



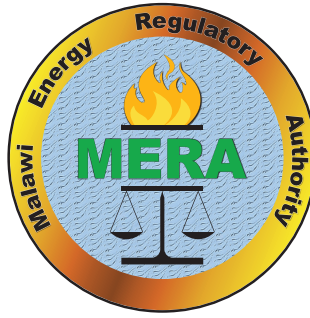
MALAWI ENERGY REGULATORY AUTHORITY  
(MERA)



# REGULATORY FRAMEWORK FOR MINI-GRIDS

July 2020





MALAWI ENERGY REGULATORY AUTHORITY (MERA)

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## Glossary

Concession Agreement	A negotiated contract between a company and a government that gives the company the right to operate a specific business within the government's jurisdiction, subject to certain conditions.
Concession Arrangement	An arrangement whereby a government or other public sector body contracts with a private operator to develop (or upgrade), operate and maintain the grantor's infrastructure assets such as energy distribution networks.
Cost Reflective Tariff	A unit price of electricity that take into consideration all costs of reductions and distribution of power with possibility of mark-up for sustainability of the power supply enterprise.
Dispatchable Generation	Sources of electricity that can be used on demand and can be switched on or off at the request of power grid operators, according to market needs.
Electricity Tariff	The unit charge for electrical energy consumed by customer.
Energy Mix	A group of different primary energy sources from which secondary energy for direct use (e.g. electricity) is produced.
Feed-In-Tariff	Fixed electricity prices that are paid to energy producers for each unit of energy produced and injected into the grid.
Grid Code	A document (or set of documents) that legally establishes technical and other requirements for the connection to and use of an electrical system by parties other than the owning electric utility in a manner that will ensure reliable, efficient, and safe operation.
Inverted Block Rates	A fee structure for energy in which each additional block or unit of energy above a given level is charged at a higher rate than preceding blocks.
Kilowatt	A unit of power capacity equivalent to 1000 watts i.e. 1000 joules/second.
Megawatt	A unit of energy equivalent to 1000 kilowatt.

Mini-grid	An isolated electricity distribution system energized by up to 5 MW installed capacity power plants that supplies electricity to a localized group of customers.
Non-Dispatchable	Sources of electricity that cannot be used on demand neither be switched on or off at the request of power grid operators, according to market needs.
Off-Grid Solutions	Electricity Power Systems which are isolated from national grid.
Photovoltaic System	A system generating electricity from the sun using solar panels.
Single Buyer	An entity responsible of buying electricity from generators, conclude agreements to import or export electricity, perform the expansion planning, and prepare the long-term operation schedules.

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## Acronyms

CA	Concession Agreement
CSOs	Civil Society Organisations
DoEA	Department of Energy Affairs
DSM	Demand Side Management
EAD	Environmental Affairs Department
EoI	Expression of Interest
EPB	Environmental Project Brief
ESCOM	Electricity Supply Corporation of Malawi
ESIA	Environmental and Social Impact Assessment
ESMP	Environment and Social Management Plan
ICT	Information and Communication Technologies
IEC	International Electro-technical Commission
IPPs	Independent Power Producers
IRR	Internal Rate of Return
ITB	Invitation To Bid
KPIs	Key Performance Indicators
kW	Kilowatts
MAREP	Malawi Rural Electrification Program
MERA	Malawi Energy Regulatory Authority
MGD	Mini-Grids Developer
MW	Megawatts
NCIC	National Construction Industry Council
NGOs	Non-Governmental Organizations
PPA	Power Purchase Agreement
PV	Photovoltaic
PVEs	Photovoltaic Energy Systems
REA	Rural Electrification Act
REF	Rural Electrification Fund
REMAC	Rural Electrification Management Committee
RET	Renewable Energy Technologies
RR	Required Revenue
SB	Single Buyer
SMO	System and Market Operator
SPV	Special Purpose Vehicle
ToU	Time of Use
WACC	Weighted Average Cost of Capital
WTP	Willingness to Pay

## Acknowledgement

This framework was developed with support from the United Nations Development Programme (UNDP) Malawi Country Office and Global Environment Facility (GEF).

Preparation of the Regulatory Framework for Mini-Grids in Malawi was a commitment and devotion from many stakeholders to whom we are highly indebted for their valuable contributions.

The following institutions are particularly acknowledged for their support and contributions: Ministry of Natural Resources, Energy and Mining (MoNREM); Department of Energy Affairs (DoEA); Malawi Bureau of Standards (MBS); Mzuzu University (MZUNI); Electricity Supply Corporation of Malawi (ESCOM); Electricity Generation Company (Malawi) Limited (EGENCO); Mulanje Electricity Generation Agency (MEGA) and Environmental Affairs Department (EAD).

Finally, appreciation goes to all stakeholders and the general public who provided inputs during consultation meetings in the southern, central and northern regions of Malawi.



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## Executive Summary

The National Energy Policy (2018) promotes mini-grids as one way of accelerating electrification in locations where grid extension cannot be an economically viable electrification approach. Based on the Malawi Renewable Energy Strategy (2017), Malawi would have at least fifty (50) operational mini-grids by 2025. Previously implemented mini-grids since 2006 have resulted in mixed experiences and mixed lessons due to limited long-term support mechanisms although the legislation has provisions for supporting mini-grids. Therefore, the mini-grids regulatory framework provides structures for organised and regulated development and operation of mini-grids in Malawi in order to ensure sustainability and tangible socio-economic impact of mini-grids and electrification approaches.

This mini-grids regulatory framework recognises five ownership arrangements for mini-grids that can be approved by the Rural Electrification Management Committee (REMAC) or its successor through either a solicited process or unsolicited process as described herein. The five acceptable ownership arrangements are: community-based either as a Trust or by cooperative associations; public; private; private-public partnership, and hybrid.

The full requirements for development and operation of mini-grids including the design considerations are described. However, in order to reduce bottlenecks to the mini-grid development process, a number of exemptions are provided for on the technical and licencing requirements.

The approval and licensing processes for mini-grid developers and operators includes qualifying the mini-grids for concession with the Malawi Government; where the technical and socioeconomic studies show that the mini-grid operation will not be economically and financially viable. Therefore, where applicable, concession agreements may be signed with the Malawi Government in the light of the financial models consideration described herein, and based on the provisions of the Rural Electrification Act (2004).

# 1. Introduction

## 1.1 Background

Since 2006, a number of mini-grids have been implemented in Malawi by both government and non-government organisations. Generally, there are mixed experiences and mixed lessons from the previously implemented mini-grids. The existing mini-grid systems have been left to the administration of the developer institutions to manage, operate and maintain without relevant regulatory framework; thereby undermining monitoring and enforcement of compliance with quality, safety and environmental standards for sustainability. Ownership and organisational structures of the mini-grids governance are not clear. Accountability and transparency procedures are also not clearly defined, thereby presenting challenges for authority institutions to manage supporting and regulatory structures. Despite lacking relevant skills, some communities develop mini-grid for household and community use. Consequently, instead of benefiting from the electricity services, the consumers face a number of risks including losing their property due to poor quality of power supply and substandard installations which result in previously installed systems operating for shorter periods than the expected life-time. Therefore, the regulatory framework for mini-grids is intended to achieve sustainable development and operation of mini-grids in Malawi while striving towards the provision of modern energy services to remote communities where grid extension does not offer an economically feasible electrification solution.

## 1.2 Policy and Regulatory Framework for Mini-grids

The National Energy Policy (2018), stipulates increasing renewable energy mix from below 10% in 2016 to 23% by 2030. In this regard, the Government of Malawi developed a Renewable Energy Strategy. The Malawi Renewable Energy Strategy (2017) set a target of at least 50 mini-grids to be operational by 2025. In addition, the Malawi Action Agenda 2030 on Energy indicates a trend of 900 electricity consumers per year to source electricity from mini-grids until 2030. In general, the National Energy Policy (2018) advocates electrification of villages and specifically households, grain mills, and social service facilities in order to increase access to electricity to over 80% of the population of Malawi living in rural areas. It is expected that mini-grids will play a significant role in realising the policy direction of increasing electricity access.

Cognizant of limited impact of the Rural Electrification Fund (REF) mainly because Rural Electrification had previously targeted grid extensions; the National Energy Policy (2018) provides for diversified use of REF to significantly promote development of renewable energy mini-grids in support of priority areas for rural electrification. Other provisions of the National Energy Policy (2018) that can relate to Mini-grids include:

- a) Supporting small-scale renewable energy initiatives by communities or entrepreneurs.
- b) Capacity building in areas of Renewable Energy Technologies (RETs) programming, supply and services, as well as in entrepreneurship and management, taking into account gender and social issues;
- c) Promoting private sector driven renewable energy technology industry and recognizing the role played by CSOs in contributing to Government efforts through renewable energy projects;
- d) Diversified use of REF to significantly promote development of renewable energy mini-grids in support of priority area of rural electrification;

- e) Financing off-grid solutions, from the REF, the cost of transformers and associated infrastructure, where it is intended to serve a minimum prescribed number of customers as approved by Government;
- f) Use of tariffs that encourage efficient use of electricity, such as Inverted Block Rates, Time of Use (ToU) Tariffs and Dynamic or "Real-time" Pricing; and
- g) Introduction of lifeline tariffs to enable low income households access electricity.

