United Nations Development Programme

Project Document template for projects financed by the various GEF Trust Funds

Project title: National child project under the GEF Africa Minigrids Program - Malawi		
Country: Malawi	**Implementing Partner (GEF Executing Entity):** Ministry of Energy	**Execution Modality**: National Implementation Modality (full NIM)
Contributing Outcome (UNDAF[1] and CPD[2]): **UNDAF Outcome 9:** By 2023, Malawi has strengthened economic diversification, inclusive business, entrepreneurship and access to clean energy **CPD identified national priority or goal and cooperation framework outcome involving UNDP:** Transition Malawi to a productive, competitive and resilient nation. With supporting Country Programme Outputs. Output 1.1: Women and youth in targeted areas have access to employment opportunities. Output 1.2: Public and private sector institutions enabled to develop and implement policies and practices that enhance innovation, productivity and entrepreneurship. Output 1.3: Inclusive and sustainable solutions adopted at the national and subnational levels to achieve increased energy efficiency and universal modern energy access (especially off-grid sources of renewable energy).		
UNDP Social and Environmental Screening Category: Moderate	**UNDP Gender Marker:** GEN2.	
Atlas Award ID: 00136404	**Atlas Project/Output ID:** *00127321*	
UNDP-GEF PIMS ID number: 6512	**GEF Project ID number:** 10413	
LPAC[3] meeting date: 23 August 2021		
Last possible date to submit to GEF: 19 June 2021		
Latest possible CEO endorsement date: 19 December 2021		
Project duration in months: 48 months		
Planned start date: July 25, 2022	**Planned end date:** July 24, 2026	

[1] United Nations Development Assistance Framework, Malawi 2019 – 2023 (or Sustainable Development Cooperation Framework)
[2] Country Programme Document for Malawi (2019 – 2023)
[3] Local Project Appraisal Committee, consisting of Country Office, Implementation Partner and key country and development partners, convened just before endorsement as a final step to ensure alignment.

Expected date of Mid-Term Review: July 25, 2024	**Expected date of Terminal evaluation:** April 24, 2026

Brief project description:

The UNDP-supported, GEF-financed Africa Minigrids Program (AMP) aims to support African countries to increase energy access by reducing the cost and increasing commercial viability of renewable energy (RE) minigrids. It is a regional program with 18 participating countries, including Malawi.

The AMP project in Malawi is directly aligned with the National Energy Policy objective to increase access to affordable, reliable, sustainable, efficient and modern energy for every person in the country.

This promotion of clean energy minigrids will be achieved through three outcomes: (i) appropriate policies and regulations addressing policy, institutional, regulatory and technical barriers to investment in RE minigrids; (ii) innovative business models, based on cost reduction, operationalized; and (iii) increased awareness and network opportunities in the minigrid market and among stakeholders as well as lessons learned for scaling up rural electrification using RE minigrids.

The number of direct project beneficiaries is expected to be around 763 persons, of whom approximately 389 women. The lifetime global environmental benefits that will accrue from the adoption of off-grid solar technologies is estimated at 1,068 tCO_2e. Indirect emission reductions amounting to 2,043,000 tCO_2e are expected due to investments in minigrids completed during the 10-year influence period following project completion, predominantly through the replication of the sustainable technology value chain. The project yields a GEF abatement cost of 199.5 USD/tCO_2e.

FINANCING PLAN	
GEF Trust Fund grant	USD 396,125
UNDP TRAC resources[4]	USD 1,000,000
(1) Total Budget administered by UNDP	**USD 1,396,125**
(2) Total confirmed co-financing to this project not administered by UNDP	**USD 2,344,395**
(3) Grand-Total Project Financing (1)+(2)	**USD 3,740,520**

SIGNATURES:		
Signature: print name below MacDonald Mwale ALFONSO CHIKUNI	**Agreed by Government Development Coordination Authority**[5]	**Date/Month/Year:** *within 25 days of GEF CEO endorsement*
Signature: print name below Alfonso Chikuni	**Agreed by Implementing Partner**	**Date/Month/Year:** *within 25 days of GEF CEO endorsement*

[4] This is not a mandatory requirement.

[5] *Other evidence of government agreement may be accepted in lieu of a signature, unless the programme country government requires a signature.*

Signature: print name below	Agreed by UNDP[6]	Date/Month/Year: *within 25 days of GEF CEO endorsement*
Shijeki Komatsubara		

[6] *For NIM projects this is the Resident Representative.*

I. TABLE OF CONTENTS

List of Tables

List of Figures

List of Box Inserts

ACRONYMS AND ABBREVIATIONS

The following acronyms, listed in alphabetical order, are used in this document:

Acronym	Description
ACRE	Access to Clean and Renewable Energy
AMP	Africa Minigrids Program
CC	Climate Change
CO_2	Carbon Dioxide
CONREMA	Cooperation Network for Renewable Energy in Malawi
COVID-19	The coronavirus disease 2019 (COVID-19)
CPD	Country Programme Document
CSO	Civil Society Organisation
DDP	District Development Plan
DfID	Department for International Development (UK)
DREI	Derisking Renewable Energy Investment
EA	Implementing Partner
EAD	Energy Affairs Department
EGENCO	Electricity Generation Company Limited of Malawi
EMA	Environmental Management Act
EIA	Environmental Impact Assessment
ESCO	Energy Services Company
ESCOM	Electric Supply Corporation of Malawi
ESIA	Environmental and Social Impact Assessment
ESMP	Environment and Social Management Plan
FSP	Full Sized Project
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEF	Global Environment Facility
GEFSEC	Global Environment Facility Secretariat
GHG	Greenhouse gas
GIZ	Gesellschaft für Internationale Zusammenarbeit (German Corporation for International Cooperation)
GoM	Government of Malawi
HACT	Harmonised Approach to Cash Transfer
IP	Implementing Partner
IPP	Independent Power Producer
IBRD	International Bank for Reconstruction and Development
IRENA	International Renewable Energy Agency

Acronym	Description
kWh	kilowatt hour
MEPA	Malawi Environmental Protection Agency
MERA	Malawi Energy Regulatory Authority
MGDS	Malawi Growth and Development Strategy
MITC	Malawi Investment and Trade Centre
MoA	Ministry of Agriculture
MoE	Ministry of Energy
MoF	Ministry of Finance
MoT	Ministry of Trade
MSME	Micro Small and Medium Enterprises
MSP	Medium Sized Project
MW	Megawatt
MWK	Malawian Kwacha
NCCMP	National Climate Change Management Policy
NCRP	National Climate Resilience Programme
NDC	Nationally Determined Contribution
NEP	National Energy Policy
NGOs	Non-Governmental Organisations
NIM	National Implementation Modality
NSO	National Statistical Office (NSO) of Malawi
PAC	Project Appraisal Committee
PFD	Program Framework Document
PIF	Project Identification Form
PIR	GEF Project Implementation Report
POPP	Programme and Operations Policies and Procedures
PPG	Project Preparation Grant
PUE	Productive Use of Energy
PV	Photovoltaic
RE	Renewable Energy
REIAMA	Renewable Energy Industries Association of Malawi
REP	Rural Electrification Program
RETs	Renewable Energy Technologies
RRA	Renewable Readiness Assessment
SAPP	Southern African Power Pool
SDG	Sustainable Development Goal
SE4ALL	Sustainable Energy for All

Acronym	Description
SES	Social and Environmental Safeguards
SMEDI	Small and Medium Enterprises Development Institute
STAP	Scientific and Technical Advisory Panel
TOC	Theory of Change
UNCDF	United Nations Capital Development Fund
UNDAF	United Nations Development Assistance Framework
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations International Children's Emergency Fund
USD or US$	United States Dollar
WB	World Bank

II. Development Challenge

Malawi is a small, landlocked country covering 118,484 km^2. The country is home to an estimated population of 18.6 [redacted] compared to the average of 45 for Africa. Census[8] data in 2018 showed 84% of the population lives in rural areas.

The formal economy in the country produces approximately USD 399[9] in gross domestic product (GDP) per person, placing Malawi among the five countries in the world with the lowest GDP per capita. The economy is largely agro-based accounting for 30 – 40% of the GDP and employing approximately 80% of the country's workforce. This heavy reliance on agriculture makes the country particularly vulnerable to climatic shocks.

The 2017 Integrated Household Survey[10] found that 39.5% of households had inadequate income to meet expenses. An analysis of the data also showed that a large majority of Malawians feel poor or very poor when they assess themselves, with 74% declaring themselves to be poor or very poor. The national incidence of poverty, at the national poverty line for Malawi is estimated at 50.7%, with rural areas worst affected (57%). When using the international poverty line of USD 1.90 per person per day, the poverty rate is around 70%[11]. Income inequality has also remained stubbornly high with an estimated Gini coefficient of 37.3% (2016)[12].

The global coronavirus pandemic (COVID-19) has been far more than a health crisis, affecting societies and economies at their core. The policy measures to limit the spread of the disease have resulted in substantial economic impacts, with a significant contraction in the global economy in 2020. The situation in developing countries is even more tenuous. While the widespread economic impact of the COVID-19 crisis will only be evident in time, the negative trends have already been observed in many small-scale businesses and business owners[13]. A World Bank working paper, published in November 2020, provided some of the first evidence[14] on the socio-economic impacts among households and individuals in Sub-Saharan Africa. Using data collected monthly since May 2020, it shows that between 60 and 80% of households in Malawi have already lost income because of the pandemic. It also points out that socio-economic effects of the pandemic, such as food insecurity, are disproportionately borne by households that were already impoverished prior to the pandemic. A large share of Malawian households is therefore particularly vulnerable.

Delivery of infrastructure projects, such as the minigrid pilot projects included under the AMP, are particularly vulnerable to supply chain disruptions, availability of construction teams, access to rural communities, logistical and cost impacts of meeting health and safety compliance. At the broader project level, if a vaccine program in Malawi is delayed or if variants emerge that can escape the existing vaccines, this could lead to knock-on effects in advancing key activities. Specifically, carrying out in-person training activities or outreach to rural communities where physical presence is preferable could also prove difficult if some sanitary risks materialize. This project document considers that at this stage, COVID-19 risks to the project are moderate and contains mitigation measures to minimize any potential disruption. Continued vigilance and risks assessments will however be required as the global situation continues to evolve.

The availability of vaccines requiring storage and transport at below zero temperatures underscores the importance of electricity for cold storage. Access to energy at health centers will be an immediate priority across the region. Over the medium to long term, access to affordable, clean energy will be crucial to support economic recovery, highlighting the significant potential opportunities for co-benefits from rural electrification in the fight against COVID-19.

---

[7] World Bank https://www.worldbank.org/en/country/malawi/overview

[8] 2018, Malawi Population and Housing Census. Main report. National Statistical Office, May 2019.

[9] International Monetary Fund, World Economic Outlook October 2020.

[10] Fourth Integrated Household Survey 2016-2017 and AfDB, 2018 African Economic Outlook, Malawi.

[11] World Development Indicators Database (WDI). 2016, 2017, and 2018. Washington D.C.: World Bank.

[12] https://knoema.com/atlas/Malawi/Poverty-rate-at-national-poverty-line.

[13] Hettinger, Patrick Shawn; Nyirenda, Yalenga Loraine; Saldarriaga Noel, Miguel Angel. 2020. Malawi Economic Monitor: From Crisis Response to a Strong Recovery. World Bank Group. Published: 1 July 2020.

[14] Josephson, Anna Leigh; Kilic, Talip; Michler, Jeffrey David. 2020. *Socioeconomic Impacts of COVID-19 in Four African Countries.* Report No.: WPS 9466. World Bank Group. Published: 3 November 2020.

More generally however, energy can be regarded as a critical input resource for economic growth and development and is key to poverty alleviation. The provision of sustainable and reliable energy is expected to catalyze industrialization and modernization of the Malawian economy through supporting rapid growth of the productive sectors such as agriculture, manufacturing, mining and the service sector.

Currently, power supply in Malawi is largely dependent on hydro, which is vulnerable to drought and seasonality. The total installed capacity for electricity stands at 362.8 MW from hydro plants and 126.2 MW from diesel generators. Hydropower resources supply 80% of the country's power needs, with diesel generators used mainly for emergency or stand-by generation. Electricity demand is expected to reach 1,859 MW by 2030[15]. Both generation and transmission capacity need to be expanded significantly to meet this requirement.

The Government of Malawi has implemented comprehensive power sector reforms including unbundling of the national utility company and opening the market for independent power producer (IPP) participation. By opening up the market, it is expected that private sector players will contribute to increasing the generation capacity. The 2018 updated National Energy Policy recognizes the role that off-grid and minigrid systems can play in reducing or closing the electricity supply deficit in the country.

Droughts have severely impacted the availability of supply with load shedding (rotational outages) implemented for 12 to 16 hours a day for several months in 2017/18, equivalent to a tier 2 against the ESMAP / SE4All multi-tier standard for household access to grid-supplied electricity.

While the existing capacity struggles to meet the needs of already connected consumers, this customer base represents only a small percentage of the total population. Malawi has one of the lowest electrification rates with access to electricity at just 18%[16]. Grid electricity contributes 11.4% while off grid solar PV accounts for the remaining 6.6%. The access rate for electricity in rural areas is even lower at 10%[17]. Least cost electricity planning[18] shows grid electrification to be the dominant least cost electrification technology option for the country. Malawi set the target to electrify 80% of the rural population and reach universal modern energy access by 2030 and is exploring both on-grid and off-grid solutions[19]. However, given the enormous backlog and realistic delivery timelines, implementing minigrids with the intention to integrate into the electricity grid provides an interim measure to accelerate access to modern energy.

Tariffs for grid-electricity are regulated with current tariffs to residential consumers below USD 0.09/kWh[20]. Electricity tariffs are not cost-reflective, therefore implicitly subsidized. Even at these low tariffs, data suggests that 65% of the adult population[21] (60% of households) is unable to afford a Standard Consumption Package (SCP) of 365 kWh per annum. Challenges related to affordability are also reflected in the low electricity usage among electrified consumers, with only 9.5% of the adult population using electricity for lighting[22] – traditionally one of the first uses of available electricity. A typical Malawian household spends around USD 5 (MWK 3,690) per month[23] on lighting and phone charging. Research also suggested that even among those able to pay, the willingness to pay for electricity if alternative energy options perceived to be less expensive are available, is low. This perception bias is echoed by the typical expenditure on lighting and phone charging of USD 5 compared to the SCP that would cost approximately USD 3. Correspondingly, Malawi's energy consumption pattern shows a continued heavy dependence on primary energy (biomass).

---

[15] Integrated Resources Plan, Malawi (2015 – 2035). May 2017.

[16] World Bank, Sustainable Energy for All (SEforALL) database from the SE4ALL Global Tracking Framework led jointly by the World Bank, International Energy Agency, and the Energy Sector Management Assistance Program.

[17] World Bank, Sustainable Energy for All (SEforALL) database, 2018 data

[18] World Bank (ESMAP) Geospatial Least-cost Electrification Plan.

[19] Government of Malawi (2018) National Energy Policy 2018, available at https://energy.gov.mw/index.php/resource-centre/documents/policies-strategies - accessed 5 September 2019

[20] Residential, prepaid tariff USD 0.09/kWh and lifeline tariff USD 0.07/kWh.

[21] Where the SCP represents more than 20% of income.

[22] FinScope Consumer Survey data showed the majority of Malawians relying on battery-powered torches for lighting (66%), with some use of paraffin (11%) and candles (7%). Only 1.3% of adults reported their source of energy for lighting as solar.

[23] As of 1 May 2021, 1 U.S. dollar (USD) = 791 Malawi Kwacha (MWK).

This strongly suggests that the viability of minigrid systems will be directly dependent on concurrent and active development of economic activity and productive use of energy[24] (PUE).

sized enterprises (MSME) were active in Malawi, with 1.825 million people working in the sector[26]. The majority of these (74%) are classified as micro entrepreneurs, either employing 4 people or less (including the owner), or with a very low annual turnover (up to MWK 5,000,000/USD 6,775). A further 23% are small enterprises, employing 5 to 20 people, or with a turnover between MWK 5,000,001 to MWK 50,000,000 (USD 67,751). Only 3% is considered medium size.

Women own 56% of micro-enterprises in the country, while the majority of small and medium enterprises are owned by men (68% and 87%). MSMEs are most active in the trade (63%) and agriculture (24%) sectors and 78% are located in rural areas. Very few MSMEs have been registered or licensed, with 89% considered informal. Only 38% report operating from a business premise, suggesting that many are operating from residential premises.

Interestingly, considering the low electrification rate, especially in rural areas, 26% of MSMEs report having access to electricity (18% supplied by the grid and 9% with access to solar or diesel generator power). As suggested by the electrification numbers, electricity access is however predominant among urban based MSMEs (51%) compared to rural areas (9%). Male-owned (typically larger businesses) also have higher access (25%) compared to women-owned businesses (11%). With access to electricity above that of the national average, it would suggest that MSMEs are dependent on electricity supply. Yet, only 6.5% of MSMEs indicated electricity as a barrier to operations when selecting barriers from a list of options[27]. Small, rural-based MSMEs found lack of electricity a more significant barrier than larger and urban-based counterparts (small 13% vs medium 1%, rural 7% vs urban 4%).

This suggests that rural electrification can support small business development while small business development can support the viability of clean energy minigrids, collectively contributing to transformation of the rural economy.

Access to finance represents a challenge to all sizes of businesses in the country, relevant to both the minigrid developers and operators as well as small businesses. Malawian businesses have limited access to credit from formal providers (4%; FinScope 2014). Cost of credit in Malawi is also a prohibitive factor. Although the cost of credit, measured by the official bank lending rate, has fallen from over 40% to 13.5% since 2014, stakeholders reported typical lending rates above 20% and up to 100% for micro loans, making commercial debt unaffordable. Financing for off-grid solar products is only tentatively becoming available. Low mobile penetration rates in rural areas and high transaction costs are also hampering mobile payment options.

Minigrids have already been recognized as a key part of a portfolio of interventions to improve electrification rates, particularly in areas that will not be reached by the national grid in the near future. Accordingly, the country has set a target of 50 minigrid systems to be in place by 2025.

The context for and expected contribution from renewable energy minigrids is reflected in several key policy and planning documents. While there may be further enhancements possible, the overall legal framework in the country adequately allows for the planning, development, operation, maintenance and utilization of minigrids in Malawi. The addition of a Minigrid Regulatory Framework, published mid 2020 after extensive consultation, created a firm foundation for minigrid development as well as private sector participation in developing this sector. An overview of the most pertinent policy and planning documents is provided below (Table 1).

[24] PUE can be found in: agriculture (e.g. irrigation, grain milling, electric fencing), manufacturing (e.g. carpentry, tailoring, welding, and looming), and the service sector (e.g. bars and restaurants using electric lights, sound systems, refrigerators, charging stations for mobile phones). Common use applications include electricity used for potable water, public lighting, education, health (e.g. refrigeration of vaccines and anti-venom).

[25] Malawi: Energy and the poor: the need to invest in off-grid cleaner energy. Draft. 29 October 2020. UNCDF and UNDP.

[26] FinScope Malawi MSME 2019.

[27] Major barriers were identified as sourcing money (53%), lack of customers (31%), selling prices lower than expected (26%) and transportation of stock (24%). Most of these are likely to also impact minigrid operations.

Table 1: Policy context for renewable energy minigrids in Malawi

Policy / planning document	Relevance
Energy Regulation Act, 2004	The Act established the Malawi Energy Regulatory Authority (MERA) that is mandated to regulate all energy activities in the country. In the electricity sector, MERA is responsible for issuing licences of generation, transmission and distribution and quality control of the electrical facilities. The planning, development and operation of minigrid facilities are also under MERA jurisdiction.
Electricity Act, 2004 and Electricity (Amendment) Act 2016	The Electricity Act 2004 governs the activities of the electricity sector pertaining to generation, transmission and distribution. The Act, read together with the Electricity (Amendment) Act 2016, gave rise to the reform of the power sector resulting in the unbundling of the vertically integrated national utility and opening of the market to private sector participation including minigrid operators. MERA developed electricity regulations to operationalize the Act. The regulations cover the planning, development, operation and maintenance of the generation, transmission and distribution facilities for electricity including minigrid systems.
Electricity Act, 2004	The Electricity Act governs the activities of the electricity sector pertaining to generation, transmission and distribution. The Act gave rise to the reform of the power sector, the unbundling of the vertically integrated national utility and opening of the market to private sector participation including minigrid operators. MERA developed electricity regulations to operationalize the Act. The regulations cover the planning, development, operation and maintenance of the generation, transmission and distribution facilities for electricity including minigrid systems.
Rural Electrification Act, 2004	The Rural Electrification Act provides for the planning, development, operation and maintenance of rural electrification facilities. The Act defines (i) Management of rural electrification activities; (ii) Sources of funds for the rural electrification activities; (iii) Modes of electrifying rural areas; (iv) Installation of rural electrification facilities; (v) Operation and maintenance of rural electrification facilities; (vi) Subsidy provision for operation and maintenance of rural electrification facilities. The planning, implementation and management of rural electrification activities fall under the auspices of the Ministry responsible for energy. The Act establishes the Rural Electrification Management Committee to, among others, (i) ensure that the majority of the Malawian population in peri-urban and rural communities have access to efficient, sustainable and affordable energy for their social economic development through grid extension and off-grid electricity supply (including solar home system technologies) and (ii) develop a rural electrification master plan and update it at regular intervals. The Committee is supported by the Rural Electrification Unit established in the Ministry of Energy. The master plan, covering a five-year planning horizon i.e. 2020 – 2025, has just been finalized. Rural electrification activities are funded from a ring-fenced Rural Electrification Fund (REF), capitalized from levies on energy sales. The Act allows for a subsidy under the REF to be available for off-grid solutions as well as for off-grid facilities to be operated on concession. Neither of these provisions have been operationalized as yet.
Malawi Nationally Determined Contribution (NDC), 2015	The NDC seeks to promote climate change mitigation and adaptation for sustainable livelihoods through measures that increase levels of knowledge and understanding and improve human well-being and social equity, while pursuing economic development that significantly reduces environmental risks and ecological scarcities. In particular, the share of national greenhouse gas (GHG) emissions arising from the energy sector is anticipated to increase to 17% in 2040 compared to being only 4% in 2015. Renewable Energy is recognized as key to emission reductions.
National Climate Change Management Policy (NCCMP), 2016	The NCCMP is a key instrument for managing climate change in the country of Malawi. The goal is to create an enabling policy and legal framework for a pragmatic, coordinated and harmonized approach to climate change management. The Policy provides strategic direction for Malawi's priorities for climate change interventions and outlines an institutional framework for the application and

Policy / planning document	Relevance
	implementation of adaptation, mitigation, technology transfer and capacity building measures. It recognizes renewable energy as a prioritised technology under the policy priority areas.
Malawi Renewable Energy Strategy (MRES) 2017 – 2022	The Renewable Energy Strategy outlines interventions necessary to remove barriers for the planning, development, operation, maintenance, promotion and utilization of renewable energy technologies. It has also identified opportunities on the same. Clean energy minigrids are identified as one of four priority areas to advance renewable energy in the country. The strategy targets at least 50 operational minigrids in Malawi by 2025. MRES noted the need for the review of policy and regulations to create an enabling environment for clean energy minigrids. This led to the review of the National Energy Policy and the development of the Minigrid Regulatory Framework (refer below).
National Charcoal Strategy, 2017 – 2027	The National Charcoal Strategy recognizes that Malawi's demand for charcoal and firewood are increasing faster than the adoption of alternative energy sources. This is putting pressure on forests and destroys natural vegetation that would act as carbon sinks. The first pillar of the Strategy therefore, is premised on the promotion of alternative household cooking fuels. One of these alternative sources is electricity. The Strategy intends to assist in providing means for strengthening the electricity supply industry and make it more efficient and capable of providing adequate, affordable and reliable electricity supply that enables industrialization, rural transformation, sustainable economic development and wealth creation.
National Energy Policy, 2018	The National Energy Policy targets an increase in access to affordable, reliable, sustainable, efficient and modern energy for every person in the country, aligning the country commitments with both the Sustainable Development Goal 7 and the Malawi Growth Development Strategy III (MGDS III). It outlines broad policy outcomes that include (i) Diversified energy sources; (ii) Developed and efficient energy sector; (iii) Modern and sustainable energy sources; (iv) Improved living standards for women and men due to equitable provision of energy sources; (v) Increased access to clean, sustainable and affordable energy for all people. The policy calls for private sector involvement in the electricity sector and, in concurrence with the Electricity Act, prompted the restructuring of the sector, including the unbundling of the vertically integrated national power utility and establishment of the Single Buyer and System and Market Operator to enable private sector participation in the market.
Minigrid Regulatory Framework, 2020	The Minigrid Regulatory Framework has been developed under the UNDP & GEF funded project called, 'Increasing Access to Clean and Affordable Decentralized Energy Services to Selected Vulnerable Areas in Malawi'. The Minigrid Regulatory Framework was formulated to facilitate the planning and development of minigrid systems in Malawi in line with the National Energy Policy 2018 and MRES 2017-2020. It was published in July 2020 following a development process and extensive stakeholder consultation over 2 years. While being broad allowing for multiple scenarios of minigrid development, ownership and delivery models, the framework does provide important, initial clarity to the market. It defines a minigrid as an isolated system up to 5MW in size. It provides for systems smaller than 150 kW to be exempt from a license. It acknowledges the impact of grid arrival and provides some guidance for grid integration. It also allows for cost reflective tariffs, flexible tariff structures and subsidy options. It further includes guidance on selection criteria for minigrids and technical and licensing requirements.
Environmental Management Act (EMA), 2017	The EMA requires that an Environment and Social Management Plan (ESMP) be developed for an energy project - including a minigrid. The ESMP is required to adhere to (i) the Environmental and Social Impact Assessment (ESIA) guidelines for Environmental Impact Assessment (EIA) as well as (ii) Terms of Reference (TORs) that are provided by the Malawi Environmental Protection Agency (MEPA) after they receive a proposed project brief. The ESMP is used as a basis for managing, minimizing, mitigating and monitoring of the environmental and social impacts associated with the construction, operation, maintenance and decommissioning phases of the energy facility.

