the economic benefit which is the avoided cost was calculated as US$21.89 per year per household for the light and phone charging system and US$35.83 for the pico SHS. These estimates of the economic benefit were derived from the BIF[44] survey for off-grid lighting and phone charging in Malawi. The study showed that the average annual expenditure on lighting, phone charging, and radios was MWK 26,192 equivalent to US$35.83. This was used as the avoided cost per household with the uptake of solar technologies. Other assumptions are summarized in Table 5.4.

[42] Malawi Off-Grid Market Assessment Inception Report - October 2018.
[43] These project results are based on the current size of systems available in the market (pico solar systems below 10 W) and respective prices (of US$84 and less). However, recent developments in Malawi have shown that more companies are entering the market selling larger systems (of 10 W and above). It is expected that with the financial and technical support available through the fund, this development will likely continue. With the size of the SHS increasing, the fund might provide less number of systems (providing higher benefits). Taking into account this projection and experiences of more mature markets in the region, results listed in the project's Results Framework are lower (200,000 systems).
[44] BIF (Off-grid Lighting and Phone Charging Study) - August 2016.

Table 5.4 Assumptions for Off-grid Electrification

Item	Assumption
CAPEX	US$20 million
Target number of off-grid technologies	200,000 units
Average Tier 1 price (single light with phone charging) or (multiple lights, phone charging, radio, and torch)	US$100
Tier 1 price VAT exclusive	US$86
OPEX (PAYG)	3%
Cost of battery replacement	US$20
Economic benefit Tier 1 (pico SHS)	US$35.83
Mortality rate	0%

Table 5.5. Assumptions on Yearly Sales for Off-grid Electrification

		1	2	3	4	5
Tier 1 sales	Units	4,000	20,000	50,000	60,000	66,000
Percentage of total sales		2%	10%	25%	30%	33%

Project NPV and EIRR

14. The economic analysis shows that the project is economically viable. Overall, the proposed project is expected to yield substantial net economic benefits and economic returns (EIRR of 20.3 percent) and an NPV of US$65.51 million.

15. The viability of the project was also assessed for GHG reduction benefits. Table 5.6 shows a summary of the assumptions.

Table 5.6. Assumptions Used in the Computation of GHG Benefits

Assumptions	Unit	
Baseline emission factor	tCo_2/kWh	0.00098
Grid emission factor	tCo_2/kWh	0.00007
Solar emission factor	tCo_2/kWh	0
Simplified Tier 1 GHG abatement	tCo_2/household/year	0.374

16. The project will reduce GHG emissions in the amount of 13 million tCO_2 over its economic life of 25 years. Most of the GHG reductions will materialize through grid connections, which will replace traditional fuels and private diesel power generation with hydro-based grid electricity. Solar-based off-grid solutions also result in GHG emissions, but at a scale lower than those of the grid. The high value of GHG emissions is attributed to the very low diesel/fossil fuel generation mix as Malawi's generation is predominantly hydro -based.

Table 5.7. Summary of EIRR and NPV for the Project

	ENPV (US$, millions)	EIRR (%)
Project without GHG	65.51	20.3
Project with GHG		
Low carbon shadow price (on-grid)	274.6	62
High carbon shadow price (on-grid)	496.1	143.0

Sensitivity Analysis

17. The key factors affecting the project's net economic impacts would be (a) increase in CAPEX; (b) increase in OPEX; and (c) decrease in economic benefit. The EIRR and NPV of the project would remain robust under all sensitivity scenarios. In particular, the project will be economically viable if the CAPEX (on-grid connection costs) does not exceed 80 percent of the initial estimation. The project will also remain economically viable as long as the economic benefit (avoided cost) does not decrease by more than 10 percent during the lifetime of the project.

18. A sensitivity analysis of the entire project was also done with the inclusion of the mini-grid component using illustrative assumptions. This component will require upstream technical studies to emerge with a list of projects and demand assessment. The EIRR and NPV were found to be robust. However, as a stand-alone, the mini-grid component is not economically viable, and it would require subsidies. Such an inference is consistent with experience of mini-grids thus far in Sub-Saharan Africa.