The Malawi Energy Regulatory Authority (MERA) is mandated to regulate the energy sector and license energy undertakings as defined in Section 9 of the Energy Regulation Act (2004). Section 9 (2) mandates the authority to facilitate increasing access to energy supplies and promote the exploitation of renewable energy resources.

In the light of the legislation, implementation of government supporting mechanisms provided for in the National Energy Policy (2018) requires that mini-grids, as an energy undertaking based on the definition by the Energy Regulation Act (2004), be regulated within the mandate of MERA. Table 1 below provides a summary of the pieces of legislation governing the mini-grids.

*Table 1: Summary of Key Pieces of Legislation Governing Mini-Grids*

Legislation	Provision
<b>Energy Regulation By Laws (2009)</b> Energy Regulation By laws 42 – licensing of energy undertaking	(a) Licence be issued for renewable energy activities; and (b) No person shall carry on the business of importing, selling, installation and maintenance of renewable energy technologies without a licence issued by the Authority.
<b>Electricity By Laws (2012)</b> Electricity By law 44 – Installations Permits	(a) Installers of renewable energy technologies be certified and Issued Electrical Installations Permit; (b) Renewable energy activities be licensed; (c) The Authority shall not issue a licence to an applicant for renewable energy technologies unless the Authority has granted to the applicant an electrical installations permit;
Electricity By law 55 – Standards and Code of Practice	Every licensee shall comply with and adhere to the standards and specifications for renewable energy technologies approved by the Authority.
Electricity By law 56 – Only authorized persons to Install and maintain renewable energy	Every licensee shall comply with and adhere to the applicable provisions in the Electricity By laws in respect of authorized persons or licensees to carry out installations and maintenance of renewable energy technologies installations.
<b>Rural Electrification Act (2004)</b>	The REF supports projects with Internal Rate of Return (IRR) of up to 6%.
<b>Electricity (Amendment) Act (2016)</b>	The Electricity (Amendment) Act (2016) allows MERA to specify IRR for all energy undertakings;
<b>Electricity Act (2004)</b>	1. Cost reflective tariffs be charged on off-grid/mini-grid projects. Section 25 of the Rural Electrification Act (2004) and By-Laws 205(g) and 211 (d) of the Electricity allow MERA to approve tariffs for off-grid electrification which: <ul style="list-style-type: none"> <li>• are cost reflective and competitive; and</li> <li>• do not impede competition in the industry.</li> </ul> 2. Both generation and distribution licences be issued under the Rural Electrification Act, albeit limited to installed capacity of 5MW
<b>Environment Management Act (1996)</b>	Mini-grid developer should submit an environmental project brief to the Environmental Affairs Department for determination of whether or not an ESIA is required. Usually an ESMP will be required

## 2.0 Framework Objective

The mini-grids regulatory framework aims to provide guidelines for the development and operation of mini-grids in Malawi in terms of the following:

- a) Solicitation process for mini-grids development;
- b) Requirements for approval of mini-grid project;
- c) Terms and conditions for registering or licensing based on whether they are for commercial or private use;
- d) The Governance structures to ensure transparency and accountability in the operation of the mini grids;
- e) Quality of supply and services standards for development and operation of the mini grids;
- f) Key Performance Indicators (KPIs) and monitoring;
- g) Tariff methodologies and structures for mini grids to ensure sustainability of operations and alignment with policy on subsidies; and
- h) Sustainability of mini grid operations when the national grid extends to the mini-grid supply areas.

## 3.0 Solicitation Process for Mini-Grids

Similar to the solicitation process of Independent Power Producers (IPPs) as presented in Independent Power Producers Framework 2017, mini grids shall be developed through two pathways as follows:

### 3.1 Solicited Pathway

For the solicited pathway, the government shall advertise requesting developers to provide bids for development of mini-grids for specific areas based on the Rural Electrification Master Plan. The stages shall be as presented below:

*Table 2: Pathway for Solicited Mini-grids*

Stage	Description	Parties	Action
1	Prefeasibility/Feasibility	DoEA	DoEA undertakes technical and economic Feasibility Study including financial modelling
2	Environmental Project Brief (EPB)	DoEA	DoEA submits EPB to EAD
3	Environmental Project Brief	EAD	EAD reviews environment project and respond with ToRs for ESIA/ESMP or exemption certificate
4	ESIA/ESMP (if applicable)	DoEA	DoEA undertakes ESIA studies and prepares ESIA/ESMP report to EAD
5	ESIA/ESMP (if applicable)	EAD	EAD reviews ESIA/ESMP report and responds with comments for revisions or with approval
6	Expression of Interest (Eoi)	DoEA	DoEA prepares Eoi and advertises
7	Evaluation of Eois	REMAC/DoEA	Eoi evaluated and prequalified Mini-grid developers shortlisted
8	Invitation To Bid (ITB)	DoEA	DoEA prepares ITB and advertises
9	Tender	Mini-grids Developer (MGD)	MGDs submits bids to DoEA
10	Tender Evaluation	REMAC/DoEA	Tenders evaluated and preferred Mini-grids developer shortlisted
11	Tariff and Incentives Setting	MERA/DoEA/ REMAC/DoEA	MERA/DoEA/ REMAC discuss the applicable tariff and agrees on concession arrangements
12	Concession Agreement (CA)	DoEA/ REMAC/DoEA/MGD	The parties agree and sign CA
13	Regulatory Assessment	MERA	MGD submits relevant applications to MERA and MERA processes including advising on indicative requirements for licensing
14	Financial Close and Project Implementation	MGD	MGD secures financing and implement project in the light of NCIC regulations of contracting, subcontracting and joint venture
15	Commissioning Tests	MGD/MERA/DoEA	MGD/MERA/DoEA undertakes commissioning and acceptance tests; and sign the commissioning report.

### 3.2 Unsolicited Pathway

Private institutions, companies, individuals, NGOs, or registered community-based organisations may also express interest to develop mini-grids in any preferred area based on technical and socioeconomic studies. However, the project area shall have to be approved by the REMAC based on the following stages:



*Table 3: Pathway for Unsolicited Mini-grids*

Stage	Description	Parties	Action
1	Prefeasibility	MGD	MGD undertakes technical and economic pre-feasibility Study
2	Eol	MGD/DoEA	MGD submits Eol to REMAC/DoEA
3	Evaluation of Eols	REMAC/DoEA	Eol evaluated and consent to develop given or not given
4	Full feasibility	MGD	MGD undertakes full technical and economic feasibility study including financial modelling and submits to DoEA
5	Evaluation of Feasibility and Financial Models	REMAC/ DoEA /MERA	Feasibility study and financial models evaluated
6	Environmental Project Brief	MGD	MGD submits EPB to EAD
7	Environmental Project Brief	EAD	EAD reviews environment project and respond with ToRs for ESIA/ESMP or exemption certificate
8	Tariff and Incentives Setting	MERA/DoEA/ REMAC	MERA/DoEA/ REMAC discusses the applicable tariff and agrees on concession arrangements
9	Concession Agreement (if applicable)	DoEA/MERA/MGD	The parties agree and sign Concession Agreement
10	ESIA/ESMP (if applicable)	MGD	MGD undertakes ESIA studies and prepares ESIA/ESMP report to EAD
11	ESIA/ESMP (if applicable)	EAD	EAD reviews ESIA/ESMP report and responds with comments for revisions or with approval
12	Regulatory Assessment	MGD/MERA	MGD submits relevant applications to MERA and MERA processes including advising on indicative requirements for licensing
13	Financial Close and Project Implementation	MGD	MGD secures financing and implement project in the light of NCIC regulations of contracting, subcontracting and joint venture
14	Commissioning Tests	MGD/MERA/DoEA	MGD/MERA/DoEA undertakes commissioning and acceptance tests; and sign the commissioning report.

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## 4.0 Requirements for Approval of Mini-Grids Projects

### 4.1 Approval and Licensing of Mini-Grids

The Mini-grids shall be developed consistent with the National Energy Policy (2018), Malawi Renewable Energy Strategy (2017) and Rural Electrification Master Plan. The mini-grids shall be approved by REMAC/DoEA.

A baseline demand and user survey shall be conducted, at micro level by project developers. Demand projections (growth factors based on historical trends or from similar area already electrified) shall be done to assess viability of the project for the life span of the mini-grid. The Mini-grids shall, among its target customers, have customers engaged in economic activities to enhance their viability.

MERA shall license mini-grid proposals approved by REMAC/DoEA based on the solicitation processes described in section 3.

MERA shall consider feasibility studies report and including, among other requirements, the following to approve applications for the licensing of mini-grid projects:

- (a) **Resource Availability** - An assessment confirming sustainability of the energy resource (prime movers including wind, water, solar, geothermal, biogas, etc) under consideration for the economic life time of the project and a pre-feasibility study;
- (b) **Willingness to Pay (WTP) and Affordability** - How much the potential customers are ready to pay for the electricity services relative to what their predicted electricity demand would cost. The outcomes from a survey of the mini-grid concession area shall be used to determine operational subsidy to close the gap between affordability and cost recovery, where applicable;
- (c) **Financing Options** - to be adequate for project development (in the case of private financing), and for operations and maintenance. Financing options shall consider funding the cost of associated infrastructure to connect the potential customers to facilitate service connections. Subject to Government policy, it may include customer installations to accelerate connections for enhancement of the financial model;
- (d) **Financial Model** - to demonstrate among others capital expenditure, operational expenditure, tariff calculations and financial viability of the investment;
- (e) **Energy Mix** - to be consistent with short, medium and long-term renewable energy strategy targets set by Government; and
- (f) **Selected Location of the Mini-grid** - unless otherwise specifically preferred and approved, mini- grids should be located outside areas earmarked for grid extension to give certainty to investors. Reference shall be made to MAREP to identify areas earmarked for electrification by grid extension within the payback period of the mini-grid assets.