The country has seen a number of minigrid pilot installations, including very small projects, containerized systems, community-led projects and hydro minigrid projects. Over the years there have been several case studies, many on failures and lessons learnt and several role players who have contributed to the emerging sector. Past failures have mainly been ascribed to (i) lack of funding for sustained operations and maintenance of systems, (ii) quality of equipment or installations and (iii) limited community ownership. Past experience has contributed significant learnings to more recent minigrid developments, with at least three[28] current minigrids operating with business models focused on sustainability and achieving revenue positive operations.

For the moment, the minigrid industry remains small, but with significant potential to grow. Ten formal systems are currently known to be operating with an additional 10 systems in different stages of planning[29]. Several development partners are actively supporting the Malawian Government and specifically the Ministry of Energy to advance off-grid and minigrid developments in the country. A significant focus of World Bank support is on development of bankable minigrid projects, business models, and the regulatory framework. Included in the support to the MoE are technical studies for up to 10 minigrid locations and transaction advisory to design a tender process; technical assistance for off-grid market development such as policy and regulation; quality assurance and gender-informed consumer awareness; sector studies and training. This complements the ongoing activities of the UNDP as well as other development partners (refer related initiatives Table 7, Section IV).

Most commonly, formal minigrid developments have been led by development partners using international suppliers and developers. Local companies have typically provided EPC services or in-country operations and maintenance services for these installations. As the minigrid market begins to mature, the expectation would be for capacity to design, build and operate minigrids to be established and to grow within the country, creating a new subsector of economic activity. To assess market readiness, an enquiry was sent to potential developers in the country to test their interest and capacity to participate in the development of renewable energy minigrids. Seventeen companies responded, confirming interest and capacity to provide products and services ranging from the equipment and material supply, both supply and installation of renewable energy equipment, a full range service of design, supply and installation as well as renewable energy engineering services.

One Malawian-based developer already active in the complete design and construction of minigrid systems in the country, as well as a few minigrid operators were interviewed. Interviews with these industry players as well as development partners highlighted the following remaining challenges and barriers to successful minigrid development and operations:

- Processes[30] for approvals and authorizations remain lengthy and opaque, particularly for first time developers.
- The low national electricity tariff for residential consumers at USD 0.09 per kWh[31] is not cost reflective and presents a deterrent to private investors in alternative solutions.
- Even at this subsidized tariff, fewer than 40% of households can afford to purchase 1 kWh per day. This corresponds with very low electricity usage among electrified consumers - only half of those who have access to electricity use it for lighting.
- Low consumption levels are also evident in the slow uptake and low utilisation rates of minigrids. For three recent minigrid developments, demand and consumption has consistently been well below (less than 30%) the available capacity[32].
- The subsidy provided for under the Rural Electrification Act is not being used.

[28] Mulanje Electricity Generation Agency (MEGA) project in Mount Mulanje, UNDP-GEF project in Sitolo Village in Mchinji District, and University of Strathclyde & United Purpose project in Mthembanji Village in Dedza

[29] Corresponding to 10 planned minigrid developments noted during stakeholder interviews.

[30] Feedback as received during interviews, particularly as it related to sequencing of authorizations from various ministries / regulatory authorities. It is noted that the timing of interviews would not have allowed any experience with new Minigrid Regulatory Framework. At the time of the interviews however, this framework was not readily available on the MERA website or elsewhere online and a copy had to be requested.

[31] Lifeline tariff even lower at USD 0.07/kWh

[32] Three examples: (1) Installed capacity 80 kW_p vs demand of 5 kW_p and 15% of available power; (2) Installed: 12 kW_p vs demand of 2.5 kW_p and (3) demand 30% of installed capacity and approximately 25% of the anticipated connections.

- Inadequate funding structures, financing instruments and payment mechanisms to support the development and operations of minigrids.
- Tax waivers for RE equipment are in place, but not adequately comprehensive and not consistently applied. Reports also indicated occasional allowance for VAT to be waived, but dependent on an onerous application process.

Addressing some of these barriers could help accelerate the adoption of clean energy minigrids and open the market for private sector participation in the sector. Opportunities to enhance the enabling environment for minigrids to meaningfully contribute to rural electrification exist in:

- Implementation under the Rural Electrification Fund as a mechanism to subsidize minigrid developments and operations.
- Implementation of the Minigrid Regulatory Framework, providing a level of policy and regulatory certainty and clarity across a broad scope of important issues.
- Harnessing the experience with minigrid developments of different sizes and technologies that has already been gained in the country.
- Smart metering data collection on recent projects offer the opportunity to markedly improve the understanding of minigrid systems in the country context: technical performance, demand, usage and design parameters (load profiles, sizing, etc.).
- Strong coupling of minigrid development with agriculture-based productive use to reduce electricity costs and promote localized economic growth. This is supported by an already active MSME sector in rural areas with potential for symbiosis with minigrid electrification.
- The significant involvement of women in the micro enterprise sector would mean that women not only stand to benefit from the electrification of household activities, but may also gain the benefit of energizing and growing their small businesses.
- With grid integration operationalized under the minigrid regulatory framework, minigrids may also contribute to grid strengthening and supplemental supply capacity.

While minigrids contribute greater resiliency to the overall energy system (refer Annex 17, Climate risk screening for resiliency benefits) they are themselves vulnerable to the impacts of climate change. Climate hazards and risks such as higher temperatures, strong winds and prolonged periods of drought interspersed with flooding, will threaten generation and distribution infrastructure and impact consumer demand. These risks are aggravated by the logistical challenges facing remote, rurally located communities with limited access to technical support, spare parts, and maintenance capacity to address mini-grid issues and disruptions. As climate risks are expected to increase to 2050, climate risks will demand due consideration in project planning, design and operation. Accordingly, consideration was given to the climate risks at regional, national and pilot project level (Annex 17) to inform risks and mitigation measures for the project and particularly pilot systems.

With regards to gender equality, Malawi possesses a dual civil and customary legal system. Its civil system offers comprehensive gender protections, though they may not always be respected in practice due to widespread patriarchal normative practice. There is considerable geographic variation between systems of matri- and patri-lineality and locality, which exert influences over patterns of landholding and marriage customs, though women face some degree of disadvantage under both systems. Conflicts between civil and customary law may be best managed on a site-specific basis, where the project may emphasize its coherence with civil statutes as well as make the "business case" for greater inclusion and equality in planning and execution. Especially vulnerable groups of special concern identified are the following: widows, divorced women, single mothers, child brides, teen mothers, child-headed households, orphans, and households with members living with disabilities.

III. STRATEGY

Technology advances and cost reductions in the most recent decade have made RE, most notably solar PV, the most affordable source of energy available[33] when developed at utility scale. Coupled with the flexibility and modularity offered by RE systems, solar PV increasingly also offers affordable, clean energy solutions for electrification of more remote, rural communities and activities. Accordingly, low carbon[34] and specifically solar PV minigrids have been recognized as a key part of the portfolio of options available to countries towards achieving universal access to clean, modern and affordable energy.

Minigrids lie at the nexus between rural electrification, climate resilience and sustainable development. The African Mini-Grid Community of Practice (AMG-CoP)[35] – a collaborative network of 16 African country governments including Malawi – identified minigrids as a central element of developing a decarbonized, climate-resilient energy services sector for the millions of people in Africa who lack access to affordable, safe and clean energy. Green minigrids deliver climate change mitigation and resilience, while also advancing economic and social development benefits. A 2020 EEP Africa study of the climate co-benefits from clean energy projects[36], highlighted the significant potential for resilience co-benefits[37] offered to communities by off-grid solar home systems (SHS), minigrids and powering productive uses. It also pointed to the importance of initial, small-scale risk-taking, through clean energy innovation, business model testing, and demonstration projects, for assessing long-term viability.

While technology advances and downward cost trends have markedly improved the business case for RE minigrids, in many countries, they are not yet competitive with fossil-fuel based alternatives. The overall AMP Theory of Change (TOC) is premised on the understanding that the high costs of RE minigrids are partly attributed to a range of risks[38], each of which contributes a premium to the development costs of minigrid systems.

The hypothesis follows that by significantly reducing the investment risks for RE minigrids in a partner country, the levelized cost of electricity (LCOE) can be reduced, which in turn will accelerate and scale up the adoption of RE minigrids as part of the effort towards achieving universal energy access in the country and the broader region. Accelerating the adoption of clean energy also contributes greater GHG emission reductions.

The AMP has adopted a common architecture of four key components, a combination of enabling policy and regulations, business model innovation with private sector involvement, innovative financing and digital innovation as the levers to lower investment risks, thereby reducing financing, hardware and soft costs while increasing revenues and improving system efficiencies. Within this architecture, AMP will emphasize - and seek to develop comparative advantages - in three 'key areas of opportunity' (national dialogues on delivery models; productive use; digital). This approach, illustrated below in Figure 1, is structured to advance the program objectives of cost-reduction and innovation for minigrids and give effect to the TOC.

[33] Lazard Levelized Cost of Energy Analysis, version 14. October 2020.

[34] Although the AMP contribution is expected to benefit all low carbon minigrids, it has a deliberate Solar PV technology focus leveraging recent technology advances, cost reductions and potential economies of scale as well as the consistently high solar radiation resource throughout the continent (i.e. solar potential is largely location independent).

[35] https://africaledspartnership.org/2019/01/30/african-mini-grids-community-of-practice-amg-cop/

[36] EEP Africa. 2020. Energising Resilience, Climate Co-Benefits from Clean Energy Projects.

[37] Co-benefits including local value chains and diverse livelihoods, Self-reliance including food and energy security, and resilient infrastructure such as health care.

[38] Based on risks identified in consultation with numerous stakeholders in the Derisking of Renewable Energy Investment studies conducted for utility scale and off grid solutions in a range of markets.

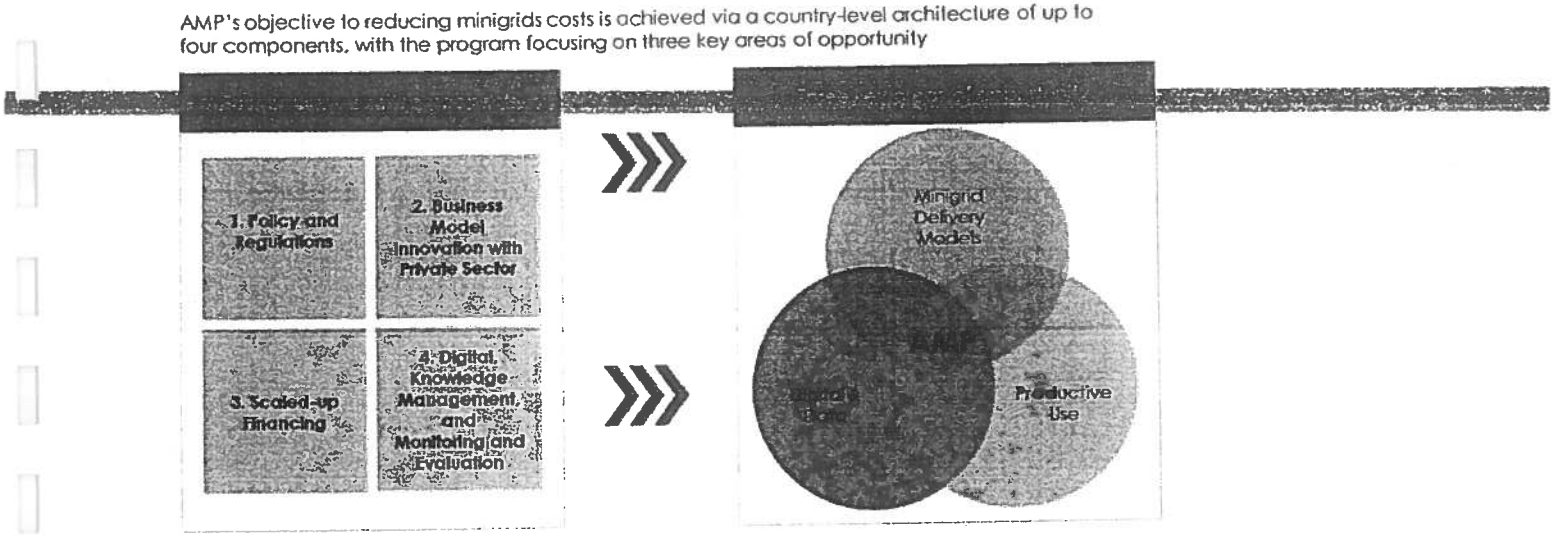


Figure 1: AMP's objective, architecture and areas of opportunity

The TOC draws on the Derisking of Renewable Energy Investment (DREI)[39] methodology and standard categories of risk. As noted earlier, these risks have been shown to translate into higher development costs that in turn increases the cost of electricity to the consumer and/or discourages investment in the sector. Various cost reduction levers across the themes of policy and regulation, business model innovation and private sector as well as innovative finance can be employed to reduce risk (e.g. policy derisking), compensate for risk (e.g. financial incentives) or transfer risk (e.g. financial derisking). Less risk contributes to simplified feasibility assessments, lower development costs and lower financing costs, improved revenues and system efficiencies, among others. This, in turn creates a more attractive investment environment conducive to scaled up investment in the sector.

De-risking the investment environment and attracting and leveraging private and public-sector resources to increase energy access, promote RE and energy efficient appliances in a manner that is inclusive and responsive to the needs of different sectors of the population, will support the Government of Malawi in its transition to sustainable energy systems in line with its stated ambitions and the aspirations of Sustainable Development Goal 7. Access to clean energy is also expected to play a critical role in combatting the COVID-19 pandemic and catalyzing an economic recovery in its wake, particularly in African countries[40]. At a project level, this understanding is expected to shape the review of the investment risks and policy instruments (Outputs 1.2 and 1.3). Power to healthcare facilities, supply of clean water for essential hygiene, enabling communications and IT services for education or more broadly connect people while maintaining social distancing, have been noted as potential opportunities to adapt and respond to the pandemic. These have been recognized as preferred interventions at pilot sites (Output 2.1), as appropriate. Preliminary investigations for partnership opportunities related to these services were also initiated and captured (refer Partnerships under Section IV). Furthermore, in collecting and analyzing data for the planned GIS-based modelling there will be an opportunity to capture metrics highlighting the availability of equipment, services and relative "situational" vulnerability of a given location (Output 1.1).

Within the framework provided by the generic AMP TOC, the AMP in Malawi will focus on a selection of activities that build on the foundation already established by previous projects and policy developments in the country and that complements the ongoing activities of other role-players in the market (refer Table 6 and Table 7 for parallel and partner activities). By harnessing the wealth of data and experience, the AMP can contribute to consolidating country and regional knowledge resources, in support of all future developments.

Given the relatively small AMP GEF allocation, the approach will necessarily be targeted and confined to a handful of interventions aimed at making a significant contribution to lower risks and development costs for minigrids in

[39] UNDP & ETH Zurich (2018). Derisking Renewable Energy Investment: Off-Grid Electrification. United Nations Development Programme, New York, NY and ETH Zurich, Energy Politics Group, Zurich, Switzerland.

[40] Multiple sources including: https://www.seforall.org/covid-19-response and https://ecdpm.org/events/green-gender-driven-covid-19-recovery-africa/

Malawi. It has also aligned closely with the UNDP-funded Access to Clean and Renewable Energy (ACRE) Project[41], sharing project management resources and capacity established within the MoE for the implementation of ACRE. In particular, the AMP activities will align with 3 of the 4 ACRE strategic areas, namely:

- Developing and strengthening clean energy minigrids that promote productive uses of energy for rural economic transformation (see: AMP Outputs 1.1 and 2.1)
- Accelerating and de-risking the clean energy transition in the country (see: AMP Outputs 1.1, 1.2, 2.2, and all outputs under Component 3)
- Enhancing power sector coordination, building institutional capacity and conducting research and development (see: AMP Outputs 1.1, 2.2 and all outputs under Component 3)

Linkages to the AMP Regional Project: The project will also align with the AMP Regional Project to foster knowledge sharing, learning, and synthesis of experiences in a multi-directional manner– i.e. flowing from the AMP Regional Project to the Malawi project, and vice versa, and between the Malawi project and other national projects within the Program. The AMP Regional Project will connect countries to knowledge, resources and networks of best practice and will support the rapid deployment of expertise, solutions and tools to support on-the-ground implementation. The main role of the AMP Regional Project is to make best practices in regulations and policies, innovative and inclusive business models, digitalization and financing available to all AMP beneficiary countries.

Within the broader framework of the AMP TOC, this specific focus for Malawi is illustrated in a national Theory of Change (Figure 2).

Based on the experience in other markets, it is assumed that the different risk categories are also relevant to varying degrees in the Malawi market. Drawing on the stakeholder consultation and desktop reviews, a cursory assessment of the risk categories, defined by the UNDP Derisking Renewable Energy Investment (DREI) methodology, was done during the project preparation phase. It has provided a preliminary perspective on the most likely risks contributing to increased costs, but will be comprehensively tested with a full DREI assessment during implementation.

Though financing is acknowledged as one of the significant barriers, the need to confine the project focus and recognizing the parallel efforts on innovative finance under ACRE, led to Component 3 on Innovative Finance not being retained for the AMP in Malawi (Figure 2). Data and Knowledge Management, that was originally anticipated as a fourth, independent Component of the AMP, has been included in the TOC and strengthened as an important lever in the reduction of investment risks.

[41] Implementation period from 2020 – 2023,

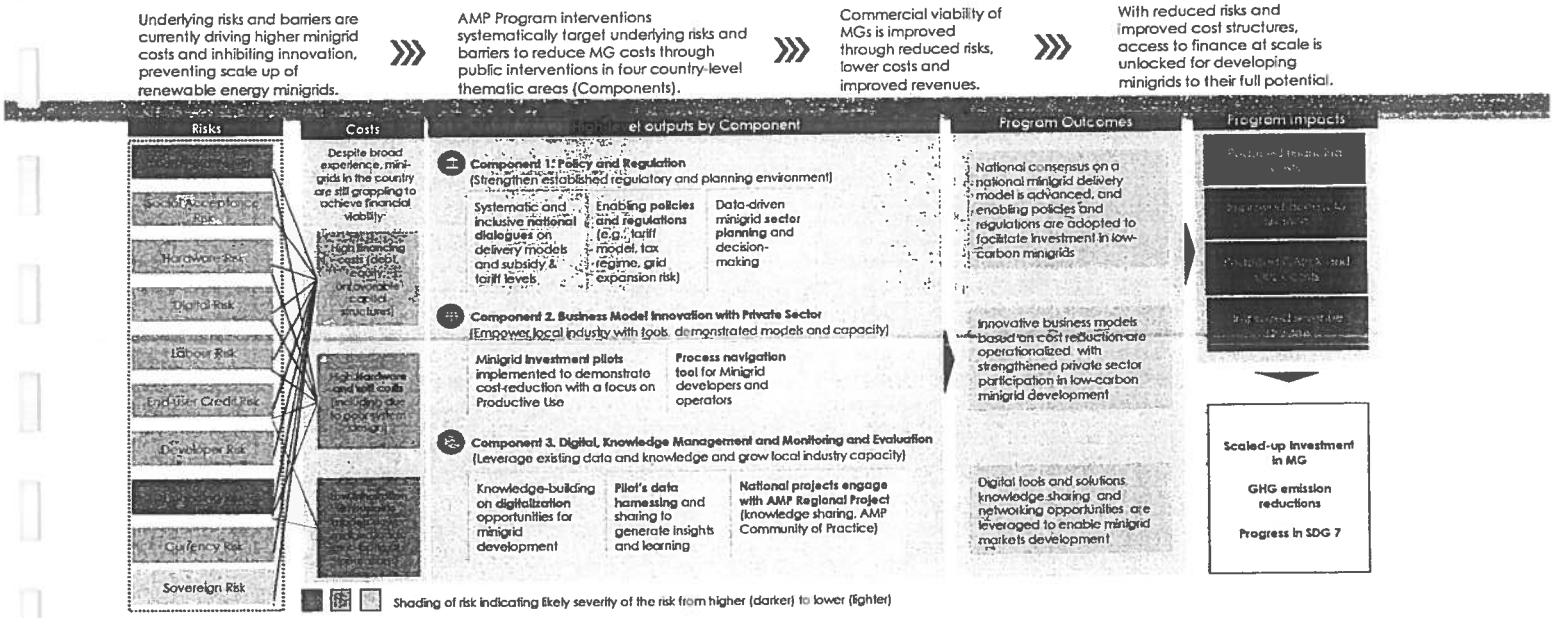


Figure 2: Malawi AMP Theory of Change

Again, informed by the available resources, the targeted interventions and outputs have been selected to mitigate risk and thereby reduce development costs for all future developments. Accordingly, the focus of the three thematic areas or components depicted in the Theory of Change consists of:

In the **Policy and Regulation** area, the focus will be on strengthening and expanding the foundation that has been established in the country. A clear line of sight[42] on policy direction and planning data has proven crucial to investor confidence across all scales of RE development across the continent. Certainty is significantly enhanced by a policy and regulatory environment that is conducive to and encourages development that advances national objectives.

Experience in minigrid markets has shown the policy and regulatory development process as an iterative process, informed and refined by market experience[43]. The policy and regulatory environment also holds the key to multiple risk categories described in the Theory of Change. Accordingly, the project aims to advance and facilitate implementation of already formulated policy aspirations. This will be achieved by leveraging the resources and expertise available from the regional project to facilitate a review of the existing environment through the DREI analysis accompanied by the development of a policy action plan, establish an active interface with the Regional Community of Practice and building the capacity of the industry association to meaningfully engage with government on policy issues and execution (Component 3).

[42] IRENA. 2015. Africa 2030: Roadmap for a Renewable Energy Future.