Table 5.8: Illustrative Assumptions for Mini-grids

	Unit	
CAPEX Mini-grids	US$	10,000,000
No. of HH per mini-grid	No	400
Tier 2 size of solar equipment for mini-grid	kWp	26
Capex for solar equipment (inclusive of battery storage)/kWp	US$	4,600
Capex solar equipment/mini-grid	US$	119,600
Average capex for LV network/km	US$	5,000
Average network length/HH	km	0.04
Capex for network/mini-grid	US$	80,000
Cost of service drop per customer	US$	100
Capex for service/mini-grid	US$	40,000
Total Capex/Mini-grid	**US$**	**239,600**
No. of mini-grids based on available capex	No	36
Total Capex/Mini-grid (inclusive of VAT)	**US$**	**279,134**
O&M costs/annum	**% of total capex**	**1.5%**
Admin costs/customer/annum	**US$**	**20**
Total Admin costs/annum	**US$**	**8,000**
Cost of Battery replacement (15% of capex of solar equipment)	**US$**	**15,399**

Battery replacement		Every 7 years
Cost of Inverter (5% of capex of solar equipment)	**US$**	**5,133**
Inverter replacement		Every 11 years
No. of Domestic HH/Mini-grid	%	90%
No. of Commercial customers/Mini-grid	%	10%
Energy demand/Domestic HH/annum	**kWh**	**72**
Energy demand/Commercial customer/annum	**kWh**	**1000**
LCOE/kWh	**US$**	**0.98**
Avoided cost/Domestic HH/Annum	**US$**	**35.83**
Avoided cost/Commercial Customer/Annum	**US$**	**207**

ANNEX 6: PROJECT FINANCIAL ANALYSIS

I. Introduction

1. ***Project Objective and Costs*:** The Project Development Objective is to increase access to households, electricity in Malawi. The activities envisaged include (i) the connection of 280,000 new customers (56,000 annually) during five (5) years; (ii) the distribution of LED lightbulbs (3 per customer connected); and (iii) provision of financing for off-grid market development. The project will also provide capacity building for project management, and implementation, and other TA to the GoM.

2. The estimated costs of the project's activities are provided in Table 6.1 below:

Table 6.1: Project Costs Breakdown for the Project Activities

Cost Category	Project Costs (US$ million)	Of Which IDA (US$ million)
New On-grid electricity connections (component 1)[45]	**105.00**	**105.00**
Off-grid market development (component 2)	30.00	30.00
Technical Assistance (component 3)	15.00	15.00
Total Project Costs	**150.00**	**150.00**

Main Assumptions of the Financial Analysis

3. The main assumptions related to the tariff applied to the electricity consumed, the cost of the electricity supplied to new customers connected, and the associated transmission and distribution losses are described in detail in the paragraphs below.

- *Project economic investment.* The Project's total investment requirement is US$150 million including all sources of funding. The financial analysis focuses on component 1 that account for 70.0 percent of total Project investment (US$105 million). These costs include the VAT and duties applicable in Malawi on imported equipment.
- *Economic life of the project.* The economic life of component 1 of the project is assumed to be 15 years.
- *Financial Discount rate*. The financial discount rate assumed is estimated to be 1.04 percent (after tax discount rate on 1.48 percent with tax rate at 30 percent).
- Cost of generation. With the implementation of component 1, the project will increase access to electricity to new customers. The cost of generation (supply) is assumed to be the average cost of energy supply, which is currently close to US¢ 5.1/kWh (MWK 37/kWh)[46].
- *Additional energy demand from 280,000 new customers*. The new customers that will be connected during the implementation of the project are assumed to have a specific consumption rate described in Table 6.2.