## 4.2 Concession Agreement

Section 27 of the REA (2004) stipulates that where the execution of a rural electrification project is to be carried out by a Concessionaire, there shall be executed a CA between the Concedante and the Concessionaire in the prescribed form. Thus, for rural electrification projects that have been approved and are consistent with the REA (2004) unless otherwise directed by Government, the developers shall enter into a CA with Government to develop and operate the mini-grids.

Section 29 of the REA 2004 provides that a concession agreement shall remain in force for a period of up to twenty years as long as the Concessionaire complies with the provisions thereof and this Act or any other relevant written law.

The CA shall be in a format as presented in **Appendix A**. Among other areas, the CA shall specify the following:

4.2.1 The Concession area demarcated for the Concessionaire to carry out the installation operation and maintenance of rural electrification system.

4.2.2 A Subsidy Program

Where necessary and to facilitate implementation of the mini-grids, a subsidy programme may be arranged as follows:

- a. **Capital Subsidy**– The extent of provision of infrastructure. Whether to include or exclude any or all of:
  - i) service drop
  - ii) meter board; and
  - iii) customers' wiring installation);
- b. **Output based Aid** – A subsidy provision with in-built performance incentives received only on proof of a tangible output being achieved. For instance, an output-based aid can be granted to extend service to new customers, where a fixed subsidy amount is provided for each new customer who is connected and purchases electricity. The subsidy shall be paid only when the connection and its use has been verified.
- c. **Operational subsidy** – Subject to market survey of willingness-to-pay and affordability, a subsidy may be agreed to close the gap between affordability and cost recovery;
- d. **Pro-poor rates** – to allow mini-grid operator to fix a higher tariff for other customer categories such as commercial customers so that subsidies can happen across customer categories or price discrimination.

## Targeting Customers

The CA may specify target of customers engaged in productive use of electricity to provide access to social and administrative institutions; and to customers engaged in economic activities to minimize the gap between affordability and cost reflective tariffs.

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#### 4.2.3 Using Local Resources

Subject to the nature of the project, the CA shall have stipulations that priority be given to use of local resources including human resource and technologies available within the country and local environment.

### 4.3 Ownership Arrangements

MERA shall consider the following ownership models for eligible applicants for mini-grid licences consistent with the energy policies and renewable energy strategy -

- (a) **Community Based** with Community involvement and participation. Either by a trust or cooperative associations to leverage community and private resources to reduce costs.
- (b) **Public** Owned and operated by an institution with state shareholding;
- (c) **Private** licensed as sole proprietary, partnership, or corporate company
- (d) **A Public Private Partnership** A Special Purpose Vehicle (SPV) with clear shareholding and risk sharing arrangements; and
- (e) **Hybrid System** where different persons own different components of the mini-grid system.

## 5.0 Grid-Connection of Mini-grid

The continuity of mini-grid business shall be assured through transitional arrangements to be applied in the case where the national grid extends to the mini-grid supply area.

Grid interconnection of the mini-grid shall be allowed under terms and conditions specified in the Grid Code or as shall be discussed and agreed upon between the mini-grid operator, the Single Buyer (SB) and the System and Market Operator (SMO) in the light of any provisions of the feed-in tariff policy.

Where a mini-grid is allowed to connect to the national grid, a PPA shall be signed between the mini-grid operator and the SB guided by the Independent Power Producer Procurement Framework (2017). The signed PPA shall conform to MERA's standard PPA.

Where the national grid is extended to a mini-grid supply area and that grid connection is not feasible, the REMAC/DoEA shall compensate the mini-grid operator based on residual value of assets or deemed energy based on annual average energy sales, whichever is lower.



## 6.0 Tariff Guidelines

### 6.1 Formulation of End User Tariffs

Compliant with the REA (2004) and Rural Electrification Regulations (2009), tariffs shall be approved by MERA and shall be set, administered and revised in accordance with the Electricity Act. Cap. 73:01. Tariffs shall reflect social economic costs of the selected technologies. ToU tariffs may be used to cover the high costs of renewable energy technologies and/or enhance coincidence of high energy production with demand.

### 6.2 Composition of Tariffs

#### 6.2.1 General Tariff Structure

Whether the mini-grid is connected to the national grid or is isolated, mini-grid tariffs shall comply with the tariff methodology and standard tariff structure approved by MERA in line with Appendix B. In summary, the general tariff structure shall comprise the following components:

- (a) Operation costs related to energy production;
- (b) Depreciation of assets related to energy production;
- (c) Any applicable loan repayments; and
- (d) Reasonable return on capital costs that are not a grant

A cost-reflective tariff shall be calculated using

$$\text{Tariff} = \frac{\text{RR}}{\text{Total useful electricity Generation Forecast}} + \text{Applicable Levies}$$

**RR**= Operations cost + depreciation costs + applicable loan repayments  
+ return on capital

Tariffs may comprise fixed and variable charges. Innovative tariff formats shall be considered for approval by MERA. Where, for instance, load limiters are used and where customers opt to be interrupted under conditions of system disturbances to stabilize system operation and to be switched off under a load shedding program to match demand and supply.

### 6.2.2. Tariffs for Grid-Connected Mini-grid

#### 6.2.2.1 General Provisions

In areas where a mini-grid is connected to the national grid, distribution of electricity to consumers shall be the mandate of the SB. Thus, the mini-grid operator may not buy energy from the SB for resale except for the use within the mini-grid facilities.

The tariff charged on the SB by the grid-connected mini-grid shall be based on a PPA negotiated between the mini-grid operator and the SB. The PPA shall comply with a standard format approved by MERA as per Appendix C. Feed-in-Tariffs (FIT) shall apply consistent with the feed in tariff policy, where applicable;

Energy Banking may be allowed where the SB and the mini-grid operator agree that amount of energy consumed by the mini-grid be netted off with the energy sent out to the national grid and reconciliation be done after an agreed period.

#### **6.2.2.2 Components of a tariff for a grid-connected mini-grid**

The components of the tariff for a grid-connected mini-grid shall be consistent with tariff structure described in section 6.2.1. Capacity charge component may be included in the tariff if the associated power plant is dispatchable with unit commitment capabilities. Any such additional components of the tariff, shall be included in the PPA.

#### **6.2.2.3 Take or Pay Terms for the Tariffs**

In either case, whether PPA or energy banking arrangements, the tariffs for non-dispatchable energy source shall be on a Take or Pay basis unless otherwise provided by the CA.

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## 7.0 System Design

The designs shall consider sustainability of the system during the life time of the mini-grid. Except where exemptions are applicable based on provisions of Section 10 of this document, the following factors shall be considered:

### 7.1 Technology Choice

System design shall be based on a least cost technology mix for maximum stakeholder value. Technology options shall be based on what is locally available.

### 7.2 Market Needs and Demand Management

The capacity for the mini-grid shall be adequate to meet the needs of different types and number of expected beneficiaries. A baseline demand and user surveys shall be undertaken and projections be done based on population growth and growth factors derived from historical figures or from similar area already electrified.

### 7.3 Customer Management System

Customer installations shall allow two-way communication to reduce operational costs. The design shall consider using ICT methods for real time network information and communication. The ICT methods shall, for operational cost reduction, be considered for the following system management where practical:

- (a) Metering technology, billing and revenue collection;
- (b) Monitoring and regulating consumption;
- (c) Balancing demand and supply;
- (d) Automatic customer service data collection, analysis and reporting; and
- (e) Time of use tariff.
- (f) Efficient fault handling measurement

Energy efficiency measures including load limiters and DSM shall be used and loss reduction measures applied accordingly.

Aggregation of rural services shall be used as far as will be practical to reduce upfront cost for equipment and systems installations. The provision of smart grid technologies shall, for instance, endeavour to combine, other rural services including water supply, communications, financial services, consumer electronics, sales and services.

### 7.4 Sustainability of the Mini-Grids

A feasibility study shall be conducted for each project to ascertain the adequacy of the supply chain in the long term.

### 7.5 Grid Connection

Connection of the mini-grid to the national grid shall be allowed in the case where the national grid extends to cover the supply area of the mini-grid to provide for continuity of the mini-grid business. The DoEA/REMAC, shall be obliged to compensate the mini-grid owner as soon as the national grid extends to the mini-grid supply area, in the case where grid connection is not allowed.

### 7.6 Mini-Grids Technical Requirements

The mini-grid shall comply with the following technical requirements:

- (a) The Connection Code;
- (b) Network Code of the Grid Code;
- (c) Metering Code for the Grid Code;
- (d) Distribution Code;

- (e) Operation and Maintenance Policy - The mini-grid shall have a comprehensive and clear operation and maintenance scheme; and
- (f) Ability for parallel and island modes - The mini-grid shall be designed to applicable standards for easy integration into the national grid without any technical constraints during the time when national grid covers supply area of the mini-grid.