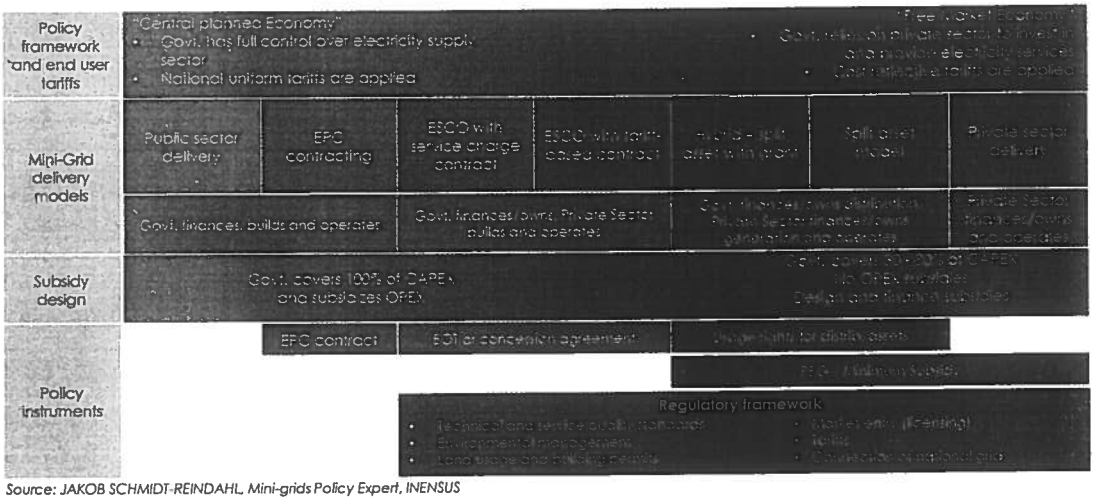
[43] GIZ, GET.transform. A Renewable Energy Minigrid Technical Assistance Guide. Take-aways from 15 years of GIZ support in minigrid market development. April 2020.

BOX 1. The Concept of a Minigrid Delivery Model

The concept of a minigrid 'delivery model' is a key concept for this project. This text box seeks to set out a common understanding of the concept and its importance to the project. The current status of the minigrid delivery model in Malawi is noted in a separate Text Box, below.

Definition: *A minigrid delivery model, determined by the national government, is the cornerstone of a country's over-arching minigrid regulatory framework. It defines who finances, builds, owns and who operates and maintains the minigrids. Where applicable, it seeks to engage the private sector. A minigrid delivery model is closely associated to other key components of a minigrid framework, including tariff structures/mechanisms and subsidy levels/mechanisms.*

In each country, identifying one (or more) delivery models will provide a framework for all sector stakeholders to plan for the longer term, particularly with regard to mobilizing private investment as one of the main objectives of the project. Figure 3 below describes the spectrum of design options for delivery models, across a number of different elements (ownership, policies, finance etc.)



Source: JAKOB SCHMIDT-REINDAHL, Mini-grids Policy Expert, INENSUS

Figure 3. Conceptual outline of minigrid delivery models

This decision-making process around identifying a delivery model is complex and should ideally be done in the form of a national dialogue involving all relevant stakeholders to varying degrees (different ministries such as energy, finance, health and environment, local authorities, the public, the media, the beneficiary communities, utilities, the private sector, and other key stakeholders) in order to build a national consensus on the basis of which large-scale deployment of mini-grids can be accelerated and have a sustainable impact.

Pilot projects planned under this project will also seek to fit into this framework. The more clarity there is on the part of the government regarding the choice of delivery model, the easier it is to develop or plan business models which can reduce minigrid costs. A clearly identified delivery model minimizes the risk of investments being made based on assumptions that are not in line with government expectations and may lead to conflicts and economic losses down the line. It also helps the government to answer the important questions related to the rural electrification sector to provide clarity for private investors and operators and build confidence.

The concept (refer Box 1) of a minigrid 'delivery model'– specifically who finances, builds, owns and operates the minigrid asset – as well as the closely related issues of tariff levels and subsidies, is a key concept and area of focus for AMP projects and the program as a whole. Clearly defined delivery models, with associated tariff structures and subsidy mechanisms, are considered an essential pre-requisite for financial scale-up in the mini-grid sector. Accordingly, the AMP framework makes provision for a National Dialogue in each partner country to review and define, confirm or refine the chosen delivery models for the country, as appropriate. The newly published regulatory framework for minigrids in Malawi takes a broad approach, making provision for a variety of models and scenarios across all key elements relevant to delivery model (refer Box 2, below).

BOX 2. Current Status of Minigrid Delivery Models in Malawi

While the market in Malawi is still at an early stage of development, the country has already developed a regulatory framework for minigrids that describes key aspects related to mini-grid delivery models. The regulatory framework has opted for a broad approach that recognizes a number of models and procurement scenarios without giving preference to any. Table 2 provides a summary of the current status of key aspects of minigrid delivery models in Malawi as presented in the *Regulatory Framework for Mini-Grids* in Malawi, published July 2020.

Table 2. Current status of minigrid delivery models in Malawi

Aspect	Current Status
Ownership and Operation	The regulatory framework makes allowance for a range of delivery models and procurement scenarios, covering both "Solicited" and "Unsolicited" processes. It recognizes different ownership options as eligible for licensing, including (i) community-based, (ii) public-owned and operated by an institution with state shareholding; iii) private, (iv) public private partnership established as a Special Purpose Vehicle (SPV) with clear shareholding and risk sharing arrangements; and (v) a hybrid ownership model where different persons own different components of the mini-grid system. The different delivery models span EPC contracting, ESCO model / concessions through to private sector delivery.
Tariff mechanisms	The framework makes provision for cost-reflective tariffs, following a tariff methodology and structure provided by the Regulator. The tariff methodology sets a broad framework or principles for the formulation of tariffs. Innovative tariff formats will be considered for approval by MERA.
Subsidy mechanisms	The framework provides for a subsidy programme to be arranged, structured as a (i) capital subsidy, (ii) output-based aid (performance based), (iii) operational subsidies to close the gap between affordability and cost recovery and (iv) Pro-poor rates (cross subsidization between customer types). The Rural Electrification Fund, collected from a levy on electricity sales, is theoretically available for rural electrification activities including minigrids, but has not been utilized for such to date as the subsidy provision has not been functional.
Regulations	Regulatory Framework for Mini-Grids in Malawi published July 2020.

Given the critical importance of the minigrid delivery model, Malawi will have the opportunity to draw on the resources of the regional project to assess the existing delivery model[s] for their feasibility and prospects of success. If needed, potential gaps in the delivery models can be identified in this way, and the project can develop constructive proposals and make contributions to close them through respective measures. One of the activities envisaged during the first eighteen months is to get all relevant stakeholders on board and initiate a process of national dialogue to analyze and validate all aspects of existing or planned mini-grid delivery models (Output 1.3), with the aim of improving them to enable sustainable implementation of pilot projects under the AMP.

A further focus will be on creating a next layer of information support to planners and developers, both from the private and public sector. Akin to how solar and wind resource maps reduce the cost of preliminary feasibility work for all developers in the market and can help direct developments to more optimal locations, mapping data can provide a screening of potentially suitable sites with associated cost savings to all future developments. It also provides important guidance in terms of potential market size and sector planning for Government. Reduced development timelines and more accurate planning information for site selection and system sizing should markedly reduce development costs for minigrids.

Interventions under this component are primarily focused on addressing energy market risk, particularly as it relates to enhancing market access (Energy Market Risk, Figure 2).

Demand stimulation and optimized load management has proven an essential cost-reduction lever for minigrids. Accordingly, under the **Business Model Innovation and Private Sector** area, the AMP aims to showcase an improved business model for operating a viable, small-scale minigrid system. In Malawi, the revenue from electricity sold to small industry and businesses is already understood to be a key success factor for minigrids. A key learning from the GEF-5 project on *Increasing Access to Clean and Affordable Decentralised Energy Services in Selected Vulnerable Areas of Malawi* noted that minigrids can only be sustainable with a utilization rate of more than 50%, pointing to the importance of coupling system development with productive use of energy and promotion of low-cost cooking appliances[44]. Because of the typically low energy usage of residential customers, often confined to early mornings and evenings, linkage to and support for these 'productive' energy users is necessary to reach the critical revenue needed for financial viability, which in turn is essential to encourage private sector players. Productive users are also important to enhance the economic and social development impacts of minigrids and rural electrification programs more broadly.

Building on the extensive experience already gained in Malawi[45], the AMP pilot intends to take this principle further by significantly growing productive uses, relative to residential consumers, on a minigrid network to find a combination of elements that describes a financially viable operation. In addition to growing the number of economic activities connected to the minigrid, developing existing small businesses and expanding value chains are expected to provide a key to greater sustainability and utilisation of the minigrid infrastructure. Ideally, the output will inform a model that is generically relevant to and replicable across different productive uses and communities.

As it can be seen in many projects across the continent, and especially at tariffs as low as the national grid tariff in Malawi, revenues from electricity sales, even if increased by PUE, will in many cases hardly be enough for private minigrid companies to survive. Rural industrialization efforts that focus on opening up new income streams for the companies (e.g., through agricultural value chains based on approaches such as the KeyMaker Model and others) are proposed to enable economic viability for the minigrid firms.

Data for the region have shown the significant cost impact, even on experienced developers, of entering a new, unfamiliar market. Further support to the private sector is therefore envisaged as an online "One Stop Information Centre", to guide developers through the requirements of the Malawi policy and regulatory environment, further contributing to a business-friendly environment.

The primary focus of this component is on energy market risks (Figure 2), but anticipated to also contribute indirectly to hardware, digital, developer and social acceptance risks.

The **Digital, Knowledge Management and Monitoring and Evaluation** component intends to actively leverage existing information and knowledge to broaden and refine the understanding of minigrids in the country context, support future planning and decision-making and contribute to the development of minigrids in the region. Initially foreseen as the contact point with the regional project for the aggregation of data and compliance with monitoring, reporting and evaluation requirements, this component has taken on greater importance as a contributor to reducing risks and costs. Ready availability of a credible knowledge resource will contribute across all risk categories: facilitating engagement with financial institutions, growing investor confidence, reducing operational and development costs, improving system utilisation and load management, and improving customer acquisition and relationship management. It will also support national planning and decision-making, enabling Malawi to optimise the contribution from clean energy minigrids for the country.

In addition to the focused efforts of the AMP under the Policy and Regulation area, it will contribute to strengthening the local industry association to lead the continued conversation with government related to policy refinements and remaining barriers under Component 3. Experience in other countries for all scales of RE development, have underscored the importance of a business-friendly approach[46] to attracting private sector participation and

---

[44] Available for as little as USD 100.

[45] Included a review of lessons from (i) the GEF-funded Increasing Access to Clean and Affordable Decentralised Energy Services in Selected Vulnerable Areas of Malawi project, (ii) successes and challenges from nine pilot projects over the preceding decade, (iii) five case studies developed for RMI Malawi Sustainable Energy Investments study, and (iv) lessons noted as input in the development of the UNDP Access to Clean and Renewable Energy (ACRE) Project, 2020-2023.

[46] World Bank. South Africa's RE IPP Procurement Program: Success Factors and Lessons. Report No: ACS8826. May 2014.

investment. An active conversation between government and industry will contribute to such an environment and provide for a feedback mechanism necessary to enable the iterative refinements to the policy environment.

available at regional level, to contribute across the majority of risk categories as prioritized during implementation.

An emerging theme from lessons across minigrid systems is the importance of digital tools and solutions as a key driver for minigrids and minigrid cost-reduction as described below in Box 3. Digitization is proving a key enabler for individual systems and national planning and decision making. Practically, in the context of AMP projects, a key mechanism for realizing this opportunity will be each project's use of a digital platform. Accordingly, a digital platform has been included in the AMP design for Malawi under Component 3 (Output 3.2) with close links to Components 1 and 2 and the AMP regional project.

BOX 3. Digitalization Minigrids

Digital technologies and solutions are fundamental to enabling off-grid electrification. In fact, the emergence of minigrids as a viable solution to electrify remote and isolated communities relies strongly on certain digital technologies such as *remote monitoring* of minigrid operations and the use of *digital money* to collect customers' payments. Figure 4 below represents an initial categorization of the digital and data opportunities for minigrids under the AMP.

Digital opportunity for minigrids. It's increasingly clear that digital is a key entry point across minigrid market development. Figure 4 below shows different categories of digital solutions in the minigrid sector: (i) digital planning, (ii) digital operations, (iii) digital aggregation platforms, and (iv) digital payments. In common to all these is the potential of digital technologies – whether used by policy makers, financiers or minigrid developers - to lower minigrid costs, reduce risks, and address barriers to scale.

Data use opportunity for minigrids. Many opportunities around digitalization are related to leveraging the large amount of data generated by minigrid projects to surface actionable insights, learning and optimization to consolidate business models and technical solutions for scaling-up minigrids. For instance, the use of operational performance information from existing systems to forecast demand and design future minigrid can help avoid a very common pitfall of many minigrid systems which are significantly oversized and hence not financially viable.

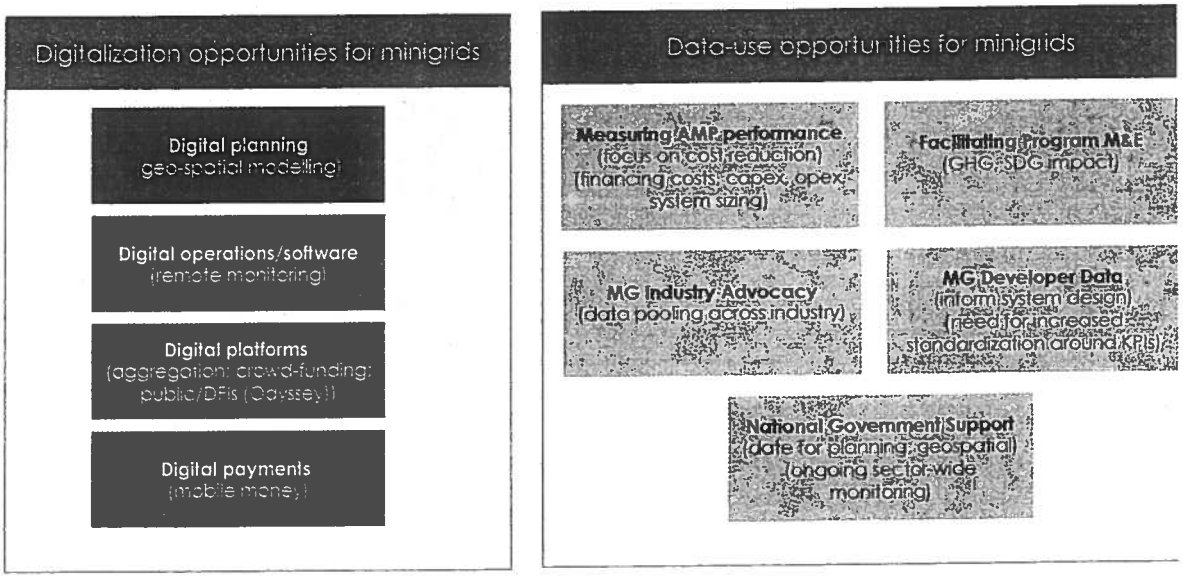


Figure 4. Digital and data opportunities for minigrids in the AMP

BOX 3. Digitalization Minigrids (continued)

The potential for using data and digital tools and solutions to add value at various stages of the minigrids value chain remains largely untapped. With enhanced capacity, **minigrid developers** could streamline their operations though smart metering and remote control of their assets and potentially reduce operations and maintenance costs by about 15% to 30%(*) through reduced site visits, labor and component replacement costs. **Government stakeholders** could leverage digital solutions for energy sector planning, to streamline licensing, monitor quality of service and broadly improve sector oversight. However, data of sufficient quality is not always available for these purposes, and government stakeholders often lack the necessary technical capacity. And while data could be a tremendously valuable asset in the minigrid sector, this potential that remains largely underutilized due to the lack of standardization and common data reporting protocols and the fact that this sector is still very nascent and remains relatively fragmented.

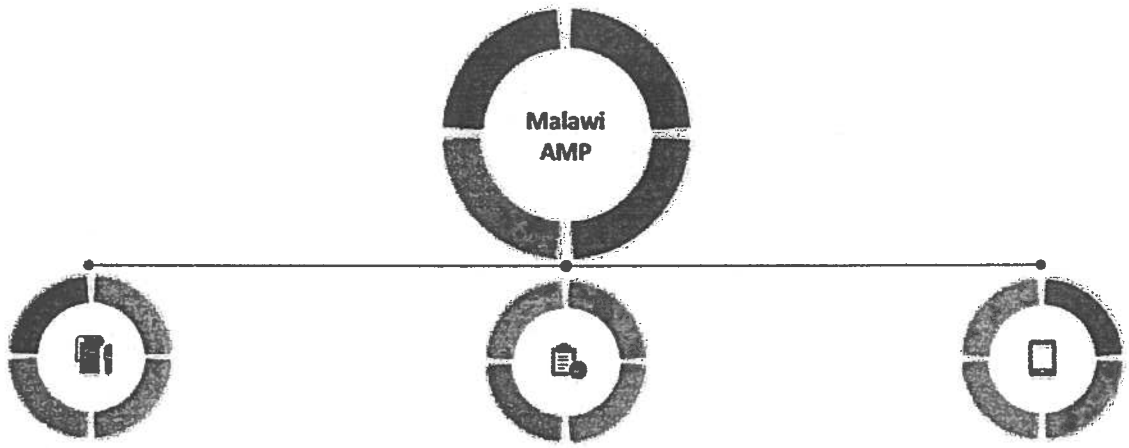
Opportunities across the Program, and with the AMP regional project. The AMP provides a unique opportunity to develop a single set of metrics and guidelines for data collection, and use them to collect data from minigrid investment pilots across different national projects which the AMP Regional Project can then aggregate, derive insights from, and systematically disseminate knowledge with participating AMP countries and with the broader minigrids sector in Africa. At the same time, the link between the regional project and the total of eighteen (18) national child projects provides a unique 'distribution channel' opportunity across Africa for AMP to mainstream the use of digital tools and solutions for minigrids cost-reduction and scale-up.

(*) AMMP Technologies. "Reducing the cost of operations and maintenance for remote off-grid energy systems." September 2018.

IV. RESULTS AND PARTNERSHIPS

Expected Results: The objective of the AMP is to support [illegible] to clean energy by increasing the financial viability [illegible] and promoting scaled-up commercial investment in minigrids in Malawi.

With the guidance provided by desktop research, past case studies and stakeholder consultation, the AMP in Malawi will focus on a selection of interventions intended to lower risks and reduce the costs for all future minigrid developments in the country (refer preceding Section III, Strategy and TOC description). These interventions have been structured according to the thematic areas described by the AMP TOC (Figure 5) into three components with specific outputs, as summarized in Figure 5. The envisaged contributions from these interventions are unpacked in the subsequent section.



Component 1. Policy and Regulation	Component 2. Business Model Innovation with Private Sector	Component 3. Data, Knowledge Management and Monitoring and Evaluation
Targeted outputs per component		
1.1. Geospatial, techno-economic modelling of least-cost off-grid renewable electricity technologies	2.1. Extension of two minigrid pilots with productive uses to identify a business model suitable to small minigrid operations	3.1. A Quality Assurance and Monitoring Framework for measuring, reporting and verification of sustainable development impacts
1.2. Minigrid Derisking Renewable Energy Investments (DREI) techno-economic analyses	2.2. An online 'One Stop Information Centre' for industry	3.2. Project Digital Strategy is developed and implemented, including linkages to and following guidance from the regional project
1.3: An inclusive national dialogue to identify minigrid delivery models is facilitated, clarifying priority interventions for an integrated approach to off-grid electrification		3.3. Minigrids digital platform implemented to run tenders and manage data from pilots, and to support minigrids scale-up and cost-reduction
		3.4. Active interface with regional project established
		3.5. Industry association strengthened to advocate for and actively engage Government on behalf of private sector minigrid developers and operators
		3.6 M&E and Reporting

Figure 5: Overview of the AMP interventions in Malawi

Linkages to the AMP Regional Project: there are strong linkages with the AMP Regional Child Project across all project components, in particular with the Regional Project Component 2, which will provide access to (if requested) a variety of dedicated technical and operational support as described in Box 4 below.

BOX 4. Linkages to the AMP Regional Project –Access to technical and operational support

As part of the AMP network, the project will have access to (if requested) a variety of dedicated technical and operational support from the AMP regional project as follows:

1) **Access to specialized expert international consultants in selected areas** (DREI, data, GIS modeling, mini-grid business models, etc.) hired, retained, contracted and paid for by the AMP regional project and made available to all participating national project staff and selected beneficiaries on as needed basis. The areas of support, listing of available firms/individual consultants under contract by the regional project and protocol for how the project can request and/or access such expertise (if needed/requested) will be elaborated in the first year of regional project implementation and disseminated to this project and the staff of all other participating AMP national projects. This support may range from virtual assistance to in-country missions. All requests for such assistance must be approved by the project manager of the AMP regional project management unit.
2) **Provision of a database of qualified international consultants and firms** disaggregated by their expertise in the four main components of this national project and other key operational areas (procurement, M&E, communications, etc.). These individuals will not be retained or contracted under the regional project but rather provided to the project for informational purposes only in an effort to assist in identifying high-quality experts and firms who may be available for contracting by national governments under their own procurement rules and modalities.
3) **Provision of generic terms of reference (ToR) for various standard activities** (mentioned above) under the four main components of the national project.
4) **Advisory support by the AMP regional project management unit** to staff of the project on trouble shooting (operational support, ToR reviews and problem solving) on an ad-hoc and as-needed basis. These services will be paid for the regional project and available on a first-come/first-serve bases under a protocol to be established by the regional project.
5) **Specialized advisory support for implementing UNDP's minigrid DREI analyses.** During project implementation, the UNDP DREI Core team, working with the regional project, will make available to national teams and consultants the resources and tools to conduct full quantitative DREI applications, and will provide ongoing support and quality assurance.

A full detailed elaboration of these offerings and the protocols attached to each service will be communicated to the project at the inception workshop of the regional project and at the inception workshop of each national project.

Component 1. Policy and Regulation.

The first component seeks to address barriers to cost-effective minigrid development within the policy and regulatory environment.

Despite a relatively young market, Malawi has made good progress with minigrids. This is recognized and embedded in policy, regulatory and planning documentation that includes provision for import tax waivers, inclusion in a least cost rural electrification plan, provision for a subsidy, and the regulatory framework for minigrids published in July 2020. The most recent publication of the ESMAP Regulatory Indicators for Sustainable Energy (RISE, 2020[47]) rated the minigrid framework in Malawi as 'good', scoring 77 out of a possible 100.

Progressing the aspirations of well-defined policy depends however on effective and consistent implementation. For policy aspirations to translate into desired results, the implementation process needs to be considered as important as the policy-decision-making and formulation. Accordingly, the focus for this component of the AMP will be on strengthening and supporting the implementation phase.

It is expected that this support will contribute to the intended outcome of this component: to advance stakeholder ownership in a national minigrid delivery model, and adoption of appropriate policies and regulations to facilitate investment in RE minigrids.

Three outputs have been identified to complement the policy platform created:

- 1.1 Geospatial, techno-economic modelling of least-cost off-grid renewable electricity technologies (minigrids, grid expansion, solar home systems).

[47] Energy Sector Management Assistance Program (ESMAP). 2020. Regulatory Indicators for Sustainable Energy (RISE) Sustaining the Momentum. Washington, DC: World Bank.

- 1.2 Minigrid Derisking Renewable Energy Investment (DREI) techno-economic analyses carried out to assess progress and propose most cost-effective basket of policy and financial derisking instruments.
- 1.3 An inclusive national dialogue to identify minigrid delivery models is facilitated, clarifying priority interventions for an integrated approach to off-grid electrification

Output 1.1. Geospatial, techno-economic modelling of least-cost off-grid renewable electricity technologies (minigrids, grid expansion, solar home systems)

Geospatial mapping developed by the World Bank/ESMAP has produced a least cost electrification plan for Malawi and informed the latest update of the Malawi Rural Electrification Master Plan that will guide rural electrification in the country from 2020 to 2025. The Master Plan ranks areas for electrification, showing priority areas for grid extension, and by default, areas that will be incorporated into the national power network last. This serves as an initial indication of locations that would benefit from minigrid installations as an interim electrification measure until the national network can integrate such systems into the broader network.

Supplementing this work, the AMP will develop additional GIS-based mapping information that is key for the identification of viable minigrid sites and to enrich the planning information readily available to both public and private sector developers. The work will focus on digitizing data to produce overlays to be shared with the baseline map data on a suitable open access, online platform. Mapping overlays will be structured into three parts: (i) Micro-, Small- and Medium Sized Enterprise (MSME) and productive use of energy data; (ii) demonstrating the visualization of 'energyscaping[48],' data, and (iii) electrical appliance data.