[45] The financial analysis will only focus on the component 1 of the project: US$105 million
[46] Using an exchange rate of US$1= MWK 731

Table 6.2: Characteristics of New Customer Categories

			Share (%)
Low Income	kWh/Year	600	62
Middle Income	kWh/Year	3,000	32
High Income	kWh/Year	6,000	6

These specific consumption rates are assumed to grow 2 percent annually

- *Incremental O&M costs*. The incremental O&M costs are assumed to be two percent (2%) of the capital expenditures.
- *Distribution and commercial costs*. Due to the size of the additional customers that will be connected to the power network, incremental distribution and commercial costs are estimated to be material. Incremental distribution and commercial costs are estimated to be MWK9.9/kWh (US¢1.4/kWh (average of projected transmission and distribution (T&D) cost on 2018-2021).
- *Transmission & distribution losses*. Transmission and distribution losses have been estimated to be 17.6 percent.
- *Collection rate.* A collection rate of 97.3 percent is assumed for the analysis.
- *Corporate Tax rate:* The corporate tax rate in Malawi is currently set at 30 percent.
- *Average Tariff*. The average tariffs used for the analysis for each category of customers are summarized below:

Table 6.3: Applicable Tariff of New Customer Categories

		Tariff (US¢/kWh)	Share (%)
Low Income	49.7	6.8	62
Middle Income	81.9	11.2	32
High Income	93.6	12.8	6

- *VAT and import duties.* The financial analysis assumes that the project will be paying the VAT and duties on imported equipment. It will also be paying all other duties, fees and taxes on net business income, which is assumed for this analysis to be 30 percent.
- *Financing plan.* All project costs will be financed through IDA Credit under standard IDA Credit terms. The expected financing plan is provided in the following Table 6.4.

Table 6.4: Financing Plan

Source of Financing	Amount (US$ million)	Interest Rate	Tenor (years)	Grace Period (years)
IDA Credit (IDA Blended Terms)	150	1.48%	38	6

- *Sensitivity Analysis.* Switching values of the main project variables have been assessed to determine their impacts on the project's financial viability.

4. The financial impact of the project on ESCOM: The financial analysis of the proposed investment (Component 1) seeks to assess the Financial Internal of Return (FIRR), the value created (Financial Net Present Value – FNPV), and the project's annual impact on ESCOM's net income and cash-flows from the connection of 280,000 new customers.

5. Financial Rate of Return (FIRR): The estimated FIRR for the project's Component 1 is presented in the following Table 6.5 indicating that the proposed investment should provide a healthy financial return, particularly as it would benefit from IDA terms (US$105 million – 100 percent of financing) with an indicative interest rate of 1.48 percent.

Table 6.5: Project Financial FNPVs and FIRRs - Base Case

Investment	FNPV (at 1.04%(1) discount rate) (US$ million)	Estimated Financial Internal Rate of Return (FIRR) (%)
Component 1: Connection of 280,000 new customers	29.9	5.6

(1) After tax discount rate of 1.04 percent on 1.48 percent IDA Rate

6. The project will also have a positive impact on ESCOM's financial condition (Net income and Cash flows) only after one year (2020) when revolving funds are excluded in the Cash flows. Table 6.6 below provides a summary of the positive cash the power sector is expected to realize from the project.

Table 6.6: Component 1 Impact on ESCOM's Finances - Base Case

Year	2020	2021	2022	2023	2024	2025	2026	2027	Cumulative on Project Life (15 years)
Net Income Impact (US$ million)	0.79	1.01	1.27	1.56	1.18	1.27	1.37	1.48	20.3
Cash Flow Impact (US$ million)	2.19	3.81	5.47	7.16	8.18	4.83	4.94	5.04	73.4

7. Project Financial Viability: The financial analysis also assessed the robustness of the project (Component 1) viability under several scenarios related to its main drivers; (1) increase in capital expenditures; (2) decrease in tariff; (3) increase in cost of energy supply; (4) increase in transmission and distribution losses, (5) increase in Distribution and commercial cost; (6) increase in O&M cost; (7) decrease in collection rate; (8) decrease in the number of customers connected; (9) decrease in unit consumption rate.

8. Overall, the FIRR and FNPV of Component 1 of the Project are sensitive to the average retail tariff, the cost of energy supplied to the national network, and the collection rate. The results of the sensitivity analysis are presented in Table 6.7 below.