### 7.7 Key Performance Indicators (KPIs)

The regulator shall monitor and enforce compliance with agreed KPIs, which shall include but not limited to the following:

- (a) Reliability and security of supply - The design may include the following to enhance reliability and security of supply -
  - Energy banking;
  - Energy storage;
  - Backup systems;
  - Design for minimum system losses;
  - System adequacy to meet demand and customers' needs but avoiding over-sizing; and
  - Affordability by the target market evaluated from WTP and affordability survey results.
- (b) Compliance with Electricity By laws as follows:
  - Stability of system voltages and frequency;
  - Planned and forced outages;
  - Times to respond and resolve complaints, faults and request for general information;
  - Customer service standards benchmarked through consultative processes and on the following scope:
    - Reporting requirements including on KPIs;
    - System availability for both the distribution network and generation as a percentage of total hours in a year;
    - Access by distance to call centres; and
    - Customer services centre performance on quotation days; connections days; new connections; faults clearance, duration to clear; and number and duration of faults per customer.

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## 8.0 Standards Compliance

Except where exemptions are applicable based on the provisions of Section 10 of this document, mini-grid shall be developed in compliance with Malawi Standards on quality for rural electrification and mini-grids development, systems and service delivery provided in **Appendix C**.

All equipment used in the development and for operation of the Mini-grid shall comply with the Malawi Standards and be certified by the Malawi Bureau of Standards.



## 9.0 Licensing Requirements for Mini-Grids

### 9.1 Licensing Threshold

Mini-grids of less than 150 kW shall not be licensed provided that, where such type of mini-grids are developed for public and commercial use, they shall be registered to monitor compliance with quality of service, safety and environmental protection standards.

All mini-grids with generation and or distribution capacity of 150 kW or more developed for commercial purposes shall be licensed. A single licence shall be issued for combined activities of generation, distribution and retailing.

All mini-grids, of 150 kW or more developed for private use, shall be registered for records and to monitor compliance with safety and environmental protection standards.

In summary, all Mini-grid shall be licensed and registered as presented in Table 4, below.

*Table 4 : License threshold*

SYSTEM CAPACITY	PRIVATE	PUBLIC AND COMMERCIAL
<150KW	N/A	Registration
≥150KW	Registration	License

### 9.2 Licensing Fees

The Authority shall issue one license for a mini grid that will cover both electricity generation and distribution in a particular locality, the license fees shall also cover both generation and distribution aspects. The fees may be reviewed from time to time to reflect any changes in administrative costs of regulating the mini grids.

Table 5, below summarises all licensing fees per annum based on system generation capacity.

*Table 5: Generation/Distribution License Fees per annum*

SYSTEM CAPACITY	PURPOSE	LICENSE APPLICATION FEES (MK)	REGISTRATION FEES (MK)	LICENSE FEES (MK)
<150KW	Private	N/A	N/A	N/A
<150KW	Commercial	N/A	50,000.00	N/A
≥150KW < 1 MW	Private	N/A	100,000.00	N/A
≥150KW < 1 MW	Commercial	40,000.00	N/A	250,000.00
1-5 MW	Private	N/A	150,000.00	N/A
1-5 MW	Commercial	50,000.00	N/A	500,000.00

### 9.3 Licensing Terms and Conditions

The following terms and conditions shall form pre-requisites for licensing of mini-grids:

- (a) Permits and certificates -At a minimum the following certificates shall be required:
  - i. Approved Environmental and Social Management and Monitoring Plans (EMPs) or exemption certificate for ESIA;
  - ii. Water Rights;
  - iii. Local authorities' approvals on usage of land and forests; and
  - iv. A valid MERA permits or equivalent for Authorized Operators;

- 
- (b) Business registration in Malawi - compliance with registration requirements including: tax remittance (if the business has been operational for the previous financial year), and ownership/shareholding documentation.
  - (c) Work place registration for safety of people and equipment; and
  - (d) Application requirements - any person applying for a licence or registration for operation of mini-grids, shall duly fill and submit to MERA application form provided in Appendix D.

## 10.0 Application of Less Onerous Regulation

In order to reduce barriers and enhance the implementation of Mini-grid, exemptions on certain requirements as provided by the legislation shall be applied as follows:

### 10.1 Tariff Consideration

Tariffs for community based isolated mini-grids, shall be decided in consultation with the customers themselves. The approach is believed to yield tariff levels that are within the range of affordability and willingness to pay of the customers without need of having to develop a financial model. The agreed tariff shall be verified by MERA on adequacy to cover operations and maintenance of the mini-grid in order to ensure sustainability such as providing for accumulation of adequate funds for system maintenance during major equipment system failures and/or predicted equipment replacement times.

### 10.2 Financial Model Consideration

Minimum expectation of a financial model shall include the following:

- (a) A breakdown of capital cost estimates including project management costs;
- (b) A breakdown of base year operational costs;
- (c) A calculation of annual energy yield;
- (d) An estimated base tariff excluding levies; and
- (e) A calculation of minimum, maximum, and mean willingness-to-pay per month for households and business customers

### 10.3 Feasibility Study Requirements

For a mini-grid power system with an installed capacity of less than 150 kW, a feasibility report shall be considered adequate if it contains:

- (a) A section discussing resource assessment;
- (b) A section of electricity demand analysis with growth scenarios for the lifetime for the project;
- (c) A section discussing the power plant technology choice and adequacy of the system;
- (d) Justification of the technology choice relative to other available options based on any relevant economic viability assessment;
- (e) Implementation drawings for the system; and
- (f) Land requirements for the project implementation including land acquisition processes for the selected project site.

### 10.4 ESIA/ESMP Requirements

Full ESIA shall not be required for mini-grids with installed capacity of up to 1 MW, subject to Environmental Affairs Act specifications. However, an ESMP shall be required.

Where upon submission of an Environmental Project Brief, the EAD determines that a full ESIA is required, review fees shall be fixed to an amount equivalent to the review fees of an ESMP instead of using determining the review fees based on the project budget.

For solicited mini-grid projects, ESIA/ESMP report shall be developed by the Department of Energy Affairs.

### 10.5 Design Process Requirements

Excel based calculations for system sizing and technology performance modelling can be used by those who do not have access or do not have capacity to use commercial renewable energy modelling software.

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A full design report shall not be required for mini-grid power systems with installed capacity of up to 150 kW provided the design drawings are approved with/without recommendations by a registered engineer in a relevant field for the design drawings.

#### **10.6 Project Implementation Team Requirements**

Community based mini-grid projects may be carried out with local skills provided at least one supervisor has valid MERA permit for both renewable energy installations and power lines.

# APPENDICES

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## Appendix A: Concession Agreement Template

FORM RE 6 RURAL ELECTRIFICATION ACT reg. 8

(CAP. 73:03)

### CONCESSION AGREEMENT

THIS CONCESSION AGREEMENT is made the ..... day of....., 20..... BETWEEN .....of ..... (hereinafter referred to as “the Concedante”) of the one part AND .....of ..... (hereinafter referred to as “the Concessionaire”) of the other part.

WHEREAS the Government through the agency of the Concedante is willing and desirous to enter into an agreement for the installation and/or operation and maintenance of rural electrification installation; AND WHEREAS the Concessionaire is desirous to provide the services for the installation and/or operation and maintenance of rural electrification installation and has agreed with the Concedante to enter into this Concession Agreement.

NOW THEREFORE this Agreement witnesseth as follows—

1. The Concessionaire shall carry out the installation operation and maintenance of rural electrification system in the concession area demarcated in the First Schedule hereto and shall not charge consumers any tariffs or charges other than those specified in the Second Schedule hereto or as may be revised in accordance with the Energy Regulation Act (Cap.73:02) and the Act.
2. This Concession Agreement is subject to the provisions of the Rural Electrification Act and the regulations made thereunder.
3. The Concessionaire shall pay to the Concedante a management fee of K..... (Malawi Kwacha) per annum payable quarterly in advance provided that the said management fee shall be subject to revision with the approval of the Malawi Energy Regulatory Authority.