1. MSME activity, including location, size and sector, as well as productive uses, those active and with potential to scale. Care will be taken to disaggregate business activity by gender whenever possible and include the activities of cooperative and self-help organizations. This view of existing activity will be enhanced by incorporating mapping data for potential productive uses – particularly linked to agricultural production or potential production, to establish an even more valuable planning resource for the country. By using freely available geospatial data on agricultural land use[49] as a further overlay to planning data, the relevance and potential of an energy access intervention can be assessed in terms of impact on a number of key value chains. Access to energy has been shown to significantly improve product quality and increase yields. Value addition at point of production also retains more agricultural value in the rural community, which in turn contributes to economic transformation of rural communities and supports the viability of the energy access initiative or minigrid revenue model[50]. It is further recommended that the value chain mapping is linked to the data from the pilots in Component 2. Real-world data from the pilots can provide a data-point that can be applied to the results of the value chain mapping and should provide an indication of whether other parts of the country are also suitable for this kind of PUE overlay.
2. The Government of Malawi has initiated a process to place a District Energy Officer (DEO) in every district by 2023[51]. 'Energyscaping' is one of the workstreams expected of DEOs. The objective of this workstream is to accumulate relevant information on energy needs, priorities and opportunities[52] throughout the district. Verified data points with GPS coordinates are mapped to visually represent all locations and energy infrastructure. The expectation is that 'energyscaping' information will be available to stakeholders such as local planners and other actors interested in developing energy infrastructure – including minigrid developers – and will help direct and align investment with local and national priorities. The initial work developing the DEO role and workstreams has been supported by Community Energy Malawi and University

[48] The term 'Energyscape' refers to the spatial organization of energy sources together with energy demand and energy infrastructure within a particular landscape.

[49] Such as MAPSPAM that covers all Sub-Saharan countries and all crops, available at: https://www.mapspam.info/about/

[50] This positive feedback loop has been underscored by the recent USAID funded Productive Use Stimulation in Nigeria: Value Chain and Minigrid Feasibility Study, published in May 2020. It showed that using a minigrid to electrify the three key processing activities could result in a reduction of local energy tariffs of 26 percent with no adverse impact on the long term financial outlook of the minigrid. Study available at: https://rea.gov.ng/NEP-Prod-Use-Study-Presentation_NPSP.pdf or https://pdf.usaid.gov/pdf_docs/PA00WQX4.pdf

[51] Malawi is divided into 28 districts within three regions. During 2020, the first two DEOs were appointed to help develop the role.

[52] This includes surveying the 20+ Area Development Committees, reviewing District Development Plans, accumulating data from education, health, agriculture and community development extension workers on energy access status of schools, health centres, irrigation schemes and trading centres.

of Strathclyde with financial support from the Energy Access through Social Enterprise (EASE) and Decentralisation project, funded by the Scottish Government.

Combining the MSME and productive use data with 'energyscaping' data collected by DEOs will greatly enhance the depth of planning data available to developers. The focus of the AMP will therefore be on demonstrating the utility of combining this data from the first two DEO regions into a fully functional, online mapping tool and how this can be used for minigrid planning. Based on the perceived value, specifications will be developed that will enable replication for all districts in the country.

3. An informed view of the availability of electrical appliances will provide another key piece of information of interest to achieving sustainable minigrid operations. A survey of available appliances (including those of special interest to female users), their efficiencies, costs and distribution across the country will provide a better understanding of the existing market and areas requiring further development and growth. This data should also provide valuable input to the GIZ funded Energising Development (EnDev) initiative that includes promoting clean cooking appliances and productive use equipment in the country (refer Table 7).

The intention is for mapping data to be hosted on a highly functional online platform that integrates with other available data sources and mapping resources. Ideally, such a platform would be hosted by the Government or an agency of government and would provide for open access and continued augmentation and maintenance. The existing Minigrid Portal for Malawi[53], hosted by the Ministry of Energy, is expected to offer a suitable, existing online platform for this purpose. The portal is accessible from a link on the Ministry's website and currently provides information regarding the locations of existing minigrids, their developers, potential areas for minigrids and/or rural electrification sites earmarked for development, including the relevant mode of electrification.

This portal platform and the extent of customization to meet the stated user requirements, will have to be assessed. If this proves not to be a viable option, a suitable platform will be established in consultation with the Ministry of Energy.

Visualisation of supplementary data pertaining to MSME distribution and activity, productive uses, 'energyscaping' and electrical appliances will serve as an invaluable resource for all stakeholders. While it has value more broadly, from the Government of Malawi's rural electrification planning through to small NGOs working with community partners on local priorities, it will be of particular value in demarcating areas well-suited to minigrids. As such, it is a valuable contribution from a planning perspective, both for the Ministry of Energy and other potential role players in the market.

Analogous to how solar and wind resource maps reduce the cost of preliminary feasibility work for all developers in the market and can help direct developments to more optimal locations, pre-screening of potentially suitable minigrid sites can contribute cost savings to all future developments.

Output 1.2. Minigrid DREI techno-economic analyses carried out to propose most cost-effective basket of policy and financial derisking instruments

As noted in the discussion of the TOC, a range of perceived risks increase the development costs for small-scale RE, which in turn impacts the cost of electricity and the sustainability of installed systems. The DREI minigrid methodology assesses risks across 10 pre-defined risk categories[54], identifying the underlying barriers, quantifying the impact on development costs, and suggesting the most appropriate policy and financial derisking instruments to address the risk-return profile of minigrid investments.

The Malawi Energy Regulatory Authority (MERA) published a comprehensive Regulatory Framework for Minigrids in July 2020. The framework has taken a broad approach, making allowance for various delivery models and scenarios. Consequently, implementation requires flexibility to accommodate solicited and unsolicited developments and

[53] Developed under the Increasing Access to Clean and Affordable Decentralised Energy Services in Selected Vulnerable Areas of Malawi project and completed in 2019.

[54] At a technology or sector level, eight risks including energy market risk, social acceptance risk, hardware risk, digital risk, labour risk, developer risk, end-user credit risk and financing risk. At a macro level, two risks: currency risk and Sovereign risk, as well as two that overlaps with the technology/sector level, i.e. end-user credit risk and financing risk.

various options of ownership, delivery models, tariff models, system design and sizing, among others. It is intended and anticipated that the direction provided by the newly published minigrid regulatory framework will markedly reduce the risk for minigrid developments, encouraging greater participation from private sector players in accelerating market development. A DREI analysis, conducted within the first year of the four year implementation period, will provide a helpful assessment tool to identify the remaining risks following introduction of the minigrid regulatory framework. Again, noting the iterative nature of policy development, it will provide further information regarding the remaining priority opportunities to enhance policy and introduce financial derisking instruments. Findings from the DREI country analysis may also inform adaptive management of AMP project activities to incorporate derisking measures identified in the DREI analysis.

A *full quantitative DREI application* will be conducted for Malawi, as well as all AMP participating countries, in the first year of the project. The analyses will cover all four stages of DREI and produce all standard outputs (see Figure 6): LCOEs, financing cost waterfalls, package of selected instruments, life-cycle cost assessment and key performance metrics. These will be summarized in the following publicly available deliverables: an Executive Summary (20 pages) report, a slide deck report, and an annex capturing the assumptions behind the analysis for full transparency.

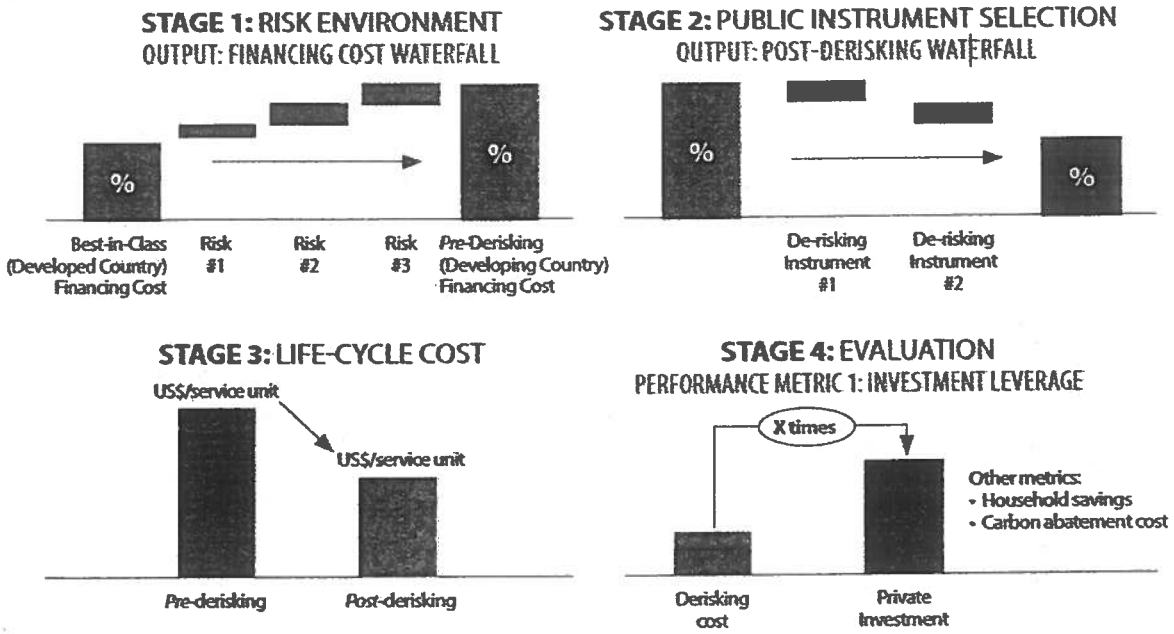


Figure 6: Stages of a full quantitative DREI application.

The results, findings and recommendations of the comprehensive DREI analysis will be presented to the Steering Committee, Sector Working Group on Energy, Malawi RE Partnership Group and any other identified stakeholders in a series of 3 to 4 dissemination workshops or round table events.

Findings from the DREI combined with any further insights collected during the dissemination events, will assist Government stakeholders to identify and prioritise the next tier of derisking policy and regulatory interventions. The AMP project will host and facilitate a workshop for key government stakeholders to develop a national Minigrid Policy Action Plan. This will also present an opportunity to draw on the resources available at the regional project to facilitate an assessment of the delivery model(s) best suited to mitigating risks and barriers to private sector interest and progressing national objectives and priorities. The workshop would therefore also serve to confirm the current Delivery Model options or to identify preferred or priority delivery model(s) for Malawi (Refer Output 1.3 below).

National DREI analysis data will feed into a regional flagship AMP knowledge product on DREI and lowering minigrid financing, hard and soft costs. This consolidated knowledge resource / product will in turn be available to national projects for cross-country comparisons and further learning.

The national project will benefit from implementation support provided by the DREI Core team, working with the regional project. National teams and consultants will have access to the resources and tools to conduct the full quantitative DREI applications, and will receive ongoing support and quality assurance. The development of the regional flagship AMP knowledge product will be led and funded by the regional project.

A second, follow up or 'light' DREI analysis will be conducted in the final year of implementation. This 'light' analysis will build on the earlier materials, refreshing data to track evolutions in financing costs as well as in hardware and soft costs. Updated data on the risk environment and financing costs will be collected and key financial modelling inputs updated with the latest hardware and soft costs. The outputs will be a brief update note of 2-5 pages, specifically focusing on changes in (i) the risk environment, (ii) financing costs, hard and soft costs, and the Levelised Cost of Electricity (LCOE). The second analysis should reflect the impact of the newly implemented minigrid regulatory framework and point to any remaining opportunities to reduce risks and encourage clean energy minigrid investments in the country.

Output 1.3. An inclusive national dialogue to identify minigrid delivery models is facilitated, clarifying priority interventions for an integrated approach to off-grid electrification

Prioritising and progressing the policy and financial derisking instruments identified by the DREI analysis will benefit from an inclusive dialogue between key government stakeholders as various spheres and areas of government bring invaluable experience and hold parts of a coordinated minigrid development strategy for the country. Such a dialogue could be adopted under the Sector Working Group on Energy or Malawi Renewable Partnership Group, if appropriate. Under the leadership or the MoE, active and continued engagement between these key role-players, and development partners and industry where relevant, will contribute significantly to furthering prioritized policy interventions. Appropriate structuring of subsidies, tariff structures and grid integration have been among the policy areas that have benefited significantly from market experience and dialogue among country peers. If not suitably sensitive to the country context, these could present a risk for the advancement of minigrids in the country. Certainly, in Malawi resolution of a subsidy mechanism under the Rural Electrification Fund is likely to be an important consideration for minigrid developments. Informed by DREI findings and recommendations, prioritized topics, will benefit from consideration at the National Dialogue. If findings of the National Dialogue merit further consideration, the focus of studies and consultation under the AMP and regional Community of Practice (Output 3.4) can be steered to address questions.

Given the critical importance of the minigrid delivery model in unlocking private investment (refer Text Box 1 and 2 under Section III Strategy), Malawi will have the opportunity under the AMP to analyse and assess the already existing delivery model[s] for their feasibility and prospects of success. The resources at the regional project can be used to facilitate an assessment of the delivery model(s) and identify what would be best suited to mitigating risks and barriers to private sector interest and progressing national objectives and priorities. If needed, potential gaps in the delivery models can be identified in this way, and the project can develop constructive proposals and make contributions to close them through respective measures.

This review will complement the broader policy and regulatory framework review and planning process on conclusion of the DREI analysis. It is therefore anticipated that it will form part of the multi-day workshop for key government stakeholders when developing the national Minigrid Policy Action Plan.

Component 2. Business Model Innovation with Private Sector Engagement

The second component aims to demonstrate innovative business models, based on cost reduction, that can encourage private sector participation in RE minigrid development in the country. Malawi has gained invaluable experience in the development and operations of minigrids with lessons informing greater innovation in delivery models, tariff designs and productive uses, among others. Despite these learnings and advances in the regulatory environment, a financially independent or self-sufficient minigrid operation has not yet been achieved.

The targeted outcome for this component is stated as having innovative business models based on cost reduction operationalized as well as strengthened private sector participation in RE minigrid development.

For Malawi, the focus under this component will be on using the wealth of experience from within the country, combined with the knowledge resources available from the regional project, to enhance feasibility and business model innovation.

The project will also leverage the practical experience gained by minigrid developments in the country to help streamline development processes from conceptualization to commissioning, aiming to reduce the time and costs associated with the pre-commissioning stages for all future developments.

Towards the targeted objective, two outputs are included for this component:

- 2.1 Extension of two minigrid pilots with productive uses to identify a business model suitable to small minigrid operations.
- 2.2 An online 'One Stop Information Centre' established with practicable guidance to developers for navigating unfamiliar and/or evolving regulatory processes from concept to commissioning.

Output 2.1. Extension of two minigrid pilots with productive use overlays to identify a business model suitable to small minigrid operations.

Noting the continued challenges with achieving self-sustainable minigrid operations in the country, the project aims to pilot an innovative business model that can help in the planning and design of future minigrid developments. AMP will concentrate on finding a business model suited to small minigrids, below 50 kW in size. The dispersed population density in Malawi suggests a larger market exists for smaller scale systems. Therefore, the expectation is that there will be numerous sites within the country that are more suited to small minigrid systems that can be rolled out quickly in support of the government targets to bring electricity to more communities. If the operational model can be solved at this scale, these learnings will be equally relevant to larger systems that already benefit from economies of scale. The intention is also to formulate a solution that is equally relevant to different crops, agro-processing and value chain applications and other, diverse off-taker requirements.

The hypothesis that will be tested as part of this pilot is that small-scale minigrids that can be embedded into a value chain or around which strong PUE can be grown, will offer cost effective and replicable solutions that can be utilized throughout Malawi. The AMP pilot will demonstrate this approach by assessing the impact on feasibility for a small minigrid system when introducing a strong productive use off-taker(s) in combination with other economic activities and various elements of business development support and financial assistance. The addition of multiple productive uses associated with value addition, a second larger off-taker or electrifying a further layer of small businesses, will contribute diversity and resilience. This will be piloted at two minigrid systems with excess capacity, making it possible to assess the impact of different elements and interventions against a comprehensive baseline.

Essentially, the objective of the pilots is to identify scalable and replicable business models of minigrids implementing PUE in multiple agricultural value chains as an enabler and accelerator for minigrids in Malawi. It will do so by taking a dynamic, progressive approach to growing the system utilization and shaping the business model in response to feedback from concurrent data monitoring, analysis and modelling.

The AMP approach also offers an opportunity to investigate the benefits of rural industrialization, even at a small scale. Significant potential for socio-economic development and an improved minigrid revenue model lies in identifying innovative opportunities that open up new income streams for rural-based businesses or communities[55]. Success stories have enabled inclusion of deep rural communities into domestic and international trade. Potential for such an opportunity would be assessed as part of the pilot detail design and implementation phase.

The pilot will introduce productive use of energy overlays to two solar PV minigrid systems in Malawi. Both systems are developed by United Purpose and the University of Strathclyde under the Scottish Government funded Energy Access through Social Enterprise (EASE) and Decentralisation project. The systems are owned and managed by

[55] As discussed for Output 1.1, energizing agricultural production has been shown to (i) improve product quality and increase yields, (ii) contribute value addition, (iii) retain more value within the rural communities, and (iv) contributes to socio-economic developmental objectives for rural areas, which in turn has a positive effect on the minigrid revenue model.

United Purpose Malawi through a social enterprise framework. The large equipment introduced as part of the PUE overlay will be supported via a third-party ownership model[56].

The first system is a 12 kW Solar-PV minigrid system located at Mthembanji Village in Dedza [57] that was commissioned in July 2020. It currently provides electricity to 60 customers (47 households, 11 businesses, 1 church and 1 school). Despite the small size of the system, the available capacity is significantly underutilised with peak demand only approximately 20% of the installed capacity. The need for productive use add-ons has already been expressed by the community with detailed planning made for implementation.

The second system is currently under development in Dedza district at Kudembe village[58]. A comparable system in size and scale to Mthembanji (12 kW Solar PV, 60 customers) will be installed before the end of 2021. Baseline surveys have revealed significant economic activity in the village with farmers producing soy and groundnuts as cash crops. Focus Group Discussions in the village have revealed a keen interest in oil processing opportunities with barriers stated regarding upfront costs of machinery.

Ownership of the minigrids are currently under United Purpose (UP), a charity and NGO. United Purpose are in the process of initiating a social enterprise which will gain ownership of the minigrids once it is legally registered. The social enterprise, to be registered as a company limited by guarantee in Malawi in 2021, will be responsible for the operation and maintenance of the minigrids through employed staff, and will collect income from the sale of electricity to cover these costs. United Purpose will support the social enterprise as it is set up and operates the minigrids, maintenance contracts are in place to ensure the technical sustainability of the electrical systems, while the University of Strathclyde, will provide research and knowledge exchange support. The social enterprise has a business plan in development for deploying further minigrids and operating them at scale across Dedza and other districts in Malawi.

Table 3: Minigrid pilot ownership and operation

Stakeholder	Role	Responsibilities
United purpose (UP) Social Enterprise	Owner	Collect tariffs through site agents and pay for expenditures to ensure sustainable operation and maintenance of the minigrid. Community engagement and training on safe electricity use and PUE promotion.
BNG Electrical	Maintenance Contractor	Quarterly site visits to both minigrid sites, ensure technical sustainability of both microgrids through preventative and corrective maintenance.
United Purpose (NGO)	Social Enterprise Support	Business support, joint funding opportunity collaboration, knowledge sharing in PUE food-water-energy nexus activities related to the minigrids.
University of Strathclyde	Research Support	Analysing primary data, techno-economic modelling to inform technical efficiency and business modelling.

Mthembanji already has, and Kudembe will be fitted with comprehensive, advanced metering infrastructure that allows remote monitoring, data collection and supporting flexible and innovative tariffs. For the Mthembanji site, metering data will provide a detailed usage baseline with at least one full year's data. As data and knowledge management are key aspects of the AMP, both at national and regional levels, each National project will contribute to growing the regional knowledge resource. With this focus in mind, both Mthembanji's and Kudembe's

[56] Third party ownership model, as opposed to a self-ownership model, involves the minigrid asset owner purchasing the productive use equipment, and then effectively leasing it back to the end-user, as part of an "energy as a service" offer.

[57] Mthembanji is located in Katchindamoto Traditional Authority in Dedza district, relatively close to lake Malawi. The GPS coordinates for the site are -14.246680 S, 34.605612 E.

[58] Kudembe is also located in Katchindamoto Traditional Authority in Dedza district relatively closer to Lilongwe than Mthembanji. The GPS coordinates for the site are -13.99833831, 34.19723709

development under the EASE project offers significant additional benefits to the AMP, through an experienced partnership combining University technical expertise and local NGO fieldwork and operational expertise, and matching funding secured through EASE on related activities until March 2023. This allows for additional research, implementation and field learning that will feed into the AMP project learning that would otherwise not be readily available. Data collection frameworks and procedures are already in place for social impact, technical, and demand data, allowing for the PUE addition analysis to be streamlined, with robust research outputs guaranteed to further inform and strengthen the minigrid sector in Malawi. An environmental and social management plan (ESMP) is also in place for Mthemnbaji and will be complete for Kudembe by Q4 of 2021. The ESMP and business models make provision for continued maintenance and safe handling of spent batteries and equipment. Detail of these provisions are included in Annex 21.

Both sites have been assessed for climate risks and mitigation measures incorporated into the planning, design specifications and operations (refer Annex 17 for additional detail). In selecting suitable productive uses, consideration will also be given to resilience to climate risks and hazards and/or productive use options that inherently contribute to climate resilience where possible.

Against the project baseline, the pilot extension projects will demonstrate (i) the contribution of different productive uses of energy and efficient appliances on minigrid capacity factor, revenue and business case, (ii) the benefit of business development support partnerships for minigrid projects, (iii) innovative financing of efficient electrical appliances, (iv) opportunities for asset financing models for productive use assets, and (v) the impact on socio-economic indicators. These elements are foreseen to consist of:

(i) **Rice mills (Mthembanji).** An existing irrigation scheme allows farmers from this community to grow rice from January to November. Currently, farmers from the area have to travel to the nearest trading center, 7 km away, to mill their rice. The addition of rice milling facilities in the village will allow local processing as well as packaging and marketing of the rice in the area. Three rice milling machines[59], at least one of which will be owned and managed by a female entrepreneur or collective enterprise, will be added as the primary productive off-taker of electricity, serving approximately 140 farmers from the area. Some energy efficient, direct current de-huskers and polishing machines are produced in table-top sizes small enough to be used in a home-based business, which could be more convenient for women. In addition to the milling facility, depending on the remaining system capacity, there may be an opportunity for lantern charging, a charging station or Solar Kiosk[60] that offers energy services to households not connected to the minigrid or other productive uses[61] to augment the commercial use of electricity from the system. If an opportunity for industrialization is identified, it may further inform the structure of PUE addition.

(ii) **Oil processing (Kudembe)** Currently, soybeans and ground nuts are grown as cash crops in Kudembe and sold to vendors during harvest season, who usually manipulate market prices and do not adhere to minimum prices set by the government. Cooking oil is purchased from Domwe in Mozambique at high prices for reselling. The introduction of three oil-pressing machines [62] offer a value addition to farmer cooperatives, increasing the income levels through creation and sales of a non-perishable, high value density output. Additional value-add electrical uses identified at Kudembe include soybean threshing and peanut butter making machines which will be investigated and implemented based on value to farmers and technical feasibility for integration into the minigrid. Challenges identified at the site for setting up crop processing in Kudembe are technical capacity to operate processing machinery and capital to buy the machinery, which this project will address.

---

[59] Pilot design is based on 1.1 – 2.2kW rice husking and milling machines, that can process 100 – 160 kg/hour. Equipment sizing and selection will be dictated by the available excess electricity during the day from the minigrid as well as the size of inverters and electrical controls, etc. This size machines additionally offers opportunity for women ownership and operation.

[60] Solar Kiosk examples: https://graftlab.com/portfolio_page/solarkiosk/

[61] Opportunities may include a community workshop where trades people have access to electricity to manufacture wares, sewing services, a laundry service, or an internet café and printing services. Prioritising and selection of options would require further investigation, a cost benefit analysis and consultation with the community.