Table 6.7 Sensitivity Analysis (Switching Values)

	Unit	Original Value	Switch Values	Change (%)
Component 1 – New Customer Connections				
Capital Expenditures (Cost overrun)	US$	363	478	32
Average Retail Tariff (weighted)	**MWK/kWh**	**77.3**	**72.4**	**-6**
Cost of Energy Supplied	**MWK/kWh**	**37**	**41**	**11**
Transmission & Distribution Losses	%	18	26	45
Distribution and Commercial Cost	MWK/kWh	9.9	14.7	49
O&M Cost	% CapEx	2.00	5.51	175
Collection Rate	**%**	**97.3**	**91.1**	**-6**
Unit Consumption Rate (weighted)	kWh/month	141	108	-24

ANNEX 7: GENDER GAP ASSESSMENT AND PROPOSED WAY FORWARD

1. Enhancing gender equality in the energy sector, particularly in electrification, not only contributes to the poverty reduction strategies nationwide but also contributes to the economic development of Malawi. In 2015, Malawi developed a National Gender Policy that provides a framework for achieving gender equality and women's economic empowerment in Malawi; however, the policy does not provide a clear link to gender and energy.

2. The MEAP project team conducted a gender gap assessment during the pre-appraisal mission from July 16 to July 20, 2018. The aim of the assessment was to summarize gender gaps and to explore the link between the key gender gaps and the energy sector. The assessment included consultations with various stakeholders working in the area of gender and energy, as well as national surveys. The following is a summary of the major gender gaps at national, sectoral, household, institutional, and educational levels, followed by the proposed interventions for each gap. The timeline for the implementation of the proposed interventions will be included in the POM.

3. **National.** The link between gender and energy is yet to be explored by policy makers in Malawi. There are knowledge gaps on the link between gender and energy since most efforts at the national level have focused on linking gender to climate change where deforestation has affected weather patterns as trees are a source of firewood. As alternative sources of energy are starting to emerge in Malawi, the implications on gender have yet to be developed and understood at the policy-making level.

4. **Sectoral.** The Millennium Challenge Account (MCA) Malawi, through the Power Sector Reform Project, has done the most comprehensive assessment to date with respect to gender and the energy sector in Malawi. The Power Sector Reform Project of MCA Malawi started the work of analyzing gender gaps within EGENCO and ESCOM in 2013. The analysis of gender gaps was motivated by the proposed revisions of tariffs to support the financial viability of ESCOM while being socially responsible to the constraints that women-headed households and the poor face in accessing electricity. The lack of women in decision-making positions and low employment rates of women in engineering and technical fields in the sector emerged in the social and gender gap assessment. Further, through the Infrastructure Development project, the gender assessment concluded that the lack of education, illiteracy, lower status, and lack of decision-making power make women in Malawi more vulnerable to discrimination particularly in accessing jobs in construction activities, such that appropriate measures are needed to ensure women's participation.

5. **Household.** In Malawi, approximately 30.6 percent[47] of the households are headed by females with a higher concentration of female-headed households in the rural areas than urban areas. Access to electricity in Malawi is lower for female-headed-households; approximately 12 percent of male-headed households and 7.6 percent of female-headed households had access to electricity in their dwelling units. When compared to male-headed households, female heads of households are likely to be separated/divorced or widowed and carry the burden of being care givers to the elderly and children.

[47] DHS 2015.

6. Female-headed households are more likely to be in traditional dwellings than permanent dwellings. In addition, females are more likely to be financially excluded than males. Female heads of households that own enterprises are more likely to borrow from village banks or use own savings. Female heads of households are less likely to own a mobile phone. In 2017, 53 percent of male-headed households and 34.3 percent of female-headed households owned mobile phones. Ability to own a mobile phone could determine the ability to pay bills, including electricity bills, through mobile services.

7. **Institutional.** In Malawi's main utility companies, ESCOM and EGENCO, the identified institutional gender gaps are in relation to human resources policies, customer care services, and procurement. The female staff at ESCOM and EGENCO constitute approximately 10 percent of all staff. The proportion of females employed in technical and engineering fields at the utility companies is less than 7 percent. The gender gap assessment also established that ESCOM and EGENCO lack the environment for equal employment opportunities for female employees. With TA from MCA Malawi, the utility companies have developed a gender and anti-sexual harassment policy to create an enabling environment for equal employment opportunities, but implementation of the policy is pending.