4. This Concession Agreement may not be transferred in whole or in part, by the Concessionaire, without the prior written approval of the Concedante.
5. Where the Concession Agreement has been terminated by the Concedante, the concession may be granted to any other person the Concedante may deem fit, after approval of the REMAC/DoEA and after consultation with creditors. Any compensation to the Concessionaire shall be determined by the parties and approved by the Malawi Energy Regulatory Authority.
6. The Concessionaire shall be solely liable for the installation, operation and maintenance of the rural electrification system and shall operate the same solely and exclusively and for the account of the Concessionaire.
7. Each of the parties shall ensure that their contractors, subcontractors, consultants and agents, and each of their respective permitted assigns and successors, hold in confidence all documents and other information whether technical or commercial, which are of a confidential nature supplied to it by or on behalf of the other party relating to the Concession and shall not publish or otherwise disclose or use the same for its own purpose, other than as may be required to perform its obligations under this Concession Agreement.
8. The provisions of the clause 8 herein shall survive the termination of this CA but shall expire and be of no further effect from the fifth anniversary of the date of termination of this CA.
9. The Concessionaire's obligations under this CA include—
  - a) To carry out the service of supplying electricity in such a way as to best serve the interests and needs of customers (both existing and future) and for the benefit of Malawi's economic and social development;
  - b) To utilize the grant and subsidy for the intended purpose and in accordance with the Rural Electrification Act and the Grant and Subsidy Agreement;

- 
- c) Not to remove any installation from the concession area without the prior written consent of the Concedante and to ensure that at all times each system is identifiable;
  - d) To carry out the Concessionaire's obligations under this Concession Agreement so long as it remains in force;
  - e) To allow the Concedante to enter any installation for purposes of verifying if the Concessionaire is complying with this CA and the REA;
  - f) to supply electricity as the case may be, within the concession area to all Consumers who are prima facie able to pay for the services charged by the Concessionaire, provided that the grant and subsidy received by the Concessionaire is enough to cover all such supply of energy;
  - g) to cooperate with other suppliers of electricity with regard to national and regional plans and operation of electricity supply systems;
  - h) not to reduce or terminate supply of electricity or remove the installation except in accordance with:
    - i. the Rural Electrification Act;
    - ii. the Electricity Act;
    - iii. the Energy Regulation Act;
    - iv. this Concession Agreement; and
    - v. the contract for supply of electricity entered into between the Concessionaire and a consumer;
  - i) Not to charge consumers any other tariffs or charges that have not been agreed in accordance with the REA, and as varied from time to time in accordance with the provisions thereof;
  - j) To submit to the Concedante within sixty days of the end of each financial year an annual report on all relevant parts of the operation including, but not limited to:



- i. target and actual total number of connections for each month;
    - ii. projection of connections for the next financial year; and
    - iii. any particulars as may be specified by the Concedante;
  - k) To maintain full and proper records of all its activities and to make the same available to the Concedante, MERA and their employees or agents at any reasonable times including;
    - i. Complete records of maintenance and repair activities including dates, personnel and the contractors involved and the costs thereof where these can be reasonably calculated or estimated;
    - ii. particulars of the physical locality and the identification of all installations in terms of which a grant or subsidy has been granted; and
    - iii. any other records as may reasonably be required by the Concedante or the Authority to properly monitor the activities of the Concessionaire;
  - l) to indemnify the Concedante and its employees for all liabilities arising out of the installation operation and maintenance of the rural electrification installation; and
  - m) in the case of solar home system, to enter into the solar home system purchase agreement and solar home system service agreement with the supplier as prescribed in the Rural Electrification Regulations.
10. This Concession Agreement may be terminated by the Concedante following the occurrence of any one or more of the following events—
- a) material suspension by the Concessionaire of rural electrification activities which do not result from a force majeure event;
  - b) repeated refusal by the Concessionaire to permit the due exercise of inspection, monitoring and supervision operations;
  - c) refusal by the Concessionaire to undertake the appropriate maintenance and repair of the rural electrification installations;

- 
- d) the charging by the Concessionaire of tariffs at a rate in excess of that which has been fixed under this Concession Agreement and as varied from time to time with the consent of MERA;
  - e) bankruptcy of the Concessionaire;
  - f) unauthorised transfer or assignment of the Concession Agreement by the Concessionaire;
  - g) breach of the Electricity Act, the Energy Regulation Act, the Rural Electrification Act or other material breach of this Concession Agreement; and
  - h) material deviation by the Concessionaire from the purpose of the Concession: Provided that the Concession Agreement shall not be terminated if the Concessionaire has taken appropriate remedial action within thirty (30) days of being given notice of intention to terminate by the Concedante.

11. The Concession Agreement may be terminated;

- a) by the Concessionaire, on giving three months written notice following material violation of the grant and subsidy agreement in the non-payment of grant and subsidy where applicable:

Provided that such violation has resulted in such infringement or such prejudice that the Concessionaire is unable to install, operate or maintain the rural electrification system on an economical basis in part or in whole; or

- b) after twenty years for rural electrification electricity and five years for renewable energy technologies or as specified in the Concession Agreement whichever occurs first.

## Appendix B: Tariff Setting Framework for Mini-Grids in Malawi

### 1.0 Introduction

Following the power sector reforms, MERA adopted a new tariff methodology in line with the new unbundled electricity market. The new tariff methodology sets a broad framework for approach to formulating tariffs for various undertakings in the electricity business, including mini-grids.

### 2.0 Tariff Setting Methodology and Formula

In assessing and setting tariffs for operators in the electricity market, MERA uses the Revenue Requirement (RR) Methodology approach with a revenue cap in determining electricity tariffs. The guiding principle of RR is that revenues of the regulated utilities should cover efficient operating and maintenance expenses, taxes and depreciation, and ensure a fair rate of return on assets utilised for provision of electricity. To arrive at an average tariff, MERA reviews and verifies all information related to the various components that make up the revenue requirement in the utility's tariff application. MERA further examines the marginal costs by customer type and customer load characteristics that forms the basis of costs of service by customer.

The RR of an operator is arrived at by summing up the revenues required for financing individual cost items known as the building blocks. The typical components of the building blocks models are:-

- a) Operations and maintenance, comprising:
  - staffing and operating costs, and
  - fuel costs/fees for power purchased from IPPs
- b) Depreciation charges
- c) Return on net fixed assets

The 'Building blocks' approach to determining the RR, is summarised by the diagram in below.

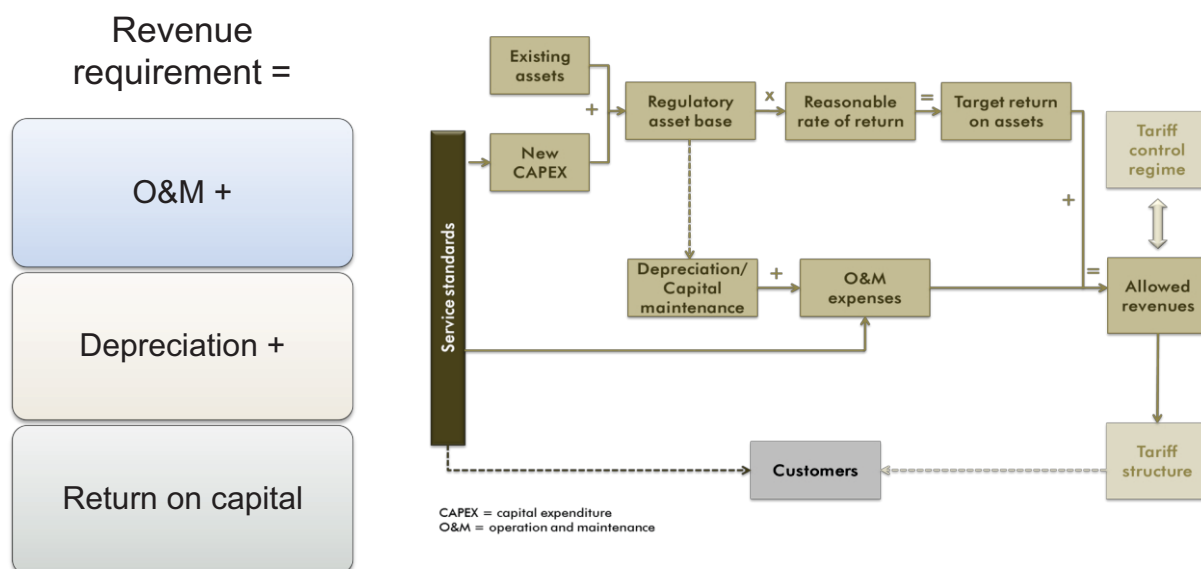


Figure 1: Determination of RR

### 3.0 The Tariff Tool for Mini-Grids

The approach to tariffs for mini-grids will follow the general principles set out by the new tariff methodology. This **tariff tool** for mini-grids has been put in place to guide mini-grid operators in determining the appropriate tariff for customers in an isolated cluster of customers. The tool will identify relevant building blocks that are applicable to mini-grid set up where operations involve generation and supply/distribution of electricity.

### 4.0 Inputs for the Tariff Tool

The starting point in devising tariffs for mini-grid is to determine the building blocks and these are essentially inputs to the tariff formula. The list below provides inputs for the mini-grid tariff formula:-

- a) Operating costs
- b) Capital costs
- c) Financing costs – as a basis for calculating return on capital
- d) Asset lives – as a basis for calculating depreciation
- e) Collection rate - To factor in bad debt costs
- f) Deductible income - non-tariff revenue that should be deducted from the cost base
- g) Billed consumption - To assist in converting revenue requirement to an average tariff

## 5.0 Calculating the revenue requirement

Having determined the relevant building blocks, the next step is to calculate the revenue requirement for each of those blocks

### 5.1 Operating costs

This requires estimation of annual costs for the tariff period

**5.2 Return of capital (depreciation)** - this is calculated by first determining the opening asset value for each asset type in each year, and divide it by the asset life. Depreciation costs will not be applicable on assets financed through grants as grant/donor financed assets are taken to have fully been paid for. Bearing in mind that mini-grids will mainly involve generation and supply of electricity, assets for mini-grids will mainly be in two segments of generation and supply/distribution as there is no transmission of electricity involved.

**5.3 Return on capital;** Investing in mini-grids is done as a business venture in which the investor expects a return. The return is realized by calculating the total asset value each year, then multiply it by the Weighted Average Cost of Capital (WACC). The Authority will only allow such a return on investments in assets that are funded by the investor and not on assets that are funded through grants from development partners, Rural Electrification Fund, and any other donor.