[62] Pilot design is based on 2.2kW oil pressing machines, that can process 30-40kg/hr. Equipment sizing and selection will be dictated by the available excess electricity during the day from the minigrid as well as the size of inverters and electrical controls, etc. This size machines additionally offers opportunity for women ownership and operation.

(iii) **Value chain development** Community needs and value chain assessment will be undertaken to understand the current and future potential of key agricultural economic activity in the target site, namely through value chains of rice, soy and ground nuts. Analysis will inform recommendations on how PUE additions can be integrated into the community and the minigrid sustainably, helping to accelerate economic growth in the area. This will primarily focus on market development of PUE products, through identifying local and national markets, increasing market awareness for the farmers, and creating market linkages so products can be sold at a higher value. The activities will map and plan financially viable Value Addition Centres at both minigrid sites, putting a project plan, budget and financial model in place and frameworks to track the results for the AMP project period to provide sufficient data for similar projects to be repeated in other locations in Malawi. Business model support for farmer cooperative will map detailed planning considerations for hiring and training machine operators, designing and production of packaging materials, certification of products with Malawi Bureau of Standards (MBS) and linkages to both domestic and international markets, as well as detailed financial models. Key Maker models will also be explored where the mini-grid operator plays a more hands on approach to the PUE business, supporting the identification, formation and execution of rural processing businesses across a spectrum of consumable and durable products as part of their minigrid services.

(iv) **Small business development support**. Experience[63] has shown that benefits of electrification cannot be assumed, particularly where programmes to provide access have a narrow focus on the delivery of energy infrastructure alone. Rather, if electricity is to provide the multiple development benefits on offer, it should be delivered as part of wider development programmes. Thus, an essential component of this pilot is parallel development support for small businesses, with a particular focus on women-owned businesses. For this purpose, the project will partner with the Small and Medium Enterprises Development Institute (SMEDI) in Malawi to support the establishment, formalisation and growth of small businesses and cottage industries through capacity building, training and tailored support. Business support may also include linkages to market and community savings schemes, as relevant.

(v) **Electrical appliances and equipment**. Another element foreseen for the pilot is making available efficient electrical appliances to households and small businesses. One option includes subsidizing the purchase of electric pressure cookers[64, 65] to displace less energy- and time efficient, costly cooking fuels. Electric cooking appliances may also be deployed for productive uses in an eatery or school environment. Alternatively, a 'lease to own' option for electrical equipment used for economic activities[66] or guarantees for loan repayments can be explored. The exact scope and focus will depend on a status quo, needs assessment and interest identified in consultation with the community as well as a view of appliances available in the market.

(vi) **Facilitation of micro-finance**. The smart metering system makes it possible to test asset financing models for productive use assets, with the aim of encouraging micro-finance institutions (MFIs) to work with minigrid operators[67]. When combined with support for the acquisition of electrical appliance/equipment (refer iii, above), the opportunity for MFIs to engage with this market can be more appealing with the findings and experience used to encourage and shape future participation by MFIs at other minigrid developments.

(vii) **Data monitoring**. A monitoring system[68] has already been introduced to assess the social impacts of introducing clean energy, with a baseline established at Mthembanji in 2019 and the Kudembe baseline

---

[63] Noting two: (1) *Productive Use of Energy (PRODUSE), Measuring Impacts of Electrification on Small and Micro-enterprises in Sub-Saharan Africa. 2013*. Developed as a joint initiative of the Energy Sector Management Assistance Program (ESMAP), the Africa Electrification Initiative (AEI), the EUEI Partnership Dialogue Facility (EUEI PDF) and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). (2) *Productive Use of Energy in African Micro-grids: Technical and Business Considerations. 2018*. A Product of the USAID-NREL Partnership. National Renewable Energy Laboratory (NREL) and Energy 4 Impact.

[64] A successfully executed, small scale example is available at: https://storage.googleapis.com/e4a-website-assets/Accelerating-Microgrid-E-Cooking-Through-Business-and-Delivery-Model-Innovations.pdf

[65] For a more technical discussion, see Lombardi et al (2019) "Enabling combined access to electricity and clean cooking with PV-microgrids: new evidences from a high-resolution model of cooking loads" in Energy for Sustainable Development, vol. 49.

[66] Availability of efficient electrical appliances will be mapped in output 1.1.

[67] SMEDI facilitates linkages between MSMEs and financial institutions under their Business Information Management and Dissemination service offering.

[68] Social impact tracked through kobo collect (kobotoolbox.org).

being developed during 2021. Technical (generation and metered consumption) data [69] describing consumption patterns is supplemented with surveys and focus group discussions to gain insight on social impacts. Any additional monitoring requirements and data collection instruments (e.g. interviews, surveys, satellite data [70], etc.) will be identified, including changes and updates to the existing monitoring and evaluation system to assess the enhanced economic and social development impacts, including gender specific impacts, linked to the productive use additions. The project will actively collect and monitor data throughout implementation and operation. The requirement for sharing of minigrid performance data with the national project in exchange for support from the AMP project has been agreed in principle with the EASE project team. It is further noted that the generic principles provided in Box 5 will be applicable, to the extent that it is relevant to the data sharing interface with the pilot. The existing metering infrastructure for the pilot sites have also been verified for suitability and compliance to the requirements provided by the AMP. As noted under Component 1, pilot data should also link to the value chain analysis and visualization to provide a real world data point for verification and extrapolation.

The findings and any recommendations for further enhancement will be used to formulate a generic "blueprint" relevant to a range of productive uses[71] with similar characteristics that can be replicated for future developments. This will rely on both the technical and social impacts of different interventions and the sustained contribution and benefits being monitored, analysed and evaluated to inform the formulation of a business model, a suggested suite of suitable interventions and recommendations or guidelines. This is intended to reach a critical level of electricity sales to secure financial viability to electricity providers and encourage private sector players.

The activities related to data capture, monitoring and analysis will include: Techno-economic modelling; Financial feasibility assessment and tariff setting against willingness to pay; Agricultural PUE business model development for mini-grid customers; Investigating innovative financing of efficient electrical appliances, and opportunities for asset financing models for productive use assets. Additionally, business models that are replicable, scalable and suitable to the private sector, will be developed and disseminated operating mini-grids at different scales, and fleets at regional and national scales, with policy integration and smart subsidies, as well as detailed socio-economic impact assessment, with dissemination and training activities embedded throughout all activities.

In addition to producing the blueprint business model under this output, data and findings will also feed into Component 3 for the development of case studies to inform future minigrid developments by all role-players and expand the data and knowledge resources aggregated by the AMP regional project.

[69] Data of the generation production using SMA sunnyportal and demand data through Steamaco Smart Meters.

[70] In addition to population numbers, satellite data can help track the growth rate of the village footprint before the minigrid, after July 2020 and then after the introduction of the productive use intervention.

[71] Considering different agricultural crops and produce, different types of crop, meat or fish processing and/or cold storage.

BOX 5. Text on digital data sharing for minigrids

Pilot beneficiaries (e.g. minigrid operators) receiving support from the project will be required to share minigrid performance data with the national project.

Specific terms and conditions for data-sharing and how best to operationalize the commitment and its adoption by the beneficiaries will be defined and agreed upon with minigrid operators during project implementation, including details of what data can and cannot be used, based on consultations with industry stakeholders and with support from the AMP Regional Project.

The specifications around the data generation by the demonstration pilots supported by the project will consult and follow guidance/standards provided by the AMP Regional Project. A standardized Quality Assurance and Monitoring Framework (QAMF) for application in all minigrid pilots supported under the project will be developed in year 1 of the regional project and disseminated to all national projects.

A data platform will be procured by the project (under Component 3, Output 3.3) to manage all technical and financial data related to minigrid sites.

Through the implementation of this data management platform, minigrid developers selected to implement minigrid pilots with support from the project will have access to a set of best-in-industry tools for analyzing minigrids (e.g. demand forecasting, system optimization, distribution network design, detailed financial modeling at the site and portfolio level). Similarly, as part of the roll-out of the data platform, minigrid developers (as well as key government and other stakeholders) will receive capacity-building and in-depth training to use analytical tools and data management technologies.

The above descriptive text for this output 2.1 represent the initial design of the two minigrid pilots. This has been supported at the PPG stage by the EASE project team. During project implementation in Q1 of Year 1, the PMU, in close collaboration with the EASE project team, will draft a short project 'Minigrid Pilot Plan' document, building on this initial design and updating it as needs be. This will include brief summary updates, at the time of drafting the plan, on the status in Malawi of (i) any other minigrid pilots (specifications, any results/findings to date) and (ii) any other examples of minigrid productive use applications (specifications, any results/findings to date). This project Minigrid Pilot Plan will conform with the principles for the application of GEF INV set out in Box 6 below. Once prepared, the Minigrid Pilot Plan will first be reviewed for clearance by UNDP (CO and BPPS NCE), and then shared with the Board.

BOX 6. Principles for the application of GEF investment funding

~~Principle 1. Categorization of project. The pilot will be developed as an SE overlay~~

Principle 2. Private sector involvement in project. The delivery model for the pilot will seek to incorporate private sector involvement to the highest degree possible.

Principle 3. Digital platforms. This relates to the use of a digital platform for tendering pilots. While this is not relevant for this pilot, it will be a central element of the overall AMP and, should it be of interest to the Government, the opportunity will exist

Principle 4. Productive use: third party ownership model; limited technical assistance (TA). For pilots that will financially support the purchase of productive use equipment using an allocation under the GEF INV (i.e. both Malawi pilot sites), it is required that the project will only provide its support via a third-party ownership model. Similarly, projects may also provide TA building capacity for productive uses associated with the pilot investment. The amount of GEF budget to technical assistance programs for general productive use should be limited and moderated.

Principle 5. Clear methodological basis for additionality for calculating the level of GEF INV/financial support for capital expenditures. It is critical that the appropriate use of GEF donor funding to the pilots be ensured, requiring a methodological basis for which the level of GEF INV will be determined during implementation.

- 'Core' investment in minigrid system, productive use equipment (third party ownership) and household connections: GEF INV can be provided for these areas using the principle of minimal concessionality. Suitable methodologies for minimal concessionality can include calculating the level of GEF INV support on the basis of achieving (i) Levelised Cost of Electricity (LCOE) parity with a diesel minigrid, (ii) LCOE parity with pre-existing residential tariffs, or (ii) LCOEs based on the willingness to pay of the end-users (via surveys etc). During implementation, the AMP regional project may also provide updated guidance on suitable minimal concessionality methodologies.
- 'Top up' investment in metering infrastructure above the baseline to meet the requirements of the regional project and link into digital platform.
- Ensuring UNDP social and environmental safeguards, gender equity requirements and action plan are fully met.

The above principles should guide the determination of GEF INV for capital expenditures. Should the project depart from the above principles this should be cleared be in consultation with the AMP regional project and cleared with the Steering Committee.

Principle 6. Digital data: obligation to report; inclusion of digital equipment. As already stated for pilot 1 and detailed in Box 4, it is required of the asset owner of the minigrid benefitting from the GEF INV support, to share digital data from the minigrid's performance with the AMP national project. The pilot sites for Malawi have confirmed meeting the minimum requirements for hardware and software required for reporting.

Principle 7. Compliance with UNDP Social and Environmental Safeguards and Gender requirements. Pilot projects funded by the GEF INV is required to comply with all the relevant national standards of the country as well as UNDP standards as it pertains to social and environmental safeguards and gender equity. In support of this principle, an Environmental Safeguards Management Framework (ESMF), developed for the program, and a gender action plan accompany this ProDoc (Annexes 10 and 11). The ESMF is structured as a program-wide framework that provides guidance that is both generically applicable to all AMP country projects as well as country specific. This guidance will have to be incorporated and considered in developing the environmental and social management plans for pilot projects.

Output 2.2. An online 'One Stop Information Centre' established with practicable guidance to developers for navigating unfamiliar and/or evolving regulatory processes from concept to commissioning.

A benchmarking study published in 2020 by the Africa Minigrid Developers Association (AMDA)[72] revealed the cost impact on minigrid development in an unfamiliar market. It showed that experienced developers in established markets between 2016 and 2019 had on average 41% lower CAPEX costs per connection compared to new

[72] AMDA. 2020. Benchmarking Africa's Minigrids.

developers in those same markets. It similarly showed that established developers pay a significant premium when first entering a new market (Figure 7)[73].

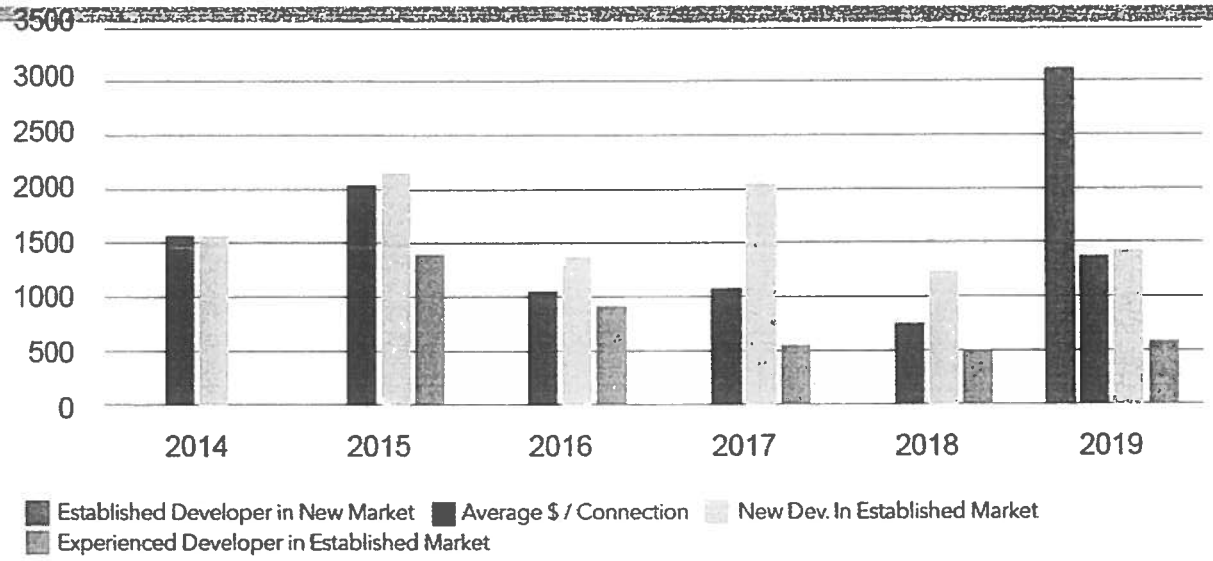


Figure 7: CAPEX per connection trends by experience (AMDA)[74]

Feedback from developers in Malawi echoed this finding, noting that the timelines, and therefore costs, for future developments should be significantly reduced with the experience they have gained. Leveraging this experience, the project will develop a practical "How to Guide" offering practical guidance for developers to navigate the 'unfamiliar' and evolving landscape of preparation, approvals and authorisations. The expectation is for this tool to short cut the learning curve, reduce soft costs associated with minigrid development and encourage more developers, including female entrants, to participate in the market.

The practical guidance is intended to complement existing knowledge resources[75] and Toolkits focused on policy and technical aspects of minigrid development. "How To" modules would include topics such as:

- *Site selection*. Providing guidance on the resources available to support site selection including MAREP, online mapping resources (refer also Output 1.2), current energy or fuel sources, and opportunities for productive uses and value addition, among others.
- *Understanding land rights*. Guidance with regard to land ownership, land rights, what legislation is applicable and which processes to follow.
- *Stakeholder consultation*. Pointers regarding the unique character and structure of Malawian communities, social and political structures as well as the role of different actors and authorities to facilitate consultation, both for authorisation and support as well as data collection to inform system design.
- *Approvals and authorisations*. Practical guidance for obtaining the various environmental and regulatory approvals, authorisations and licenses including entities responsible for issuing those authorisations, order of process and approvals required, contact points for applications, submissions, enquiries as well as where to locate information resources such as requirements, forms or templates.
- *Accessing tax waivers*. Information regarding products exempt from import duties, how to ensure tax waivers are applied, when VAT exemption can be requested and how to also access VAT waivers if needed and applicable.

[73] Data for new entrants in a new market was not available.

[74] AMDA. 2020. Benchmarking Africa's Minigrids.

[75] Including Green Minigrid Help Desk available at: https://greenminigrid.afdb.org and UNDP developed Toolkit for policy-makers that show-case the lessons from the clean energy minigrid based rural electrification experience in Malawi.

- *Accessing the subsidy*. Providing guidance to developers for accessing the subsidy under the Rural Electrification Fund, once guidelines are in place and this is implemented.
- *Linkages to complementary initiatives or support*. A repository of complementary support available in the country including small business development support, microfinance institutions, and development partners with interest in supporting specific development objectives.

The introduction of the Minigrid Regulatory Framework is expected to partly facilitate processing of submissions and approvals. Despite being adopted mid 2020, the framework, as approved, was not readily available online[76] and the point of contact to request a copy from MERA was not available either. A copy was obtained by email with a request sent through the UNDP Country Office. This is indicative of obvious opportunities to support developers with essential guidance and to engage with government entities to enhance the institutional interface for developers which in turn can be captured in the guidance to developers – especially new entrants in the market.

Modules will be revised or added to incorporate regulatory requirements and processes that emerge with the implementation of the minigrid regulatory framework. Overall, "How To" modules will require review and update on regular intervals.

Continued maintenance, updates and additions will be necessary for sustained relevance. The set of guides will have to be readily available, free of charge or at a minimal cost for printed copies. It will therefore be shared as an online 'One Stop Information Centre' hosted by the Renewable Energy Industries Association of Malawi (REIAMA) (refer also Output 3.2 below). This information should also be introduced and shared proactively through workshops or webinars targeting newly appointed District Energy Officers, industry members, officials hosting the Energy Desk at the Malawi Investment and Trade Centre and any other interested parties from the public or private sector interested in more efficient and cost-effective delivery of minigrid developments.

Users accessing "How to Guides" will be required to register on download and surveyed to gauge the continued value of available material and inform further refinements and development requirements. Data collection at registration should take specific note of gender and also prompt for information regarding employment and career interest (refer gender Action Plan for further clarification). The intention is to collate a view of female participants in the sector and their targeted career trajectories.

Component 3. Digital, Knowledge Management and Monitoring and Evaluation

Significant experience has been gained with minigrid developments in Malawi. Harvesting both local and regional experience, both past and future, can help encourage private sector interest, accelerate the adoption of clean energy minigrids and optimize the broader developmental impact of minigrids in the country and region. The regional project can facilitate access to past and current learnings as well as best practices from other countries.

Linkages to the AMP Regional Project: Component 3 is a key interface with the AMP Regional Child Project. As such, details on linkages to the regional project as relevant for digital, knowledge management and monitoring and evaluation activities under the project are described in Box 7 below:

[76] Checked November 2021 and again 5 May 2021, ten months after adoption.

BOX 7. Linkages to the AMP Regional Project – Component 3 – Digital, KM and M&E

The project will receive support and guidance from, as well as participate in activities led by the AMP Regional Project in the following key areas of interface between the AMP regional project and the AMP national projects:

- **Digital.**
  a. **Knowledge building/sharing.** The regional project will build and share knowledge with the project on the potential for use of digital tools and solutions, including leveraging minigrid projects' data to improve the commercial viability of renewable energy minigrids.
  b. **Data aggregation platform.** The AMP Regional Project will make a data management platform available to aggregate data from all national project pilots based on a common M&E framework to track Results Framework indicators as well as program objectives, SDG impacts and GHG emission reductions for all child projects.
- **Knowledge Management.**
  a. **Information sharing**. The AMP regional project will support and facilitate knowledge management and information sharing between the regional child project and national child projects, among national child projects, and between the program and the larger minigrid community.
  b. **Insight Briefs.** National projects will gather data and audio-visual content (video footage, photos, etc.) highlighting national project activities which will be the subject of an 'insight brief' to be developed by the AMP Regional Project. The 'insight brief' will be disseminated by the regional project to regional stakeholders and published on the AMP website.
  c. **Communities of Practice**. One of the primary ways national project staff will interface with the regional project is via the 'Communities of Practice' (CoPs) and associated activities/platforms. While it is expected that many of the activities will be undertaken virtually (via internet-based platforms, webinars or digital platforms) it is also expected that the CoPs will include actual in-person workshops, meetings or training events that project staff will participate on.
- **Monitoring and Evaluation (M&E).**
  a. **Common M&E Framework/QAMF.** The AMP Regional Project will develop, with inputs from national projects, a common M&E framework with SMART indicators to ensure that the program is able to track progress toward its overarching objective. This common M&E framework will include both the Results Framework indicators as well as additional Key Performance Indicators (KPIs) which will be adopted by the national projects to track progress toward project and program objectives (i.e. minigrid cost-reduction). The project will thereafter provide on an annual basis (and to the extent feasible if requested on an ad-hoc basis) the following M&E information to the AMP regional project staff: (a) Standard reporting on all indicators in the results framework; and (b) Reporting on all additional Key Performance Indicators (KPIs) adopted by the project under the common M&E framework/QAMF.
  b. **Operational support for national project M&E activities.** The AMP Regional Project will provide support to the project, through its PMU staff or by hiring or recommending subject matter experts, for the project to execute M&E activities such as the inception workshop, ongoing monitoring, and project evaluations. Further details provided in Section VI. MONITORING AND EVALUATION (M&E) PLAN.

The results of Component 3 in the Malawi project will feed the AMP Regional Project for onward sharing with other participating countries. There will also be opportunities for these results to be shared directly with other countries through corresponding knowledge management activities built into each child project. This will serve better integration between national projects. Integration will also be enhanced through the programmatic approach proposed for national project design around the three core thematic areas mentioned above.

This third component has therefore been structured to link into the knowledge resource of the regional project, both to access available resources and support and to contribute to the knowledge sharing.

The targeted outcome for this component is formulated as: Digitalization and data mainstreamed, across stakeholders, into local minigrid market development. Increased knowledge, awareness and network opportunities in the minigrid market and among stakeholders, including benefitting from linkages to international good practice.

Accordingly, six outputs have been defined to ensure that the contribution of the AMP is adequately captured and communicated to support future developments:

- 3.1: A Quality Assurance and Monitoring Framework for measuring, reporting and verification of the sustainable development impacts of all minigrids pilots supported, including GHG emission reductions, is adopted and operationalized based on standardized guidance from the regional project.
- 3.2: A Project Digital Strategy is developed and implemented, including linkages to and following guidance from the regional project with smart metering data aggregated, analyzed and disseminated.
- 3.3: Minigrids digital platform implemented to manage data from pilots, and to support minigrids scale-up and cost-reduction.
- 3.4: Active interface with regional project established, including, but not limited to, via (i) participating in Communities of Practice and (ii) capturing and sharing lessons learnt.
- 3.5: Industry association strengthened to advocate for and actively engage Government on behalf of private sector minigrid developers and operators.
- 3.6: M&E and Reporting, including (i) Conducting inception workshop and preparing report, (ii) Ongoing M&E, (iii) Mid Term Evaluation and (iv) Terminal Evaluation

Output 3.1. A Quality Assurance and Monitoring Framework for measuring, reporting and verification of the sustainable development impacts of all minigrids pilots supported, including GHG emission reductions, is adopted and operationalized based on standardized guidance from the regional project

A prescribed intervention for the AMP is the development and operationalization of a Quality Assurance and Monitoring Framework (QAMF) for measuring, reporting and verification of the sustainable development impacts of minigrids, including GHG emission reductions.

Performance tracking of indicators and impact relies on a deliberate approach to identifying data sources, definition of baseline, collection of data and tracking of progress over time. Surveys, questionnaires, feedback or evaluation forms, tracking of visits to a website, all serve to assess the reach and scope of the contribution made by different elements of the project. Identifying and implementing these opportunities and monitoring instruments early on will both inform adaptations to the project design during implementation and enable a more accurate assessment of impact. For this purpose, a comprehensive digital strategy will be defined and implemented to capture the contribution across all aspects of the project.

Drawing on all data available to the project, a simple, online dashboard that tracks and reflects impacts, both technical and socio-economic, will be an invaluable communication tool as well as a knowledge tool to support planning and decision-making related to the project and future developments and collaborations. Technical and training support from the regional platform can support the establishment and utilization of the national dashboard as well as the integration of data into existing data collection systems (e.g. the data feeds of the Malawi National Statistical Office (NSO)).