8. **Education.** The gender disparities in employment rates at utility companies could be triggered by gender gaps in STEM fields within higher education institutions in Malawi. Less than 20 percent of women are graduating with STEM degrees from Malawi higher education institutions. Even though Malawi has implemented a harmonization policy to close some of the gender gaps in STEM fields in higher education institutions, the enrollment rate during the 2016/17 academic year was 32 percent for females. The low enrollment of females in higher education institutions could also be due to lack of awareness of STEM fields in primary and secondary levels of education.

9. **Labor.** Malawi has no gender disparities in the labor force participation rate; however, the employment rate is higher for males at 78 percent compared to 67 percent for females. According to the Enterprise Survey of 2014, 28 percent of firms in Malawi had female participation in ownership while 11.4 percent of the firms had majority female ownership.[48] With respect to household enterprises, 29.3 percent of male-headed households and 20.7 percent of female-headed households operated enterprises in 2016. The major obstacles to female-owned enterprise development in Malawi include access to finance, access to electricity, and corruption.

Gender Gap Analysis, Proposed Interventions, and Indicators

10. This section provides the identified gender gaps related to the PDO, the proposed interventions, the indicators, and the units responsible for each intervention.

[48] Malawi Enterprise Survey 2014.

Table 7.1. Gender Gaps, Proposed Interventions, and Indicators

Component	Level	Gender Gap	Intervention	Indicators	Unit Responsible
1	Households/ enterprises	Female-headed households and enterprises lack access to electricity (on-grid and off-grid) due to lack of resources, knowledge, and so on.	Consumer awareness and consumer education programs targeting women in areas where project is being implemented. Programs will focus on how to access and manage electricity in conjunction with nongovernmental organizations that have successful consumer education models.	Number of male- and female-headed households with electricity connection (on-grid and off-grid)	PIU
				Number of male-owned and female-owned enterprises with electricity connection (on-grid and off-grid)	ESCOM
2	Households/ Enterprises	Women and female-headed households lack access to finance necessary for wiring and electricity connections	Provide concessional and low interest rate loans with a PAYG scheme to enable poorer female-headed households to access off-grid electricity. A similar program has been successfully implemented in Ethiopia and Kenya.	Number of male- and female-headed households with electricity connection (on-grid and off-grid)	PIU
				Number of male-owned and female-owned enterprises with electricity connection (on-grid and off-grid)	ESCOM
	Employment rate	Females lack income-earning opportunities that provide income stability	Utilize female technicians to wire and provide electricity connections (on-grid and off-grid) to female-headed households.	Number of female technicians and female distributors employed (intermediate indicator)	PIU
			Utilize female distributors to provide solar products to households connecting to off-grid electricity.		ESCOM
3	Institutional	In electrical utility companies, women constitute less	Provide TA to ESCOM in the implementation of the Gender and Social Inclusion Capacity Building Plan to include:	Number of female employees hired in engineering and technical positions	ESCOM

Component	Level	Gender Gap	Intervention	Indicators	Unit Responsible
		than 10 percent of the staff	Develop a recruitment, leadership development, and mentoring program targeting women graduating in STEM fields to work for ESCOM and MoNREM. A similar program has been implemented in Vietnam Electricity[49] and Ethiopia.	Number of women employed in decision-making positions	Africa Gender and Energy
	National/sectoral	Lack of knowledge on gender and energy (renewable energy)	Training/workshop/conference for gender focal points and other stakeholders on the link between gender and energy to ensure successful integration of gender in the energy sector. Similar programs have been implemented in Ethiopia.	Number of gender focal points who attended the training including those at decision-making level and policy makers	PIU
					Africa Gender and Energy
					ESCOM and MoNREM
	Education	Less than 20 percent of women graduating with STEM degrees from higher education institutions	Develop programs to increase awareness of STEM fields in conjunction with ESCOM. Programs include offering scholarship programs and internships to female students currently studying in STEM fields.	Number of programs developed to increase awareness of STEM fields	ESCOM Gender and Social Inclusion Department
				Number (percentage) of female students enrolled and graduating from STEM fields	Africa Gender and Energy
					PIU

[49] https://en.evn.com.vn/d6/news/The-World-Bank-assists-EVN-in-carrying-out-a-gender-equality-plan-6-12-508.aspx.

ANNEX 8: GEOGRAPHICAL MAP OF MALAWI