The WACC is calculated taking into account the relative weights of debt and equity components of the capital structure and their returns as presented below:-

$$WACC = \frac{K_d}{K_d + K_e} + (1 - T) * \frac{K_e}{K_d + K_e} ; \text{Where}$$

*K<sub>d</sub> is pre-tax cost of debt*  
*K<sub>e</sub> is Cost of equity*

*Gearing is the proportion of debt in the capital structure.*

**Cost of debt** may be obtained using the formula below:-

$$= \left( \frac{R_f + M}{1 - T} + \frac{K_d}{K_d + K_e} \right) * (1 - T) \text{ where}$$

*K<sub>d</sub> = cost of debt*  
*R<sub>f</sub> = Risk free rate*  
*M = Risk premium*  
*T = Corporate tax rate*

---

*R<sub>f</sub>*–Risk free rate is derived from the asset without the risk of insolvency, usually government bonds

**The cost of equity is** calculated using the Capital Asset Pricing Model:

$$= R_f + \beta * (R_m - R_f) \text{ where}$$

*K<sub>e</sub>* = Cost of Equity  
*R<sub>f</sub>* = Risk free rate  
*B* = Beta coefficient (which ranges between -1 to 1)  
*R<sub>m</sub>* = Market Rate

**5.4 Collections/bad debts;** Gross up the total of the above building blocks by the collection rate

**5.5 Deductible income;** Any activities undertaken by the operator and are outside the realm of electricity service provision cannot be borne by the customers. It has to be deducted from the RR.

## 6.0 Calculating average tariffs

Having calculated revenue requirement for each year, to calculate the average tariffs, the revenue requirement is divided by projected billed consumption.

## 7.0 Mini-Grid Tariff Principles

In considering and approving tariffs for mini-grids, MERA will be guided by the following principles:

- a) MERA shall allow mini-grid to charge retail tariffs above the uniform national tariff if required to enable them recover efficient capital expenditure and operation expenditure. This approach will ensure sustainability of electricity service provision
- b) Mini-grid operators may be allowed to cross-subsidize between customer classes specifically targeting domestic customers who are less able to afford electricity services but costly to serve
- c) MERA shall ensure that mini-grid operators enter into power sales and service contracts with businesses/customers. This will entrench customer confidence in sustained service provision by mini-grid operators, thereby realizing customer value for money

- d) Mini-grid operators may be allowed to charge tariffs that include depreciation on equipment financed through grants such as Rural Electrification Fund, development partners, etc.

## **8.0 Anticipated customer categories**

Most of the mini-grids in isolated and rural communities will target two major types of customers; namely domestic and small-scale commercial operators. In addition, there are other customers in the form of public institutions such as health facilities, schools, and community halls, among others. Just like at national level, most of domestic customers are less able to pay for electricity services due to the majority of them being availed to low incomes. On the other hand, commercial customers are able to pay for electricity services as such production costs are passed on to their customers. In order to cushion such domestic customers from 'high' tariffs, MERA will allow cross-subsidization to enable the rural domestic customers to access modern energy services in the form of electricity.

In determining the actual tariffs for various customers as indicated above, the mini-grid operators will have to consider the actual cost such customers will impose on their grids.

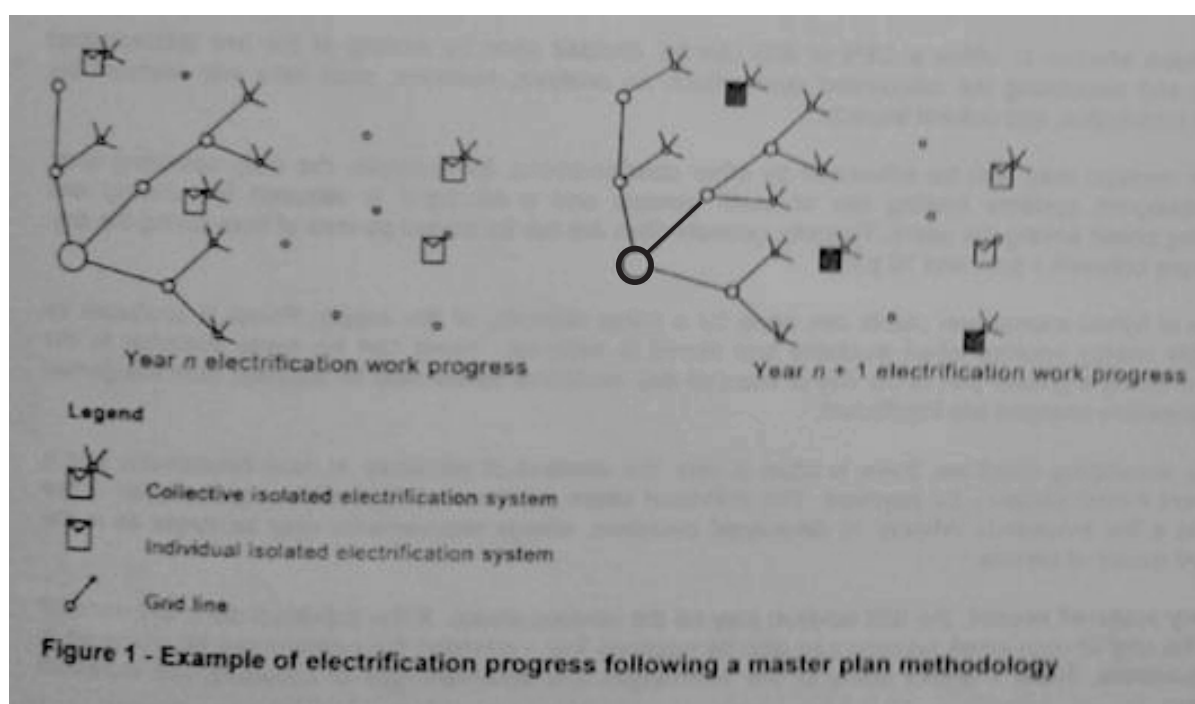
## Appendix C: Mini-Grids Development and Operation Standards

### 1.0 Criteria for Deciding Location of Mini-grid: MS 889-1: 2011

Areas for Mini-grid should be based on Rural Electrification Master/Plan or robust technical model (for unsolicited Mini-grid) in the light of the economically viable option for electrifying the concerned area. The Master Plan is updated regularly (usually 5 years) based on:

- Investigations on area energy needs with regards to demand including potential future changes
- GIS application- colour coding of villages depicting corresponding power supply/scheduling prioritisation
- Simulations of comprehensive financial analysis
- Provision for relocation and/or grid integration of the Mini-grid

Area electrification Master Plan for geographical locations is regularly updated and summarised as shown in Figure C1.



*Figure 2: Example of Rural Electrification Progress Summary Following Master Plan Methodology*