Building on the minigrid Quality Assurance and Framework developed by NREL, SEFA and others as well as the considerable data gathering, pooling and analysis work ongoing by many including RMI, SE4All and AMDA, a Quality Assurance and Monitoring Framework (QAMF) will be developed and operationalized as necessary. Depending on guidance from the regional project, a more likely outcome is that a standardised QAMF is adapted to Malawi rather than developed as new.

The requirements of stakeholders across the spectrum will be considered and the QAMF tailored accordingly. For example, in Malawi, this may entail integration with the systems and protocols of the Malawi National Statistical Office (NSO), the national sector M&E requirements of MoE and MERA, socio-economic indicators (e.g. female employment, improved income) and the site-specific monitoring needs of any private sector partners and community groups (e.g., enhanced female agency/decision-making). The framework will also consider the GEF and AMP regional level M&E and reporting requirements and, if appropriate, integrated with similar projects being undertaken in other AMP focus countries. Examples of this higher-level data harvesting include standardized emissions reductions figures and cost saving indicators.

Data collection instruments for tracking of progress against performance indicators, any supplemental indicators as well as the terminal evaluation will also be developed and implemented under this output. Operationalising this platform will include supporting developers on the installation and use of the required equipment (as well as on the use of the data) and capacity building for the Community of Practice and national agencies on the use of a resulting national dashboard. This activity will also include support to integrate the data feeds with incumbent national systems including that of the NSO.

Output 3.2. A Project Digital Strategy is developed and implemented, including linkages to and following guidance from the regional project

A common challenge, also among more recent minigrid developments, has been over-sizing, with available capacity significantly under-utilized even with productive uses being introduced and pursued. An increased uptake of the available supply and better matching of electricity supply and demand that improves the utilization or capacity factor of the grid is a priority to grow sales and improve financial viability. Because the customer base of a minigrid is confined, better understanding consumption patterns and load profiles of different customer types and the mix of end-uses and being able to optimize the composition, are key to this objective. To date however, there has been limited data to inform minigrid system design.

The addition of smart metering infrastructure on more recent pilot projects makes it possible to capture valuable information about consumption patterns of different market segments, consumer types, end-uses and equipment.

Increasingly, such data will be available across the region. Malawi can contribute to the broader knowledge resource being developed for sub-Saharan Africa, but can also benefit from country-specific insights, by collecting and developing a data resource for the country.

Following guidance from the regional project, the AMP project will support the development of a digital strategy for the project in year 1 which will be implemented thereafter. The Project Digital Strategy will updated on an annual basis or as needed to reflect learnings from project implementation, guidance received from the AMP Regional Project on digital tools and solutions, and insights gained from minigrid pilots data. Upon implementation of the Project Digital Strategy and based on lessons learned around opportunities to leverage digital tools and solutions for minigrid sector development, the project will develop a set of evidence-based recommendations for rolling out digital solutions for minigrids at the national level. These recommendations will be shared with key national stakeholders and provide the basis for developing a digital strategy for minigrid development post-project.

This process includes aggregation of smart metering data into a central database that links to the aggregated regional view. Support will include sourcing of metering data from participating projects[77] across the country, analysis of the data and development of unitized profiles for different end users and consumer categories in rural areas. Information should facilitate modelling of utilization factors, the contribution of different interventions in terms of electricity usage and payback periods of newly introduced electrical appliances. It can also help identify suitable opportunities for growth and inform improved operating regimes to optimize the available electricity supply. In addition to published load profiles and findings, the data can inform further research, technical and policy papers, industry briefs and case studies.

Historically, national power utilities had the benefit of a national footprint and captive market to develop such resources to inform network planning. In a decentralized market, developing a comprehensive and robust data resource of this kind will rely on industry collaboration. Yet, in a competitive market, issues of anonymity and confidentiality must be ensured, with data securely collated across multiple projects and only shared at an aggregated level. Active database maintenance, data updates, data integrity audits, analysis and dissemination will be necessary for sustained relevance. To the extent that it is possible, data collection should be automated to limit the time commitment necessary for data sourcing and maintenance.

It is foreseen that the implementation phase will be led by the AMP project under the auspices of the Ministry of Energy. The Ministry of Energy indicated preference for the central database to be hosted by Government to

[77] Interest to participate was tentatively checked for projects funded by GEF, UNDP and EASE.

maintain integrity and confidentiality of data. This should also provide a suitable location for the central database to ensure longevity beyond the AMP.

Collection, analysis and development of data into knowledge or information resources can be supported by universities or other stakeholders, as relevant. At an aggregated level, information can be shared more broadly with industry stakeholders for the benefit of industry growth and development.

Output 3.3. Minigrids digital platform implemented to manage data from pilots, and to support minigrids scale-up and cost-reduction

The digital strategy and QAMF will be supported by a digital platform that will provide key functionality for the project in terms of acting as the (i) national digital convening platform for key stakeholders (public/private), (ii) providing ongoing data gathering and M&E on minigrids, including linking to the AMP regional project. This platform will serve as an important integration point between outputs and between the national and regional project. Given the digital platform's central importance to the project's functioning, it should be established as a priority in the first half of the first year of implementation. A set of generic specifications was developed as initial guidance to assist urgent procurement at implementation (refer below) and any further guidance will be available from the regional project at the time of procurement. These specifications are also essential to facilitate seamless data integration across the interfaces with other countries and the regional project.

Table 4. Initial Specifications for the Project's Digital Platform

Offering	Details
National digital convening platform for key stakeholders	• Set up of a country-specific, web-based platform to manage all technical and financial data related to minigrid sites at the site and portfolio level • Single site register of minigrid sites, with geospatial views and technical/financial benchmarks for site assessment • Set of best-in-industry tools for analyzing minigrids, including demand forecasting, minigrid system design and optimization, and financial modeling • Capacity-building and in-depth training of key government and other stakeholders to use analytical tools and data management technologies
National monitoring and evaluation platform (remote monitoring & analytics)	• Direct integration with smart meters and remote monitoring systems for live data feeds and monitoring (with options to address lack of remote monitoring systems or other restrictions) • Big data analytics and customized reporting to calculate and report on standardized metrics for pilot performance, based on project QAMF • Quality assurance of data quality, accuracy, relevance, consistency • Interactive tools to analyze data, filter, and view at varying levels of granularity • All pilot-specific data can be rolled up into national view, and all country-specific data can be rolled-up into regional view

While the digital platform will be cross-cutting in terms of its applicability in the project, a key linkage is to the data collection systems for the pilot sites under Output 2.1. As already highlighted for Output 2.1, data and findings from the pilot will feed into this component, both for the development of case studies to inform future minigrid developments and expand the data and knowledge resources aggregated by the AMP regional project. This digital platform provides the primary point of integration. The AMP Regional Project will have a web-based platform and make it available to aggregate data from all national project pilots based on the Quality Assurance and Monitoring Framework.

Currently, the digital platform for running tenders is not part of the AMP project scope. This module of the platform will be supported at a regional project level and, if identified as relevant or complementary to the tender processes developed with support from, or the transaction advisory support from the World Bank, the scope of the digital platform can be reviewed and expanded by the Steering Committee (adaptive management).

Output 3.4. Active interface with regional project established, including, but not limited to, via (i) participating in Communities of Practice and (ii) capturing and sharing lessons learnt at national and regional level.

The programmatic approach of the AMP presents a significant opportunity for each participating country to harness the wealth of knowledge aggregated at the regional knowledge platform while strengthening South-South cooperation and learning, contributing to and drawing on the experiences of participating countries in minigrid cost reduction and deployment. The Malawi AMP will link with two mechanisms established at the regional level to encourage optimal utilisation of this knowledge resource:

- **Communities of Practice (CoPs).** One of the primary ways national project staff will interface with the regional project is via the 'Communities of Practice' (CoPs) and associated activities/platforms. The regional project will host CoPs structured to support knowledge sharing and facilitate the development of solutions to challenges that are common within the African minigrid sector. The CoP focus is on key institutions, i.e. ministries, government agencies, and electric utilities, within partner countries. While it will offer a web platform that may be accessible to the wider sector, membership of the CoP dialogue space will be confined to participants from ministries, utilities and regulators of partner countries. From within the CoP, technical cohorts (or working groups) will be established to focus on major challenges identified by the CoP members. Technical cohorts will benefit from the experience of nominated participants, but will also have access to heavy facilitation and support from the AMP in developing solutions to the identified challenges.

  This model has proven immensely successful to encourage collaboration and knowledge sharing to advance renewable energy with the creation of RE communities[78] among Caribbean Island nations.

  Under the AMP, Malawi will have the opportunity to nominate suitable representation from key institutions to participate in the CoP. Participation in the CoP and technical cohorts, if selected to serve on one, will require a time commitment by the nominated participant(s) as an investment from the respective institutions. The AMP will provide for logistics and costs to enable participation. In exchange, Malawi will benefit from contributing to and having access to best-in-class, locally relevant experience and approaches for accelerating cost-effective minigrid deployment. Participants and partner countries will further benefit from having access to a network of practitioners across the region and from actively growing internal, institutional ability to deploy available tools and learnings. Country representatives selected for participation in the CoP will be required to provide regular updates, feedback and facilitate knowledge sharing sessions with the Project Steering Committee, Technical Advisory Committee and or broader government or industry forums as directed by the Steering Committee.

- **Lessons learned captured and disseminated.** The expectation is that lessons learned, at national and regional level, will enable scaling up of rural electrification using RE[79] minigrids, both within the country and in the region. Towards this objective, information will be collated and shared to be available to serve as knowledge resource to both public and private sector players.

  In addition to the data and learnings from the Mthembanji and Kudembe expansion pilots (refer Output 2.1), and those emerging from the aggregated view and analysis of the centralized database, opportunities for lessons are expected to lie in:

  - Experience with the newly adopted minigrid regulatory framework and its facilitation of national objectives.
  - Interest, participation and feedback from the private sector in training, tenders, data collaboration and dissemination.
  - Environmental as well as economic and social (including gender and other vulnerable groups) impacts.
  - Performance against regional benchmarks related to comparable costs for different components, delivery models, ownership models, improved feasibility and cost-effective delivery of electricity to end users.

[78] An example is the CARILEC Renewable Energy Community, available at: https://community.carilec.org/

[79] While noting that the AMP focus is on Solar PV hybrid systems, learnings pertaining to policy & regulations, finance, and new business models are expected to be relevant to clean energy mini-grids more broadly.

Under this mechanism, data and learnings from various outputs will be captured and developed into lessons, case studies, communication and training material to inform future minigrid developments by all role-players.

developments in similar markets in the region. Equally, regional data will be available alongside country-specific information and shared with industry role-players both in the public and private sector through electronic communication and active engagements with stakeholders.

The country projects will develop content based on the country experience. The link with the regional project will help shape and inform the development of insight briefs, enriching and affirming content with common experiences across the AMP countries. It will also support packaging and standardization into a format that is consistent and commonly branded across the program.

Output 3.5. Industry association strengthened to advocate for and actively engage Government on behalf of private sector minigrid developers and operators.

A number of important policy decisions aimed at accelerating the uptake of renewable energy minigrids in the country, still have to be implemented. This includes implementation of the rural electrification subsidy for minigrids under the Rural Electrification Fund. Tax waivers have been granted for renewable energy technologies, but the list of approved duty waiver components is not fully comprehensive and not consistently applied. The inclusion of components such as batteries, inverters and solar panel combiners is not adequately clear. Value-added tax (VAT) charges have also been waived on a case-by-case basis rather than uniformly. Industry concerns have furthermore been noted regarding product standards and counterfeit products. As technologies and energy solutions continue to develop and the country context evolves, other issues will arise that will benefit greatly from active engagement with government entities and policy intervention.

Typically, developers have individually engaged government departments to clarify and resolve uncertainties. To meet the country's clean energy minigrid targets, the number of developers and developments will have to increase exponentially in the foreseeable future. Individual engagements will no longer be feasible and will add unnecessarily to development timelines and the consultation burden on Government.

The AMP will strengthen the Renewable Energy Industries Association of Malawi (REIAMA) to coordinate and actively engage Government on behalf of industry and to advocate for the perspective of private sector minigrid developers.

A strong collective custodian and voice for the industry can contribute to removing barriers to entry and sector growth as well as promote public and private sector coordination towards the cost optimization and localization of the minigrid industry and towards climate change, sustainable development and other national objectives.

REIAMA has a history of working with government on renewable energy and minigrid related issues and is well placed to provide an effective interface. AMP support will focus on growing relationships with industry players and formalizing and strengthening the interface with Government entities on behalf of industry. This will include support for the formulation of a value proposition to the minigrid sector with an accompanying implementation plan, a marketing and communication plan for all stakeholders, technical assistance and policy briefs to support well-informed discussions on specific issues as well as information support made available from the regional project. REIAMA will also benefit from linking to the Knowledge Tools support available from the regional project under the AMP, with access to the knowledge resources, network and support available to the minigrid industry players. Stronger relationships with other, related industry associations will be encouraged to ensure opportunities for the broader RE sector and localized industry development are collectively pursued.

The association will be supported to track its reach and impact to refine the implementation approach and quantify the benefits of membership that can in turn be used to encourage additional support and memberships.

Output 3.6: M&E and Reporting, including (i) Conducting inception workshop and preparing report, (ii) Ongoing

M&E, (iii) Mid Term Evaluation and (iv) Terminal Evaluation

Ensuring compliance with all mandatory monitoring and reporting requirements of the GEF, including the following specific outputs:

- **Project inception meeting and report.** In accordance with GEF monitoring and reporting requirements, a project inception workshop will be held within 60 days of project CEO endorsement to officially launch the project. The scope and objectives of the inception workshop are detailed in the Monitoring and Evaluation section (Section **Error! Reference source not found.**) of this project document. The confirmed and, if relevant and substantiated, adapted project implementation structure and approach will be captured in the inception report, providing the practical foundation for project implementation and governance over the 4-year implementation period.

- **Project Monitoring and Evaluation.** In addition to the data collection and monitoring frameworks described earlier (Outputs 3.1, 3.2 and 3.4), progress monitoring of project management parameters is required for compliance with GEF requirements. An annual Project Implementation Report (PIR), detailing progress against the objective and outcomes, annual workplans, planned expenditure, among others, must be produced and submitted to the GEF and the Project Board / Steering Committee for review.

  Annual progress reporting should also cover monitoring of any gender, environmental and social risks and related management plans.

  Earlier outputs largely already incorporate the GEF Core indicators (Annex 15) and should support progress to be reported to the GEF as required. Monitoring of these indicators should however be a deliberate focus of the project monitoring and reporting efforts, as it represents a critical requirement of the GEF.

- **Project Evaluations.** Project performance and delivery of all major project outputs and activities will be subject to independent evaluations, following the standard templates and guidance for GEF-financed projects. Section **Error! Reference source not found.**, Monitoring and Evaluation, provides guidance for the scope of the evaluations and appointment of independent evaluators. The project team will be responsible for maintaining all relevant data records and facilitating access to all information necessary for the evaluators to assess project outcomes against all indicators.

  It will be helpful for the project team to review the evaluation framework during the inception phase and ensure performance is consistently tracked, documented and can be demonstrated across all dimensions at the time of the mid-term review and terminal evaluation.

  The AMP Regional Project will provide support to the project, through its PMU staff or by hiring or recommending subject matter experts, for the project to execute M&E activities such as the inception workshop, ongoing monitoring, and project evaluations. Further details provided in Box 8 **Error! Reference source not found.** (Section VI).

It is important to note that some of the abovementioned project results will be realized by co-financing activities with resources that do not flow through UNDP accounts. In particular, the minigrid pilots to be built in the projects (Output 2.1) will be funded through a CAPEX (partial) subsidy from the project budget (GEF funds and UNDP TRAC), and the remaining of the CAPEX will be funded by third parties (who includes the Scottish Government under the EASE project, but may also include other contributions from other partners identified during implementation). While the funds from third parties will not flow through UNDP accounts, they will directly contribute to the same mini-grid pilots the GEF and UNDP funds are contributing to and will be essential to realizing the project objectives.

Similarly, the geospatial mapping (Ouput 1.1) will build on the data contribution made by the UNCDF to inform the development of data overlays that will assist with identifying suitable minigrid sites.

For this AMP child project, these are "co-financing activities included as project results". The precise sources and amounts of these co-financing activities will only be known at implementation stage. UNDP is accountable to monitor

all project results, including results to be delivered by these co-financing activities, to ensure consistency with UNDP and GEF policies and procedures, including social and environmental safeguards policies and requirements (SES). This is further detailed in the ESMF (Annex 10).

For these co-financed activities included as project results with resources that do not flow through UNDP accounts (captured on Table 5 below), the following procedures will need to be applied before co-financing activities start:

1. The co-financing partner's capacities will need to be assessed through the Partner Capacity Assessment Tool (PCAT) and the co-financing partner will need to develop a risk management strategy if gaps are identified, for UNDP's approval and subsequent oversight/assurance.
2. The co-financing partner will need to sign a legal agreement with UNDP or the Implementing Partner to confirm accountabilities, mentioning in particular the following sentence: "*The co-financed activities will be undertaken in full compliance with [co-financing partner's] policies and procedures. However, because the activities are included in the results of the project the [co-financing partner] commits to monitor these activities consistent with the UNDP Project Document. The Project Board and UNDP will also assume an oversight and assurance role to further ensure the project, including the co-financed activities covered by this letter, remains consistent with UNDP policies and procedures. These arrangements will be confirmed through [signature of Project Document OR signature of Responsible Party Agreement with reference to the Project Document].*".
3. Risks stemming from and/or to co-financed activities – as with risks from/to all other project activities – will be included in the project risk register and monitored accordingly. The risk description will clarify relation to the specific co-financing.
4. Social and environmental risks associated with the co-financed activities will be identified during project design and included in the SESP and relevant safeguard management plans. Relevant safeguards instruments prepared by the co-financing partner will be reviewed by UNDP for consistency with UNDP's SES, during project development and implementation; any gaps will be resolved in discussion with the co-financier.

Once the co-financing activities will have started, risks will need to be monitored (as per item 3 above) and results achieved through co-financed activities will be monitored and reported in the annual GEF PIR, the independent mid-term review and the independent terminal evaluation.

Table 5: List of co-financed activities included as project results

Co-financing source	Co-financing type	Co-financing amount (USD)	Included in project results?	If yes, list the relevant outputs
Scottish Government[80]	Grant	USD 331,584 (share of the total co-finance amount USD 793,492[81])	Yes	Output 2.1
Other development partners or government entities (to be confirmed at implementation stage)	Grant, Loan and/or Equity investment	To be confirmed at implementation stage	Yes	Output 2.1
UNCDF	In kind	644,000	Yes	Output 1.1
TOTAL		**To be confirmed**		

[80] For activities under the Energy Access through Social Enterprise (EASE) and Decentralisation project and administrated by University of Strathclyde

[81] £587,772 budget for 2021 - 2023 converted at an exchange rate of 1.35 Pounds Sterling to the US Dollar (19 December 2020)

Partnerships

Partnerships: For optimal impact and contribution in the country, the AMP will rely on collaboration across multiple [illegible] stakeholders drawing on different capabilities, skill sets and resources. Formalized and/or close partnerships are foreseen with a few key players in the sector and related areas of expertise. The table below (Table 6) provides a list of partners to the Ministry of Energy in implementing the AMP in Malawi, with the details of direct, active partnerships already described in the preceding section. The table also indicates the specific outputs to which a partnership will contribute or that a partner will deliver.

Table 6: Identified partners for the AMP in Malawi

Partner name	Description and contributions	Relevant project outputs
UNDP / Access to Clean and Renewable Energy (ACRE)	The ACRE project is led by the Ministry of Energy with funding and support from UNDP Malawi. The goal of the Access to Clean and Renewable Energy (ACRE) Project is to increase access to clean, affordable, reliable, and modern energy by enhancing the sustainability, efficiency and cost-effectiveness of energy technologies.	Shared project management services supporting all outputs
UNCDF	The United Nations Capital Development Fund (UNCDF) is the capital investment agency of the United Nations for the Least Developed Countries (LDCs). UNCDF programmes help to empower women and are designed to catalyze larger capital flows from the private sector, national Governments and development partners, for maximum impact towards the internationally agreed developments goals. Through Making Access Possible (MAP), a multi-country initiative, UNCDF supports Ministries of Finance and Central Banks, to drive financial inclusion through a process of evidence-based analysis feeding into a financial inclusion roadmap. In Malawi UNCDF works in partnership with FinMark Trust. Under the MAP, they have produced a diagnostic framework on access to clean energy for the country as well as a country diagnostic of the SME sector. The data sets underpinning these reports will be mined to enrich the spatial mapping of minigrid potential in the country. Coupled with established interfaces and access to supplemental data across various economic sectors, the UNCDF is well placed to lead the development of supplemental mapping data of minigrid potential.	Delivery of the additional GIS-based mapping information as overlays to the least cost electrification map (Output 1.1)
Small and Medium Enterprises Development Institute (SMEDI)	SMEDI is a parastatal organization under the Ministry of Industry specializing in the capacity building, training, research and support of SMEs. Business support is focused on generating employment, strengthening value chains, and developing markets to bring about inclusive growth and improved living conditions of SMEs in Malawi. Services include, among others (i) business training and coordination as well as (ii) business information and dissemination. SMEDI operates a "One Stop Information Centre" for start-ups and established MSMEs. It also facilitates linkages between MSMEs and financial institutions.	Support small business development for the Mthembanji and Kudembe pilot projects (Output 2.1)
The Rural Energy Access through Social Enterprise and Decentralisation (EASE)	The EASE project focuses primarily on SDG7 progress in Malawi and runs from October 2018 to March 2023 with £1.3m funding provided by the Scottish Government. EASE is a partnership project coordinated by the University of Strathclyde with collaborating partners United Purpose, Community Energy Malawi and WASHTED. EASE aims to increase access to sustainable energy for rural communities in	Baseline infrastructure and parallel support for the implementation of the pilot project and development of "blueprint" business model (Output 2.1)

Partner name	Description and contributions	Relevant project outputs
	Dedza and Balaka districts, thereby enabling economic development and improved livelihoods.	
University of Strathclyde (UoS)	The UoS Energy for Development team has been working in Malawi for 10 years with a focus on energy access. Their current project portfolio in Malawi includes: provision of sustainable rural energy access through microgrids, promoting social and economic development through productive uses of energy, capacity building and advocacy for energy issues across the public and private sectors, and accelerating the transition towards modern energy cooking. In addition to being the coordinator for the EASE project, the UoS is well placed to also contribute to: - Development of data collection and analysis protocols - Data analysis and presentation for publications – academic papers, policy briefs, etc. - Developing sustainable business models for improving energy access.	the pilot project and development of "blueprint" business model (Output 2.1) Potential to contribute aggregation, analysis and dissemination of smart metering data to guide future minigrid development planning. (Output 3.2)
Renewable Energy Industries Association of Malawi (REIAMA)	REIAMA was established in 1999 with the explicit aim of promoting efficient and sustainable use of renewable energy technologies in Malawi to the satisfaction of the end user and all stakeholders. The Association draws its membership from individuals and companies who are involved in the production, supply, importation, exportation, installation and servicing of RETs in Malawi. In addition, the Association also draws membership from organizations, individuals, projects and programs who have sufficient and verifiable interest in the promotion, production, supply, importation, exportation, installation and servicing of RETs in Malawi.	Hosting of 'How To' guidelines and 'One Stop Information Centre' for minigrid developers (Output 2.2) and beneficiary of support to strengthen the industry association (Output 3.4).

In addition to the partner initiatives of ACRE and EASE, a number of other initiatives currently under development or active in the country have relevance to the scope of the AMP and may serve as useful resources or opportunities for collaboration (Table 7). The AMP will seek opportunities for possible linkages with these, as appropriate.

Table 7: Related initiatives by development partners, donors or other role-players

Partner name	Related project scope
World Bank	The World Bank funded Malawi Electricity Access Project, effective from January 2020, aims to increase access to electricity in Malawi. It supports "the rapid scale up of access to electricity through on-grid and off-grid supply solutions that will more than double the existing electrification rate". While most of the $150 million (credit and grant) funding is earmarked to support grid expansion ($105 million), the project's off-grid market development fund ($30 million) will have a minigrid window for minigrid developers, prioritizing agriculture loads, schools, health facilities and enterprises in peri-urban and rural areas. The overall technical assistance part of the project ($15 million) will support development of (1) bankable minigrid projects, (2) business model, and (3) regulatory framework. Within this scope, assistance to the Ministry of Energy ($10 million) includes (a) minigrid development including technical studies for up to 10 minigrid locations and transaction advisory to design a tender process; (b) technical assistance for off-grid market development such as policy and regulation, quality assurance and gender-informed consumer awareness, (c) sector studies and training. It also includes Technical Assistance for finance institutions and institutional design of a semiautonomous Rural Electrification Agency and Fund with a focus on minigrids. At the time of consultations for the AMP project development, the World Bank focus was on supporting the MoE with pre-feasibility studies and preparation for mini-grid system development, expected to be procured through a competitive bidding process. This support was expected to

Partner name	Related project scope
	continue and be directed by the needs arising from the preparation process. the Bank anticipated making financing available to minigrid developers, with the format informed by the technical studies and preparatory work. A Geospatial Least-cost Electrification Plan implemented by ESMAP (World Bank) helped identify minigrid locations for investment. Discussions with the ESMAP team highlighted opportunities for additional information overlays to enrich the planning and mapping data specific for minigrids. The Malawi Energy Access Project includes aspects related to mapping and there may be potential for further collaboration during implementation.
GIZ's EnDev programme in Malawi	GIZ's EnDev programme in Malawi works to enhance a financially sustainable market for improved cookstoves in urban and peri-urban areas. At the same time, it has implemented a pico PV component. In the future, the project seeks to increasingly support the pro-poor social cash transfer scheme of its improved cookstove component. It has also initiated a project to encourage the availability of affordable, high quality technologies/solutions for productive use in Malawi. The current focus is on the supply chain of PUE equipment. The project was at an early stage and likely to be shaped by subsequent planning cycles. There are likely to be synergies and potentially also opportunities to collaborate or demonstrate some of the benefits of PUEs that might transpire during pilot implementation. Another opportunity for collaboration or synergy may exist under the appliance survey to identify the available and distribution of energy efficient appliances in the country. This is noted as a potential touch point for follow up in the multi-year workplan.
Southern African Centre for Renewable Energy and Energy Efficiency (SACREEE)	As part of SACREEE's overall scope to support clean energy development in the region, it is aiming to establish a Coordinator to support Distributed Renewable Energy (DRE) for Productive Use for member states that includes Malawi. It is expected to have this function in place from early in 2021 for a period of at least two years.
United Nations International Children's Emergency Fund (UNICEF)-Malawi	UNICEF works in over 190 countries and territories to save children's lives, to defend their rights, and to help them fulfil their potential, from early childhood through adolescence. In Malawi, UNICEF works with the Government of Malawi in support of its commitment to respect, protect and fulfil children's rights in line with international conventions and standards. UNICEF-Malawi employs an innovative country programme design focusing on the life cycle approach and service delivery platforms. It takes into consideration the risks associated with climate change and uses renewable energy to provide sustainable access to safe water for schools, healthcare facilities and communities in rural areas in Malawi. These touchpoints may present a shared interest in communities where minigrids can provide electricity for such social or community services. In particular, opportunities to collaborate in combatting the impact of COVID-19 may arise relating to energy for healthcare facilities, access to clean water in pilot communities, maintaining social distancing in educational settings using communication and IT infrastructure, among others.
U.S. Agency for International Development (USAID), Power Africa and Beyond the Grid Initiative	USAID/Malawi is currently developing its next five-year strategy. Power Africa is one of the USAID-managed programs active in Malawi. Beyond the Grid, a Power Africa initiative, is accelerating off-grid electricity access, focusing on two strategic priorities – household solar and micro-grids. In the light of the COVID-19 pandemic, USAID has provided grant funding to electrify 9 clinics using off-grid solutions in Malawi. The intention is to invest "in a series of pilot projects that demonstrate how health centre electrification can be delivered in a commercially sustainable manner with strong private sector participation". A strong focus in Malawi is on promoting enabling policies and regulations that encourage private sector investments. Obvious touchpoints exist in the operationalization of the minigrid framework and the development of the One Stop Information Shop with opportunities for collaboration and alignment to be investigated when the next five year strategy has been finalized.
Academia	A number of the universities in Malawi have been actively conducting research, data collection and analysis related to minigrids, renewable energy technologies and value chains, including those embedded in agriculture. Among these academic institutions are Malawi University of Science and Technology (Malawi Industrial Research and Development Centre), Lilongwe University of Agriculture and Natural Resources Science Technology and Malawi Polytechnic.

Partner name	Related project scope
	Several international research centres, thinks tanks and academic institutions focused on renewable energy, sustainable development and compact or off-grid power systems have also been working in the country and the region. Opportunities exist to collaborate with these institutions for data collection, mining, analysis and interpretation to develop policy and technical findings and recommendations.
Africa Minigrid Developers Association (AMDA)	Africa Minigrid Developers Association (AMDA) is an industry association representing private utilities developing small, renewable, localized power grids. It currently has 30 members across 12 African countries. Membership is composed of developers operating AC minigrids that ensure power reliability of at least 20 hours per day. The association also works closely with a variety of solution providers, including EPCs, hardware and software vendors and integrators. The association aims to combine private sector innovation, efficiency, and customer service with public sector support to help end energy poverty across Africa.

A number of the abovementioned partners have provided letters of co-financing for this project, as attached in Annex 14 to this project document. As further described in Table 8 below, most of these co-financed activities correspond to funds not flowing through UNDP accounts and whose results are not included in the project results framework. In this case, UNDP is accountable to monitor the risk to realization of co-financing amounts and realization amounts annually in the GEF PIR, at mid-term and at terminal evaluation. Specifically, potential risks associated with co-financing that may affect the Project, including safeguards related risks that fall within the project context or area of influence, will be considered in safeguards due diligence and the project risk register and monitored accordingly. Risk management measures identified will be only those within the control of the UNDP project (e.g. managing reputational risk). See the ESMF (Annex 10) for more details on the management of risks related to the different types of co-financed activities in this project.

Table 8: List of co-financed activities not included as project results

Co-financing source	Co-financing type	Co-financing amount (USD)	Included in project results?	If yes, list the relevant outputs
Ministry of Energy (MoE)	In kind	906,903	No	N/A
UNDP	Grant	1,000,000	No	N/A
Scottish Government	Grant	USD 461,908 (share of the total co-finance amount USD 793,492[82])	Partly	Output 2.1
TOTAL		**2,368,811**		

Key Risks

As described in the TOC, the AMP aims to help de-risk[83] the context for minigrid developments, thereby reducing the costs of system development, improving profitability, attracting private sector investment and commercial financing at scale, and in turn lowering the cost at which electricity can be supplied to consumers. For the AMP scope, a selection of interventions has been identified for creating an environment conducive to minigrid developments in Malawi. The key risks that can threaten the achievement of these results through the chosen strategy are highlighted here (Table 9) with the complete risk register attached in Annex 7.

[82] £587,772 budget for 2021 - 2023 converted at an exchange rate of 1.35 Pounds Sterling to the US Dollar (19 December 2020)

[83] Risks that potentially contribute to the cost of minigrid developments, span across energy market conditions, social acceptance, hardware, digital, labour, developers, end-user credit, financing, currency and sovereign risk.

Table 9: Risks

Description of risk (grouped by category)	Level of risk (I, L)[84]	Mitigation
Strategic Risk		
Failure to achieve a financially viable business model for small-scale minigrids. If the pilot project fails to demonstrate or achieve a fully financially viable business model for small minigrids, the objectives of encouraging private sector participation and accelerating minigrid uptake will not be achieved.	Moderate (I = 3, L = 3)	Even if not fully achieving a viable business model at this scale, the project should have made significant progress towards demonstrating improved financial viability and will be well placed to recommend additional measures or amendments needed towards this goal. Findings should also provide valuable guidance of interest to larger scale systems. Should this be the case, the most promising business model and suite of initiatives will be defined detailing findings and recommendations from the pilot experience as it relates to tariffs, revenue collection, share and types of PUEs, grid utilization, operational costs and efficiencies, value addition, significance and scope of small business development support, Microfinance for small businesses, and/or any other aspect of significance in developing a viable minigrid business model. It will also document learnings to serve as input into future developments as well as planning and policy development.
Regulatory risk		
An iterative process has proven critical to shape the minigrid regulatory framework. Failure to incorporate lessons and experiences from pilot projects, any other developments in the country as well as industry feedback, might limit the contribution from minigrids towards the targeted outcomes for the country.	Substantial (I = 4, L = 3)	Nominations by the Steering Committee for representatives from key institutions to participate in the regional CoP with structured feedback will support active knowledge exchange. The project makes provision for key stakeholders to actively engage with the outputs of the DREI study and use findings and inputs from the study (and other resources and sources) to inform the formulation of an action plan for further inclusion or refinement of policy instruments. The AMP/ACRE Project Steering Committee and the Technical Advisory Committee will facilitate a feedback loop of data and findings to policy and decision-makers. The Industry Association and linkages to the regional Community of Practice will facilitate engagement laterally and with government. The strong focus on data analysis and knowledge management in Component 3 should serve as valuable input to the Steering Committee and key stakeholders to inform planning and policy direction.
Operational Risk		
Restructuring within the newly created Ministry of Energy, coupled with capacity constraints and	Substantial (I = 5, L = 3)	Project management activities for the AMP will be incorporated under the ACRE project unit, located

[84] I = Impact; L = Likelihood

Description of risk (grouped by category)	Level of risk (I, L)[84]	Mitigation
cumbersome procurement processes will present a challenge to delivery under a full National Implementation Modality.		within the Ministry of Energy, with support from a UN Volunteer under the Project Management allocation. Participation by the Ministry of Energy and other key stakeholders in the Community of Practice will support capacity building. Where necessary, additional consultants with technical and procurement expertise will be brought in to support the Ministry with procurement.
Under the GEF allocation, the cash budget available to fund dedicated project team resources is severely limited and inadequate to support a dedicated Project Manager and Administrative/Finance Associate. Without these people, delivery of the project scope within the given timeframe will not be possible.	Substantial (I = 5, L = 3)	As above, the project management function for the AMP will be incorporated under the ACRE project with support from an UN Volunteer to alleviate the additional pressure on the existing ACRE project team. Government will assign officers who will dedicate part of their time to the day-to-day operation of the Project. Two responsible parties have been identified for the AMP in Malawi to lead the delivery of defined Outputs. Additional opportunities to contract suitable qualified responsible parties for the delivery of defined Outputs should be sought during implementation. TRAC funding has been allocated to extend the services of the ACRE PM to oversee delivery during the last two years of AMP.
A delayed start to the AMP will impact the opportunity for synergies with parallel projects. Alignment with the ACRE and EASE projects as well as coordinated activities across the regional project (e.g. DREI) means the earliest possible starting date should be targeted for the AMP in Malawi to optimally utilize the window period during which all resources are fully available.	Substantial (I = 5, L = 3)	For the pilot projects, budget has been allocated to retain some capacity/availability from the team to ensure monitoring, evaluation and continued support during the last two years. Significant preparation work (meetings, planning discussion, activity planning) has been done to ensure activities and project partners are ready to start. In support of an early and efficient start, a detailed workplan has been developed for the most critical outputs of the project. The workplan has also been frontloaded to encourage and facilitate implementation in such a way as to maximise the first two years of implementation that coincides with the ACRE and EASE projects. The DREI analysis has been scheduled to start in parallel with the other AMP countries and accordingly, resources (TORs for consultants, implementation guidelines, a list of qualified DREI practitioners, etc.) have already been prepared at the regional project level.
Given the digital platform's central importance to the project's functioning, successfully procuring	Moderate (I = 4, L = 2)	Procurement of the platform should be performed as a priority in the first half of year 1. This has been

Description of risk (grouped by category)	Level of risk (I, L)[84]	Mitigation
the digital platform will be a critical activity, which may otherwise result in significant detrimental delays to project implementation.		incorporated into all relevant documentation, including the workplan and procurement plans. Procurement will be done by the ACRE Project unit that is already established and operational, therefore well placed to proceed without delay. Additionally, a generic set of specifications has been developed for the digital platform as initial guidance for the TOR during implementation and hence facilitate the procurement process. The regional project will also provide updated guidance on TORs during implementation.
Reliance on ACRE project infrastructure past its implementation period. The ACRE project is currently scheduled to conclude in December 2023. As noted above, AMP project implementation will be incorporated under the ACRE project to optimally utilize and share resources. This presents a risk for implementation structures during the last two years of AMP implementation.	Substantial (I = 5, L = 3)	UNDP is committed to energy up to the year 2030. The Country Office has indicated their expectation that additional TRAC resources will be allocated to support the AMP PMU for the remaining implementation period. Budget from the TRAC funding has been allocated to extend the contract of the ACRE PM to oversee, with the continued support of the UN Volunteer, the delivery of the AMP outputs after ACRE concludes at the end of 2023. The budget allocation for a UN Volunteer to support project implementation has been made for 4 years. As noted above, the Ministry has also indicated Government's intent to assign officers who will dedicate part of their time to the day-to-day operation of the Project. The workplan and outputs have furthermore been frontloaded, with delivery of more involved activities scheduled during the first half of the four-year implementation period, with maintenance, monitoring (incorporating automation where possible), analysis, training and dissemination of findings and learnings scheduled for the latter half of implementation. Provision has also been made to ensure continued support from the Responsible Party for the pilot project for the 4-year AMP implementation period. Thereafter, the pilot is anticipated to continue operations as a self-sustainable social enterprise, with data interfaces fully automated. The identification and contracting of responsible parties for delivery of further aspects of the project can serve as an additional mitigation and delivery support measure.
The COVID-19 pandemic is, at the time of writing, at a point of inflection. Variants and second/third waves of infections are emerging worldwide with concomitant reactions from authorities, ranging	Moderate (I = 4, L = 2)	Scheduling of activities such as site development and on-site training that may require physical presence in certain localities has been front-loaded, allowing for a buffer in case the sanitary

Description of risk (grouped by category)	Level of risk (I, L)[84]	Mitigation
from mild restrictions on movement and curfews, to strict lockdowns and strict domestic travel restrictions. The most robust forms of restrictions could negatively impact activities requiring the physical presence of team members and stakeholders. At the pilot level, risks could relate to: - Supply chain delays or disruptions. Delays with importing or local availability of material and equipment due to reduced manufacturing capacity impacting planned delivery timelines. - Availability of construction teams. Increased absenteeism of resources due to sickness, the need to care for others, or restrictions on travel may impact project efficiency or progress. - Time and cost impact of COVID compliance. Project timelines may be delayed when scheduling around social distancing requirements and/or costs may increase to ensure compliance with COVID-19 guidance.		situation deteriorates to the point of preventing the swift realization of these activities. Online communication and teleconferencing options will be investigated and given preference to facilitate social distancing, where needed. Development at pilot sites will benefit from: - Performing a schedule assessment or time-impact analysis, including examining the status of material procurement on projects. Identifying most critical materials, equipment, products for procurement and engaging suppliers to prioritize and expose key vulnerabilities. - Identifying key resources and skills and possible alternatives in case of absences. - Prioritizing and facilitating vaccinations of workers if possible. - Assessing cost impacts of enhanced cleaning, reduced workforce, and other modifications. Assessing what services can be continued offsite to limit schedule delays.
Financial		
If co-financing is not realized as anticipated, it will significantly limit the contribution of the AMP.	Substantial (I = 5, L = 3)	Co-financing commitments from the UNDP TRAC funding, EASE project and Ministry of Energy are confirmed. The UNDP Country Office is responsible for tracking and reporting of co-financing commitments throughout project implementation. Additional co-financing and collaboration opportunities will be sought and leveraged during the implementation phase.
Social and Environmental (including climate)		
As an 'add on' to the Mthembanji and Kudembe pilot projects, there is a risk that inadequate measures have been put in place to safeguard social and environmental impacts of the projects or that safeguards are inconsistent with the requirements of the AMP and GEF. Without adequate safeguards, the project could have adverse impacts on the community, environment and minigrid industry more broadly.	Substantial (I = 5, L = 3)	The Mthembanji pilot project has complied with all national requirements with respect to social and environmental safeguards (SES). The Kudembe project is in the process of obtaining all approvals, following the same process and commitments. As part of this process, potential environmental and social impacts that could arise from the project were identified using various methodologies to assess any potential physical, biological and social impacts. The overall project was shown to contribute significant net positive social and environmental impacts for Mthembanji community. Where potentially negative impacts were identified, mitigation measures were proposed to reduce the impact of any unintended consequences and limit the risk of negative social or environmental impacts. These are encapsulated in the comprehensive Environmental and Social Management Plan (ESMP) for the project. A similar plan will be developed for the Kudembe site and

Description of risk (grouped by category)	Level of risk (I, L)[84]	Mitigation
		will be completed prior to commissioning which is planned for end 2021. All documentation for this site will be available for review at the start of the AMP project. The Mthembanji ESMP was subject to review by the SES specialist during the design phase and no obvious gaps were identified. Should any concerns arise during the course of implementation, the ESMPs can be updated or expanded to incorporate additional or UNDP / GEF specific requirements.
Irresponsible handling of battery waste at pilot projects and future developments may present a risk to the social and environmental sustainability of minigrids.	Substantial (I = 5, L = 3)	As indicated above, the Mthembanji pilot project is subject to an ESMP that includes scheduled replacement and responsible disposal of batteries. The same approach will apply for Kudembe and reflected in the ESMP. A battery return scheme by Tesvolt is operational in the country that accepts old batteries for recycling at end of life. The technical designs have estimated a 10-year battery life, after which it will be returned to Tesvolt under the return scheme offered to the project. Under the ESMP, agreements are in place to ensure that the supplier engaged for replacement of batteries partakes in the recycling scheme offered by Tesvolt.
Minigrid system, structures and operation would be vulnerable to the climate hazards and risks associated with extreme and changing weather conditions.	Moderate (I = 4, L = 2)	Climate risk has been considered and mitigation measures incorporated into the planning, design, structure and operations of the pilot sites. Details of the specific mitigation measures are included in Annex 17 of this document.
External environmental factors, like for example the effects of climate change (such as the volume and quality of rainfall, rising temperatures, floods, droughts, violent winds, earthquakes, landslides, severe winds, storm surges, etc.) could lead to delay or abandonment of the project.	Moderate (I = 4, L = 1)[85]	This is an external risk to the project that will be mitigated in the context of a variety of other third-party activities by the Government. Furthermore, external environmental factors likely to be a risk has been considered as part of the feasibility/assessment studies established in the ESMF for each site. These use conservative assumptions to successfully operate. Specifically at the two pilot sites, the generation systems are housed in containers, allowing for systems to be transported and deployed in other areas if the population leaves due to climate impacts or if there is damage to the distribution system for example.
Potential negative environmental impacts resulting from the project, either routine or non-routine based, could lead to adverse local, regional, and/or	Moderate (I = 3, L = 3)	During project preparation, similar project activities have been visited and/or consulted by the team of experts to evaluate the risks.

[85] Based on climate change indexes internationally recognised: https://germanwatch.org/en/cri and https://ccpi.org/ (released on 7 Dec), Malawi is vulnerable to climate risks, as follows 1) Climate risk: Stable trend from 1999 to 2018 at the SUBSTANTIAL range of countries affected by climate risks and surrounded in part by a HIGH climate risk country. 2) Malawi's capacity to fight climate change is not expected to be among the best countries internationally. Climate risk is therefore considered as HIGH (to be conservative) in the coming years.

Description of risk (grouped by category)	Level of risk (I, L)[84]	Mitigation
There is a risk that the productive use benefit will be captured disproportionately by one gender, either exacerbating existing inequality or leading to backlash.	Low (I=2, L=2)	Eventually conducting focus group discussions in the affected communities will offer more insight into the likelihood of technological appropriation of the rice mills and other equipment, along with collaborative problem-solving around how to address any specific barriers to asset ownership and use faced by women's businesses or cooperatives.

Stakeholder engagement and south-south cooperation: A detailed stakeholder engagement plan is included in Annex 9. Stakeholder engagement will focus on (i) encouraging engagement among key stakeholders (including industry) and decision makers regarding policy instruments that will encourage the development of minigrids, (ii) capturing and translating data into knowledge resources for sharing and capacity building among all stakeholders, and (iii) consultation, transparency and active engagement with communities where pilot projects will be implemented. Among all these stakeholders, the focus will be on inclusivity across gender, youth and vulnerable groups. All engagements will also link strongly with the AMP Regional Project, ensuring communication flow and information sharing among all AMP participating countries across the continent. The Regional AMP in turn is already establishing interfaces with relevant platforms, associations and stakeholder communities across the continent and more broadly, including the Africa Minigrid Developers Association (AMDA), among many others.

In addition, to bring the voice of Malawi to global and regional fora, the project will explore opportunities for meaningful participation in specific events where UNDP could support engagement with the global development discourse on minigrids. The project will furthermore provide opportunities for regional cooperation with countries that are implementing initiatives on minigrids in geopolitical, social and environmental contexts relevant to the proposed project in Malawi.

Gender equality and Women's Empowerment: In the absence of explicit mainstreaming and consultation, standard rural electrification schemes can have a tendency to overlook women's specific needs and desires. In the case of Malawi, this likely includes power for social/community infrastructure, cooking solutions, domestic and agricultural labor-saving devices, and income-generating equipment appropriate to women's rural micro businesses. Women in male-headed households, however, due to cultural norms (and in spite of legal rights and above average land holding) may frequently lack standing to make investment decisions about electricity-related expenditures, while women in single headed households may have a higher likelihood of being constrained by poverty, higher than average dependency ratios, and social ostracization. And yet, the history of local development projects in Malawi suggests that gender representative leadership is among key success factors for delivering public goods.

The project will address women's energy needs by explicitly including those needs in the 'energyscaping' exercise, recognizing as one interviewee put it that, "Where there is no infrastructure, women become the infrastructure." While the addition of anchor users to an existing project site does not offer opportunities to alter ownership or management of generation and distribution assets necessarily, the project can ensure that women benefit equitably from the ownership and use of electricity-consuming equipment, such as the three proposed rice mills, doing so as a group enterprise/collective if need be. Measures not only of women's project participation and economic empowerment will be captured in the Quality Assurance and Monitoring Framework, but those measures will be placed within the context of an evolving and relational notion of gender equality. For example, agents will be asked not only if they realized new income but whether they feel that income helped improve their social status, confidence, bargaining power, etc. in the household and in the community.

The detailed gender analysis and action plan is included in Annex 11.

Innovativeness, Sustainability and Potential for Scaling Up:

All activities under the AMP have a long-term focus, intended to enhance the overall context for minigrid development in the country. The project has been designed to build on and leverage from the existing knowledge base and policy framework in Malawi, targeting remaining barriers that hamper accelerated adoption of clean energy minigrids. Component 1 is intended to enhance the policy and regulatory environment, using the findings of the DREI analysis to inform further policy and regulatory refinements that will continue to progress the enabling environment for minigrids in the country. With the focus on identifying perceived risks that translate into higher system costs, findings from the DREI analysis will inform the most pertinent policy interventions needed to mitigate investment risks and achieve costs reductions, benefitting all future developments beyond the AMP implementation period.

Sustainability will be further targeted by empowering the industry association (Output 3.3) to actively engage government on behalf of developers and the private sector. A strong, constructive interface between private and public sector that recognizes and coordinates across a range of shared objectives, will contribute to growing and strengthening the local sector that will endure after the AMP has concluded. Recognising that funding of the industry association depends on memberships, the AMP will support growing the value offering of the industry association more broadly and will also support the establishment of an online, "one stop information centre" (Output 2.2) to guide developers through the process of planning and authorisations, hosted by the industry association. The interface between the industry association and the regional project will also contribute capacity building to grow the strength of their voice and the knowledge contribution that can be offered to the country and industry.

Output 1.1 focuses on augmenting planning and mapping data with additional details pertinent to minigrid development and planning, intending to serve both the public and private sector and uniformly reduce the scope and costs of prefeasibility assessments and site selections. Once developed, this resource will be integrated into the national platform, hosted by government, to ensure sustainability and open access. The value of the data to planners and developers and the speed of change in the market will determine the frequency of updates, likely to coincide with updates to the least cost electrification planning.