## 2.0 Methodological Approach and Tools for Mini-grid Development: MS 889-2:2011

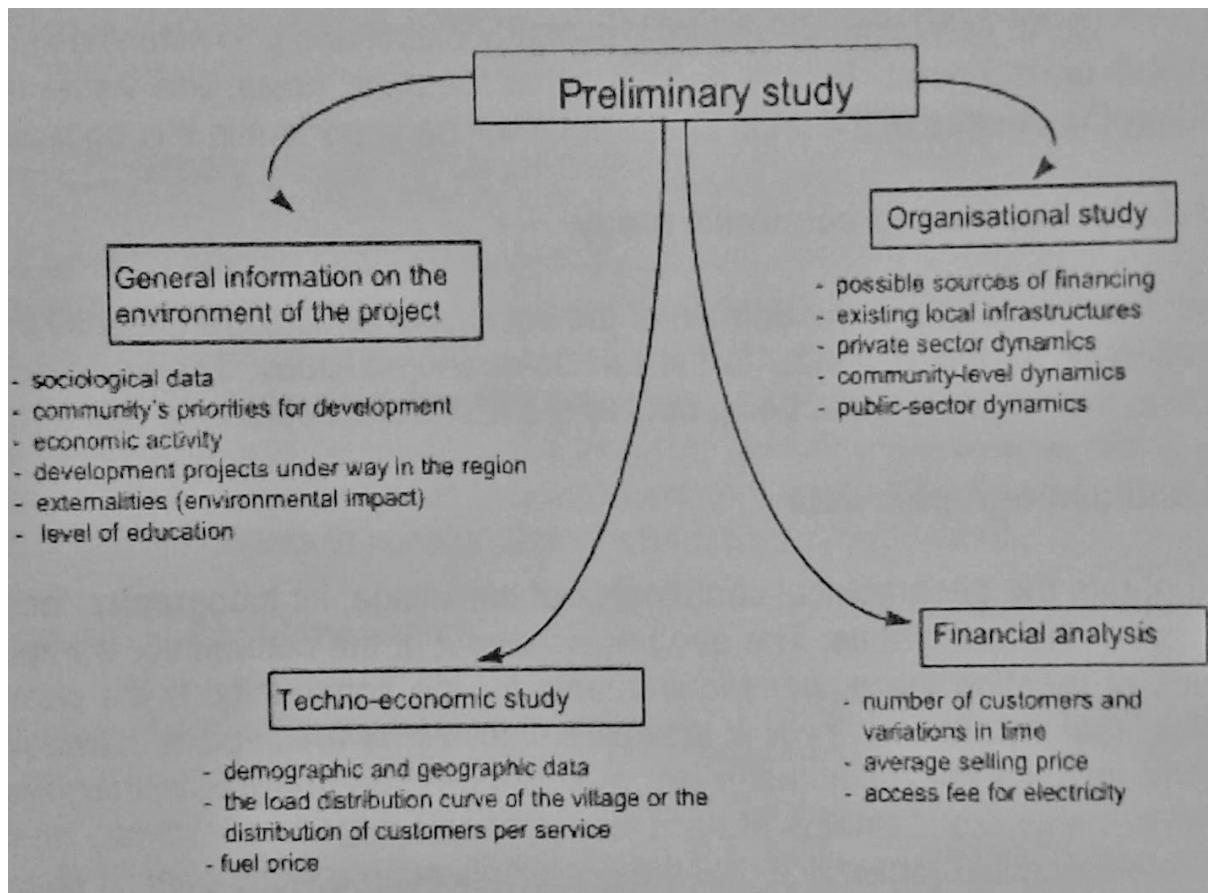
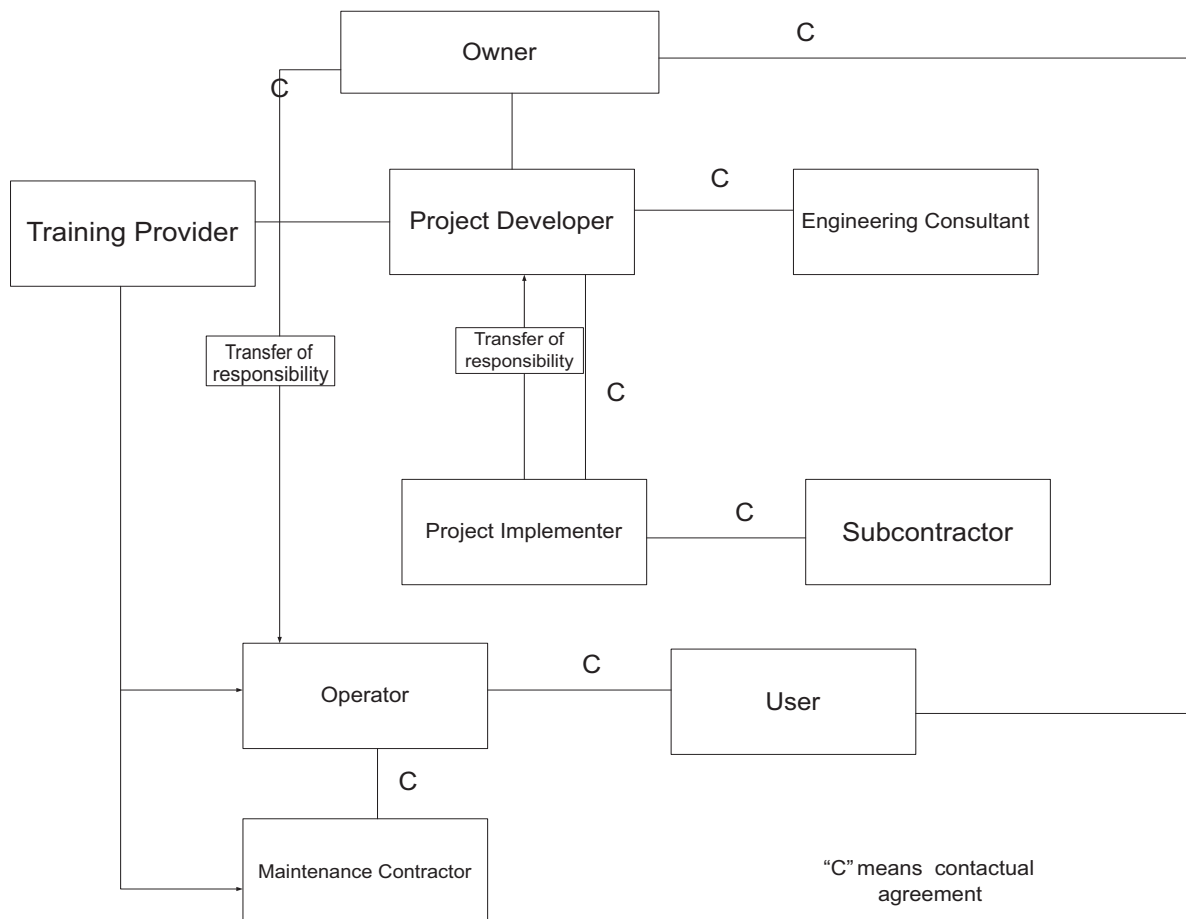


Figure 3: Methodological Approach and Tools for Mini-grid Development: MS 889-2:2011

- The techno-economic studies should make use of relevant validated industry computer tools such as HOMER, PVSYST, WAsP or equivalent reliable technical and modelling tools including tailor-made excel based models subject to the reviews by the mini-grid development committee.
- Techno-economic studies should form the basis of detailed engineering designs for the Mini-grid power system including energy production systems, and distribution lines.

### 3.0 Mini-grid Development and Project Management – MS 889-3: 2011

Mini-grid owner, and contractual relationships with the project management team should be defined as summarised in Figure 3



*Figure 4: Mini-grid Development Experts and Relationships*

Note: Contracting, Joint Ventures, Subcontracting should be done in line with National Construction Industry Regulations of Joint Venture and Subcontracting.

In application of the MS 889-3:2011, emphasis should be placed on:

- Roles of project team and contractual relationships with reference to National Construction Industry Act provisions on registration and guidelines for consultants, contractors, project managers and equivalent experts;
- Data and documentation for implementation and verification of contractual commitments;
- Relevant commissioning and acceptance tests;
- Quality assurance procedures for equipment and supervisions inspections during system construction/installation;
- Environmental Protection based on approved project ESMP by the EAD.
-

## 4.0 Quality Assurance for Equipment and System Installations in Mini-grid Development

Throughout the mini-grids development process, the project developer and associated project development team as were highlighted in Table C1 should demonstrate the application of the standards presented in Table 6: Catalogue of some relevant standards for Mini-grid development.

*Table 6: Catalogue of some relevant standards for Mini-grid development*

Standard Reference Number	Description
MS 889 – 1:2011	Recommendations for small renewable energy and hybrid system for Rural Electrification Part 1: General Introduction to Rural Electrification
MS 889 – 2: 2011	Recommendations for small renewable energy and hybrid system for Rural Electrification Part 2: From requirements to a range of electrification systems
MS 889 – 3: 2011	Recommendations for small renewable energy and hybrid system for Rural Electrification Part 3: Project Development and Management
MS 889 – 4: 2011	Recommendations for small renewable energy and hybrid system for Rural Electrification Part 4: System Selection and Design
MS 889 – 5: 2011	Recommendations for small renewable energy and hybrid system for Rural Electrification Part 5: Protection against electrical hazards
MS 889 – 7: 2011	Recommendations for small renewable energy and hybrid system for Rural Electrification Part 7: Generators
MS 889 – 7: 1: 2012	Recommendations for small renewable energy and hybrid system for Rural Electrification Part 7 - 1: Generators – Photovoltaic Arrays
MS 889 – 8 – 1: 2011	Recommendations for small renewable energy and hybrid system for Rural Electrification Part 8 - 1: Selection of batteries and Battery management Systems for Stand – Alone Electrification Systems – specific case of Automotive flooded lead – Acid batteries available in developing countries
MS 889 – 9 – 2: 2011	Recommendations for small renewable energy and hybrid system for Rural Electrification Part 9 - 2: Micro grids

<b>Standard Reference Number</b>	<b>Description</b>
MS 889 – 9 – 3: 2011	Recommendations for small renewable energy and hybrid system for Rural Electrification Part 9 - 3: Integrated system – user interface
MS 889 – 9 – 4: 2012	Recommendations for small renewable energy and hybrid system for Rural Electrification Part 9 - 4: Integrated system – user interface – User Installation
MS 889 – 9 – 5: 2011	Recommendations for small renewable energy and hybrid system for Rural Electrification Part 9 -5 : Integrated systems – selected portable PV Lanterns for Rural Electrification Projects
MS 889 – 9 – 6: 2011	Recommendations for small renewable energy and hybrid system for Rural Electrification Part 9 - 6: Integrated Systems – selection of Photovoltaic Individual Electrification Systems (PV – IEC)
MS 889 – 12 – 1: 2011	Recommendations for small renewable energy and hybrid system for Rural Electrification Part 12 - 1: Selection of Self - ballasted lamps (CFL) for Rural electrification systems and recommendations for household lighting equipment
MS 695: 2004	Battery Based Photovoltaic (PV) Solar Home Systems – Specifications
MS 696: 2004	Battery Based Photovoltaic (PV) Solar Home Systems – Code of Practice
MS 709: 2005	Fluorescent Light for Use in Photovoltaic (PV) Systems – Specification
MS 710: 2005	Secondary cells and Batteries for Solar Photovoltaic (PV) Energy Systems – General requirements and Methods of Test
MS 711: 2005	Crystalline Silicon Terrestrial Photovoltaic (PV) Modules Design Qualification and Type Approval
MS – IEC 61173: 1992	Over Voltage Protection for Photovoltaic (PV) Power Generating
MS – IEC 61194: 1992	Characteristic Parameters of Stand – Alone Photovoltaic (PV) Systems
MS – IEC 61215: 2005	Crystalline Silicon Terrestrial Photovoltaic (PV) Modules Design Qualifications and Type Approval

Standard Reference Number	Description
MS – IEC 61400 – SER – 1: 2005	Wind Turbine Generator Systems Part 1: Safety Requirements
MS – IEC 61400 – SER – 12 - 1: 2005	Wind Turbine Generator Systems Part 12.1: Wind Power Performance Testing
MS – IEC 61400 – SER – 23: 2001	Wind Turbine Generator Systems Part 23: Full Scale Structural Testing of Rotor Blades
MS – IEC 61427: 1995	Secondary Cells and Batteries for Photovoltaic Energy Systems (PVEs) – General Requirements and Methods of Test
MS – IEC 61683	Photovoltaic Systems – Power Conditioners – Procedure for Measuring Efficiency
MS – IEC 61701: 1995	Salt Mist Corrosion Testing of Photovoltaic (PV) Pumping System
MS – IEC 61702: 1995	Rating of Direct Coupled Photovoltaic (PV) Pumping Systems
MS – IEC 61724	Photovoltaic System Performance Monitoring - Guidelines for Measurement, Data Exchange and Analysis
MS – IEC 61725	Analytical Expression for Daily Solar Profiles
MS – IEC 61727	Photovoltaic (PV) Systems – Characteristics of the Utility Interface
MS – IEC 61836	Solar Photovoltaic Energy Systems – Terms and Symbols MK
MS – IEC PAS 62111: 1999	Specifications for the Use of Renewable Energies I Rural Decentralized Electrification and electrical wiring Standards

## Appendix D - Licence Application Form



Application Form for Mini-grids Template

### APPLICATION FOR LICENCE TO GENERATE AND DISTRIBUTE ELECTRICITY FOR COMMERCIAL MINI-GRID OPERATION

#### SECTION A

##### PARTICULARS OF APPLICANT

A.1 Full Name of applicant

.....

A.2 Address of applicant, or in the case of a body corporate, the registered office

.....

.....

A.3 Telephone Number of applicant ..... Fax no:.....

A.4 E-mail Address .....

A.5 Contact Person Name .....

Telephone no .....

Fax no .....

E-mail .....

A.6 Legal form of applicant (specify-company, partnership, individual, co-operative)

.....

A.7 If the applicant is a company provide the following: -

- Full names of shareholders (holding more than 5% of shares) and percentage holding
- Full names and occupation of Directors
- Certificate of Incorporation
- Memorandum and Articles of Association

## SECTION B

### COMMENCEMENT DATE, PURPOSE AND DURATION OF LICENCE

- B.1 Desired date from which the licence (if granted) is to take effect  
.....
- B.2 Duration of the licence from commencement date .....
- B.3 Purpose for which electricity is to be generated .....
- B.4 Type of application (issue, transfer, amendment or renewal)  
.....

## SECTION C

### PARTICULARS OF GENERATING STATION (To be provide for each generating station separately)

- C.1 Name of generating station  
.....
- C.2 Location of generating station  
.....  
.....
- C.3 Address of generating station  
.....  
.....

---

C.4 Contact Person Name

.....  
.....

Telephone Number .....

Fax Number .....

E-mail .....

C.5 Type and age of generating station (thermal, nuclear, hydro, pumped storage, gas turbine, diesel generator, solar, wind or other including equipment description)

.....  
.....

C.6 Date on which the generating station was commissioned for an existing station or the expected commissioning date for a proposed station

.....

C.7 The installed capacity of each unit within the generating station (MW)

.....

C.8 Life span of each generation station

.....



- C.9 Maximum generating capacity (MW) expected to be available from the generating station and energy to be produced (kWh).

	Max kWh	Total kWh	Own Use kWh	For sale kWh
YEAR 1				
YEAR 2				
YEAR 3				
YEAR 4				
YEAR 5				
YEAR 6				
YEAR 7				

- C.9 Estimate of the energy conversion efficiency of:

- a. Turbine.....
- b. Generator.....
- c. Estimated overall station.....

## SECTION D

PARTICULARS OF ANY LONG TERM ARRANGEMENTSWITH ENERGY SUPPLIERS (To  
be provided for each generating station separately)

D.1

- D.1 Particulars of the contractual arrangements (attach draft contract if in place)

.....  
.....

---

## SECTION E

### GENERATION BUSINESS

(To be provided for each generating station separately)

- E.1 Details of proposed major maintenance programmes, including the expected cost and duration thereof, covering the next five years.

.....  
.....  
.....

- E.2 Details of major generating station rehabilitation and modifications dates, cost and description for the next five years.

.....  
.....

- E.3 Details of generating station expansion, dates, cost and description

.....  
.....

- E.4 Particulars of power sales agreements and tariffs therein

.....  
.....

## SECTION F

### FINANCIAL INFORMATION

#### F.1 Income Statement

Provide statements and annual forecasts of sales, revenues and costs. Attach copies of the current and/or budgeted balance sheet, rate of return, profit and loss account and source and application of funds for current and next two years. Indicate major cost items such as staff costs, maintenance.

#### F.2 Investment Programme

Investment Programme for current and the next five years. Attach copies of the detailed scheme or schemes prepared by a competent engineer and mode and cost of financing such a scheme.

#### F.3 Fixed Assets

Summary of total assets of all generating plant.

#### F.5 Letters of Reference from Banks

Provide one letter of recommendation as to creditworthiness from a local commercial bank and one from a reputable international bank (where the developer is a foreign company).

---

SECTION G  
INFORMATION ON HUMAN RESOURCES

G.1 Personnel

- submit details of the number of staff and employees and their categories and grades in the service of or to be recruited by the applicant, showing their qualifications and number of years of experience in similar jobs.
- Provide *curriculum vitae* of top management personnel of the applicant.

SECTION H  
ENVIRONMENTAL CONSIDERATION

- Provide a brief description of the likely negative impact of the mini-grid facility on natural resources and environmental and mitigation measures proposed.

Provide a copy of the approved environmental mitigation plan (if any) by the relevant authority

SECTION I  
PERMITS FROM OTHER GOVERNMENT DEPARTMENT OR REGULATORY AUTHORITIES

Permits

Submit copies of permits or approvals issued by public or local authority or other regulatory agencies necessary for the operation of the generating plant including but not limited to water and land resource management.

SECTION J  
ADVERTISING NOTICE

- I.1 Attach draft copy of the notice of advertisement as to representations or objections.

SECTION K  
TARRIFS

Provide a schedule of the proposed tariffs

SECTION L  
ADDITIONAL INFORMATIONAL

Provide any other relevant information which the applicant wishes to include with this application.

.....

SIGNED-----

DATE-----

RECEIPT ACKNOWLEDGED-----DATE----- MERA  
STAMP

## Appendix E - Registration Application Form



REPUBLIC OF MALAWI

### REGISTRATION FORM FOR PRIVATE MINI-GRID ELECTRICITY GENERATION AND DISTRIBUTION

FORM EPOU 1

#### SECTION A

#### PARTICULARS OF APPLICANT

A.1 Full name of applicant: .....

A.2 Address of applicant, or in the case of a body corporate, the registered office

.....

A.3 Telephone number of applicant .....

A.4 Fax number of applicant .....

## A.5 E-mail of Applicant

.....

## A.6 Contact Person

Name.....

Telephone

No.....

Fax No.....

E-mail.....

## A.7 Legal Form of applicant (specify-company, partnership, individual, co-operative) .....

(A separate application is required in respect of every installation)

-----

## SECTION B

Total capacity to be installed for the purpose of this registration

..... Kilowatts comprising the following units:-

Capacity of Unit	Generation technology	Generation Voltage	A.C. or D.C. Phase and Frequency	Age	Date of Installation

e. Indication of capital investment in generating plant (book value).

f. Undertakings Distribution System (if any) (Voltages, length of lines or cables, number and capacity of substations).

.....  
 .....  
 .....

---

## SECTION C

### OPERATION

(The information given here will be affected by whether the undertaking is connected to the utility, distribution system or not).

- Normal maximum total electrical load ..... kW
- Proportion derived from own plant ..... kW
- Proportion derived from Electricity Supply Commission of Malawi
- Projected annual energy generation from plant  
..... kW

## SECTION D FUTURE PROGRAMME

- (a) Is an increase in electrical load expected within the next 3 years? If so, state extent.
- (b) Will this increased load be met from:-
  - (i) existing installation;
  - (ii) the installation of additional plant (if approved);
  - (iii) an increased demand for supply from the Electrical utility.

## SECTION E

### GENERAL

Any further information relevant to the application should be stated hereunder:

-  
.....  
.....  
.....

Signed by for on behalf of the Applicant.....

Dated.....



## SECTION F

### REGISTRATION FEES

CATEGORY I	Less than 150 kW	N/A
CATEGORY. II	150kW and above	MK 1000/kW

## SECTION G

### OTHER

#### 1. Application by:

.....  
 .....  
 .....  
 with regard to the Licence No (where  
 applicable).....  
 issued to: -  
 .....  
 .....  
 dated .....

#### 2. Reasons for the application: to:-

- i. Increase the rated capacity of the undertaking
- ii. Otherwise amend the licence
- iii. Transfer the licence
- iv. Cancel the licence
- v. Substitute another licence or licences thereof

3. Signed: .....

Dated: .....







## **MALAWI ENERGY REGULATORY AUTHORITY (MERA)**

### **HEAD OFFICE - Lilongwe**

2<sup>nd</sup> Floor Development House,  
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