The pilot projects (Output 2.1), that aim to explore innovative business models and interventions to enhance the financial viability of a minigrid system, are intended to inform blueprint business model(s) that can be used to shape future system design, development and operations. The pilot projects also link to Component 3, where (i) metering data will contribute, alongside other local minigrid projects, to building a central database for the country, and (ii) monitoring of a range of indicators, including metered data, will contribute to grow the understanding of the impact and potential of minigrids, build knowledge resources and lessons learned and from where, learnings from the pilot can be disseminated to inform both the policy and regulatory environment as well technical capacity building. The entire scope of Component 3 is focused on converting data, findings, lessons and case studies into useful resources for the benefit of future developments, both nationally and in the region.

The combined impact of enhanced planning data, an enabling policy and regulatory framework incorporating (or working towards incorporating) any enhancements identified by the DREI, a business friendly investment / developer environment supported by an active industry association that encourages private sector participation and investment in minigrids in the country, coupled with rich knowledge resources that includes regional and country specific experience, is intended to significantly strengthen the platform for minigrid developments in Malawi.

V. PROJECT RESULTS FRAMEWORK

Detail related to the definition, measurement and tracking of indicators is provided in Annex 5.

This project will contribute to the following Sustainable Development Goal(s): *SDG 7. Ensure access to affordable, reliable, sustainable and modern energy for all and SDG 13. Take urgent action to combat climate change and its impacts. It will indirectly also contribute to SDG 3. Ensure healthy lives and promote well-being for all at all ages. SDG 5. Achieve gender equality and empower all women and girls. SDG 8. Promote sustained, inclusive and sustainable economic growth, full productive employment and decent work for all*				
This project will contribute to the following country outcome (UNDAF): *By 2023, Malawi has strengthened economic diversification, inclusive business, entrepreneurship and access to clean energy*				
	Objective and Outcome Indicators **(no more than a total of 20 indicators)**	**Baseline**	**Mid-term Target**	**End of Project Target**
Project Objective: Supporting access to clean energy by increasing the financial viability and promoting scaled-up commercial investment in minigrids in Malawi.	**Mandatory** GEF Core Indicators: *Indicator 1:* Greenhouse gas emissions mitigated (metric tons of carbon dioxide equivalent) *(Units of measure: metric tons of CO_{2e})*	Zero	N/A	1,068 (direct) 2,043,000 (indirect)
	Mandatory GEF Core Indicators: *Indicator 2:* Number of direct beneficiaries disaggregated by gender (and customer segment) as co-benefit of GEF investment Units of measure: number of people; number of connections disaggregated by customer segment	Zero	500 additional of which at least 250 women	763 additional persons of which 389 women --- 600 people (residential) 16 people (social) 147 people (commercial/PUE) 763 people (total) 120 connections (residential) 4 connections (social) 49 connections (commercial/PUE) 173 connections (total)
	Indicator 3: Number of direct primary jobs created in the minigrid sector, disaggregated by gender, for minigrid development, operation and productive use. *(Units of measure: Absolute number of direct jobs created)*	Zero	5 additional of which at least 2 women	10 additional of which at least 5 women
Project component 1				
Policy and Regulation **Project Outcome 1** Stakeholder ownership in a national minigrid delivery model is advanced, and appropriate policies and regulations are	*Indicator 4: Number of policy derisking instruments for minigrid investments identified and endorsed by the national government.* *(Units of measure: Absolute number of policy derisking instruments)*	Minigrid regulatory Framework was newly published in July 2020. The resulting changes in the investment environment have not been assessed. Baseline of zero, counting	Remaining development risks identified on the basis of the Derisking of Renewable Energy Investments study. Next tier of policy and regulatory interventions for	1 new policy derisking instrument for RE minigrids investment (e.g. standards, financial incentives / subsidy, etc.) identified and endorsed by the national government.

This project will contribute to the following Sustainable Development Goal(s): *SDG 7. Ensure access to affordable, reliable, sustainable and modern energy for all and SDG 13. Take urgent action to combat climate change and its impacts. It will indirectly also contribute to SDG 3. Ensure healthy lives and promote well-being for all at all ages. SDG 5. Achieve gender equality and empower all women and girls. SDG 8. Promote sustained, inclusive and sustainable economic growth, full productive employment and decent work for all*				
This project will contribute to the following country outcome (UNDAF): *By 2023, Malawi has strengthened economic diversification, inclusive business, entrepreneurship and access to clean energy*				
	Objective and Outcome Indicators **(no more than a total of 20 indicators)**	**Baseline**	**Mid-term Target**	**End of Project Target**
adopted to facilitate investment in RE'm nig ids.		amendments or additions to what is already established.	derisking identified and prioritized for Malawi. Policy and regulatory action plan formulated and endorsed by key stakeholders i.e., one plan incorporating any number of instruments relevant to the Malawi context.	
	Indicator 5: MSME, productive uses and district level data mapped and shared online to inform minigrid developments. *(Units of measure: binary (1/0))*	Least cost electrification plan for Malawi prepared, not including the proposed detail of interest to minigrids. Malawi Rural Electrification Plan published.	First iteration of map visualizing relevant data produced and shared.	Updated map incorporating MSME, productive uses and energyscaping data published on an open access, online platform.
	Outputs to achieve Outcome 1 1.1 Geospatial, techno-economic modelling of least-cost off-grid renewable electricity technologies (minigrids, grid expansion, solar home systems) Energyscaping, Micro-, Small- and Medium Sized Enterprises and productive uses data digitized, mapped and shared on a suitable open access, online platform. 1.2 Minigrid DREI techno-economic analyses carried out to assess progress and propose most cost-effective basket of policy and financial derisking instruments. 1.3 An inclusive national dialogue to identify minigrid delivery models is facilitated, clarifying priority interventions for an integrated approach to off-grid electrification.			
Project component 2				
Project and Business Model Innovation with Private Sector Engagement	*Indicator 6:* 'Blueprint' for financially self-sustainable, small scale minigrid operations defined *(Units of measure: binary (1/0))*	Currently none of the minigrids operating in Malawi are self-sustainable.	Productive use offtake on two small minigrids significantly developed to identify inflection point for self-sustainability.	Business model defined with recommendations to guide future implementation of minigrids.

This project will contribute to the following Sustainable Development Goal(s): *SDG 7. Ensure access to affordable, reliable, sustainable and modern energy for all and SDG 13. Take urgent action to combat climate change and its impacts. It will indirectly also contribute to SDG 3. Ensure healthy lives and promote well-being for all at all ages. SDG 5. Achieve gender equality and empower all women and girls. SDG 8. Promote sustained, inclusive and sustainable economic growth, full productive employment and decent work for all*				
This project will contribute to the following country outcome (UNDAF): *By 2023, Malawi has strengthened economic diversification, inclusive business, entrepreneurship and access to clean energy*				
	Objective and Outcome Indicators **(no more than a total of 20 indicators)**	**Baseline**	**Mid-term Target**	**End of Project Target**
Outcome 2 Innovative business models based on cost reduction operationalized, with strengthened private sector participation in RE minigrid development	*Indicator 7:* Number of minigrid pilots implemented that demonstrate a delivery model, cost-reduction measure(s) and/or productive use of electricity *(Units of measure: Absolute number of minigrid sites where pilots are implemented with project support)*	Baseline taken as zero specific to the AMP.	Two pilot sites demonstrating improved feasibility with PUE overlay	No further target.
	Indicator 8: Shortened development timelines for minigrid systems. *(Units of measure: Percentage reduction in development timelines)*	Baseline to be quantified at start of implementation. Processes were reported by multiple developers to be lengthy and unclear, especially for first time developers, but timelines have not been quantified / measured.	Baseline developed. First set of How to Guides and 'One Stop Information Centre' established. Development timelines monitored for users of the facility.	Development timelines for new minigrid systems improved by 25% relative to baseline.
	Outputs to achieve Outcome 2 2.1: Extension of two minigrid pilots with productive uses to identify a business model suitable to small minigrid operations. 2.2: An online 'One Stop Information Centre' established with practicable guidance to developers for navigating unfamiliar and/or evolving regulatory processes from concept to commissioning.			
Project component 3				
Digital, Knowledge Management and Monitoring and Evaluation **Outcome 3** Data and digitalization are mainstreamed, across stakeholders, into local minigrid market development. Increased knowledge, awareness and network opportunities in the minigrid market and among stakeholders, including	*Indicator 9.* A digital strategy for the project is prepared and implemented by the relevant PMU to contribute to project implementation and local minigrid market development. *(Units of measure: binary (1/0))*	Digital strategy not currently in place.	Digital strategy developed and being implemented.	Digital strategy implemented. Complete dataset of all outputs and measured data from pilot projects. Comprehensive country specific knowledge resource with case studies, communications and training material.
	Indicator 10: Number of minigrid pilots sharing data on minigrid performance with the regional project and	Baseline data from Mthembanji minigrid pilot project, Sitolo Minigrid and Mulanje Electricity	The project's 'digital & data management platform' is procured and operational, ready for data collection from	At least 4 minigrid pilots are collecting and sharing data with the AMP Regional Project using the

is pro ill co ute to ollow...g Sustainable Development Goal(s): *SDG 7. Ensure access to affordable, reliable, sustainable and modern energy for all and SDG 13. Take urgent action to combat climate change and its impacts. It will indirectly also contribute to SDG 3. Ensure healthy lives and promote well-being for all at all ages. SDG 5. Achieve gender equality and empower all women and girls. SDG 8. Promote sustained, inclusive and sustainable economic growth, full productive employment and decent work for all*				
This project will contribute to the following country outcome (UNDAF): *By 2023, Malawi has strengthened economic diversification, inclusive business, entrepreneurship and access to clean energy*				
	Objective and Outcome Indicators **(no more than a total of 20 indicators)**	**Baseline**	**Mid-term Target**	**End of Project Target**
benefitting from linkages to international good practice.	other stakeholders following best practices and guidance provided by the AMP Regional Project *(Units of measure: Absolute number of pilots sharing data)*	Generation Company being collected but not aggregated.	the project's mini-grid pilot(s), and for data sharing with the AMP regional project's digital platform. Both (2) AMP minigrid pilot sites collecting and sharing data with the AMP Regional Project using the project's 'digital & data management platform'.	project's 'digital & data management platform'.
Outputs to achieve Outcome 3	**Outputs to achieve Outcome 3** 3.1: A Quality Assurance and Monitoring Framework for measuring, reporting and verification of the sustainable development impacts of all minigrids pilots supported, including GHG emission reductions, is adopted and operationalized based on standardized guidance from the regional project. 3.2: A Project Digital strategy is developed and implemented, including linkages to and following guidance from the regional project with smart metering data aggregated, analyzed and disseminated. 3.3 Minigrids digital platform implemented to manage data from pilots, and to support minigrids scale-up and cost-reduction. 3.4: Active interface with regional project established, including, but not limited to, via (i) participating in Communities of Practice and (ii) capturing and sharing lessons learnt. 3.5: Industry association strengthened to advocate for and actively engage Government on behalf of private sector minigrid developers and operators. 3.6: M&E and Reporting, including (i) Conducting inception workshop and preparing report, (ii) Ongoing M&E, (iii) Mid Term Evaluation and (iv) Terminal Evaluation			

VI. MONITORING AND EVALUATION (M&E) PLAN

The project results, corresponding indicators and mid-term and end-of-project targets in the project results framework will be monitored annually and evaluated periodically during project implementation. If baseline data for some of the results indicators is not yet available, it will be collected during the first year of project implementation. The Monitoring Plan included in Annex details the roles, responsibilities, and frequency of monitoring project results.

Project-level monitoring and evaluation will be undertaken in compliance with UNDP requirements as outlined in the UNDP POPP and UNDP Evaluation Policy. The UNDP Country Office is responsible for ensuring full compliance with all UNDP project monitoring, quality assurance, risk management, and evaluation requirements.

Additional mandatory GEF-specific M&E requirements will be undertaken in accordance with the GEF Monitoring Policy and the GEF Evaluation Policy and other relevant GEF policies[86]. The costed M&E plan included below, and the Monitoring plan in Annex, will guide the GEF-specific M&E activities to be undertaken by this project.

In addition to these mandatory UNDP and GEF M&E requirements, other M&E activities deemed necessary to support project-level adaptive management will be agreed during the Project Inception Workshop and will be detailed in the Inception Report.

Additional GEF monitoring and reporting requirements:

Inception Workshop and Report: A project inception workshop will be held within 60 days of project CEO endorsement, with the aim to:

a. Familiarize key stakeholders with the detailed project strategy and discuss any changes that may have taken place in the overall context since the project idea was initially conceptualized that may influence its strategy and implementation.
b. Discuss the roles and responsibilities of the project team, including reporting lines, stakeholder engagement strategies and conflict resolution mechanisms.
c. Review the results framework and monitoring plan.
d. Discuss reporting, monitoring and evaluation roles and responsibilities and finalize the M&E budget; identify national/regional institutes to be involved in project-level M&E; discuss the role of the GEF OFP and other stakeholders in project-level M&E.
e. Update and review responsibilities for monitoring project strategies, including the risk log; SESP report, Social and Environmental Management Framework and other safeguard requirements; project grievance mechanisms; gender strategy; knowledge management strategy, and other relevant management strategies.
f. Review financial reporting procedures and budget monitoring and other mandatory requirements and agree on the arrangements for the annual audit.
g. Plan and schedule Project Board meetings and finalize the first-year annual work plan. Finalize the TOR of the Project Board.
h. Formally launch the Project.

GEF Project Implementation Report (PIR):
The annual GEF PIR covering the reporting period July (previous year) to June (current year) will be completed for each year of project implementation. Any environmental and social risks and related management plans will be monitored regularly, and progress will be reported in the PIR. The PIR submitted to the GEF will be shared with the Project Board. The quality rating of the previous year's PIR will be used to inform the preparation of the subsequent PIR.

[86] See https://www.thegef.org/gef/policies_guidelines

GEF Core Indicators:
The GEF Core indicators included as Annex will be used to monitor global environmental benefits and will be updated for reporting to the GEF prior to MTR and TE. Note that the project team is responsible for updating the indicator status. The updated geospatial polygons should be shared with MTR/TE consultants prior to required evaluation missions, so these can be used for subsequent groundtruthing. The methodologies to be used in data collection have been defined by the GEF and are available on the GEF website.

Regional Project Integration
M&E is a key area of interface between the national project and the AMP Regional Project. The latter can support the PMU to undertake planning, coordination, management, monitoring, evaluation and reporting. The Malawi project will establish linkages with the AMP Regional project as described in Box 8 below:

Box 8: Linkages to the AMP Regional Project - M&E

The project will share M&E information with the AMP Regional Project as follows:

- The project will provide on an annual basis (and to the extent feasible if requested on an ad-hoc basis) the following M&E information to the AMP regional project staff: (a) Standard reporting on all indicators in the results framework for aggregation and reporting to GEF (by the regional project) on the impacts of all participating national projects for the program as a whole; and (b) Reporting on any and all additional Key Performance Indicators (KPIs) adopted by the project under the common M&E framework.

The project will receive support and guidance from the AMP Regional Project for conducting M&E activities as follows:

- **Inception workshop.** The AMP Regional Project PMU will:
  a. Provide support to the project PMU to develop content and materials to facilitate project planning activities to be completed during and after the Inception Workshop. This includes but is not limited to support for the PMU to prepare and/or update 'key project planning instruments' such as the Total Budget and Work Plan, multi-year work plan, Annual Work Plan (AWP), Monitoring Plan, Risks Matrix, and Procurement Plan, among others.
  b. Participate either remotely or in-person in the Inception Workshop.
  c. Review and provide inputs to the Inception Report prior to submitting to UNDP.
- **Ongoing project monitoring.** The AMP Regional Project PMU will:
  a. Develop a 'common monitoring and evaluation (M&E) framework' against which GHG emission reductions and broader SDG impacts and program objectives can be measured, and work closely with national child projects to ensure operationalization and harmonization.
  b. Provide support to the project PMU for updating 'key project planning instruments' at least on an annual basis as required to comply with UNDP project monitoring, quality assurance, and risk management requirements, and ensure adequate project planning and adaptive management. This may entail developing common templates for 'key project planning instruments'.
  c. Review and provide feedback on reports submitted by the project PMU seeking to continuously improve the quality and ease of reporting by national projects.
  d. Aggregate M&E data from all national projects, including Results Framework and all additional Key Performance Indicators (KPIs) adopted by the project under the common M&E framework, and report back to GEF at the program level.
- **Evaluations (MTR and TE).** The AMP Regional Project PMU will:
  a. Make available to national projects standardized terms of reference for MTR and TE as well as a roster of vetted evaluation consultants.
  b. Review and provide feedback on terms of reference and draft evaluation reports shared by the project PMU to ensure project-level evaluation will be undertaken in compliance with UNDP requirements.
  c. Make themselves available for interviews and consultation in the context of national project mid-term and terminal evaluations.

Independent Mid-term Review (MTR):
The terms of reference, the review process and the final MTR report will follow the standard templates and guidance for GEF-financed projects available on the UNDP Evaluation Resource Center (ERC).

The evaluation will be 'independent, impartial and rigorous'. The evaluators that will be hired to undertake the assignment will be independent from organizations that were involved in designing, executing or advising on the project to be evaluated. Equally, the evaluators should not be in a position where there may be the possibility of future contracts regarding the project under review.

The GEF Operational Focal Point and other stakeholders will be actively involved and consulted during the evaluation process. Additional quality assurance support is available from the BPPS/GEF Directorate.

The final MTR report and MTR TOR will be publicly available in English and will be posted on the UNDP ERC by 1 September 2023. A management response to MTR recommendations will be posted in the ERC within six weeks of the MTR report's completion.

Terminal Evaluation (TE):
An independent terminal evaluation (TE) will take place upon completion of all major project outputs and activities. The terms of reference, the evaluation process and the final TE report will follow the standard templates and guidance for GEF-financed projects available on the UNDP Evaluation Resource Center.

The evaluation will be 'independent, impartial and rigorous'. The evaluators that will be hired to undertake the assignment will be independent from organizations that were involved in designing, executing or advising on the project to be evaluated. Equally, the evaluators should not be in a position where there may be the possibility of future contracts regarding the project being evaluated.

The GEF Operational Focal Point and other stakeholders will be actively involved and consulted during the terminal evaluation process. Additional quality assurance support is available from the BPPS/GEF Directorate.

The final TE report and TE TOR will be publicly available in English and posted on the UNDP ERC by 1 June 2025. A management response to the TE recommendations will be posted to the ERC within six weeks of the TE report's completion.

Final Report:
The project's terminal GEF PIR along with the terminal evaluation (TE) report and corresponding management response will serve as the final project report package. The final project report package shall be discussed with the Project Board during an end-of-project review meeting to discuss lesson learned and opportunities for scaling up.

Agreement on intellectual property rights and use of logo on the project's deliverables and disclosure of information:
To accord proper acknowledgement to the GEF for providing grant funding, the GEF logo will appear together with the UNDP logo on all promotional materials, other written materials like publications developed by the project, and project hardware. Any citation on publications regarding projects funded by the GEF will also accord proper acknowledgement to the GEF. Information will be disclosed in accordance with relevant policies notably the UNDP Disclosure Policy[87] and the GEF policy on public involvement[88].

[87] See http://www.undp.org/content/undp/en/home/operations/transparency/information_disclosurepolicy/
[88] See https://www.thegef.org/gef/policies_guidelines

Monitoring and Evaluation Plan and Budget.

The M&E plan and budget provides a breakdown of costs for M&E activities to be led by the Project Management Unit during project implementation. These costs are included in Component 3 of the project. [illegible] M&E plan under the one technical component. The oversight and participation of the UNDP Country Office/Regional technical advisors/HQ Units are not included as these are covered by the GEF fee.

GEF M&E requirements	Indicative costs (US$)	Time frame
Inception Workshop	3,000	Within 60 days of CEO endorsement of this project.
Inception Report	None[89]	Within 90 days of CEO endorsement of this project.
M&E of GEF core indicators and project results framework	12,000 (3,000 per year)	Annually and at mid-point and closure.
GEF Project Implementation Report (PIR)	None[90]	Annually typically between June-August, starting after first year of implementation.
Monitoring of Environmental and Social Safeguards Framework	None[91]	On-going data collection, Annual reporting
Monitoring of Gender Action Plan	None[92]	On-going data collection, Annual reporting
Supervision missions	None	Annually
Independent Mid Term Review (MTR)	30,000	1 February 2024
Independent Terminal Evaluation (TE)	42,000	1 November 2025
TOTAL Indicative COST	**87,000**[93]	Add to TBWP component 4

VII. GOVERNANCE AND MANAGEMENT ARRANGEMENTS

Roles and responsibilities of the project's governance mechanism:

Implementing Partner: The Implementing Partner for this project is the **Ministry of Energy** (MoE) within the Government of Malawi.

The Implementing Partner is the entity to which the UNDP Administrator has entrusted the implementation of UNDP assistance specified in this signed project document along with the assumption of full responsibility and accountability for the effective use of UNDP resources and the delivery of outputs, as set forth in this document.

[89] To be prepared by PMU, with no additional costs

[90] Activities and costs included in the PMU, Country Office and Regional Technical Advisor functions.

[91] The ESMF has not identified specific indicators at this time, however socio-economic and environmental indicators have been incorporated under the data collection and overall monitoring framework and integrated under Output 3.4. A separate budget has therefore not been allocated.

[92] Gender specific indicators have been incorporated into the indicators, data collection and overall monitoring framework and are therefore already covered under the budget for Output 3.4. No additional budget allocation,

[93] All of these M&E activities are funded from UNDP TRAC resources.

The Implementing Partner is responsible for executing this project. Specific tasks include:

- Project planning, coordination, management, monitoring, evaluation and reporting. This includes providing all required information and data necessary for timely, comprehensive and evidence-based project reporting, including results and financial data, as necessary. The Implementing Partner will strive to ensure project-level M&E is undertaken by national institutes and is aligned with national systems so that the data used and generated by the project supports national systems.
- Risk management as outlined in this Project Document;
- Procurement of goods and services, including human resources;
- Financial management, including overseeing financial expenditures against project budgets;
- Approving and signing the multiyear workplan;
- Approving and signing the combined delivery report at the end of the year; and,
- Signing the financial report or the funding authorization and certificate of expenditures.

A joint Project Unit will be incorporated under the Access to Clean and Renewable Energy (ACRE) Programme Support that is located within the Ministry of Energy (MoE) who serves as the Implementing Partner and "Programme Coordinator"[94] of the UNDP-supported ACRE project. The project team will coordinate across all the components and outputs of the project. The joint Project Unit will be supported by a United Nations Volunteer (UNV) acting as Project Assistant/Finance Officer for the AMP project. The scope of duties for these roles are available in Annex 8 to the Project Document. The project will also benefit from Government assigned officers who will dedicate part of their time to the day-to-day operation of the Project.

Responsible Parties: The Implementing Partner may enter into a written agreement with other organizations, known as responsible parties, to provide goods and/or services to the project, carry out project activities and/or produce outputs using the project budget. Responsible parties are directly accountable to the Implementing Partner in accordance with the terms of their agreement or contract with the Implementing Partner. Any organization that is legally constituted and duly registered may become a responsible party including government agencies, NGOs, private firms, and academia.

Responsible parties have been identified to support the delivery of aspects of the project on behalf of the MOE. Contracts will be placed with the responsible parties for the delivery of:

- United Nations Capital Development Fund (UNCDF) – Component 1, Output 1.1: Geospatial data; and
- University of Strathclyde – Component 2, Output 2.1: Mthembanji and Kudembe productive use pilot projects.

The legal instruments (contracts/agreements) to engage responsible parties will be included in Annex 14 to this Project Document on conclusion and signature. Responsible parties should not serve on the Project Steering Committee to avoid conflict of interest.

During implementation, **additional parties may be identified and appointed to act as responsible parties** and these contracts added to the above.

Project stakeholders and target groups:
All the people of Malawi stand to benefit from accelerated investments in clean energy. All taxpayers and electricity users stand to benefit from more cost-effective ways to deliver clean energy to end users. More specifically, rural communities currently without access to electricity will benefit from solutions that will enable affordable, clean energy to be delivered to their communities. Very directly, the specific communities who will be the recipients of the pilot projects will benefit from access to clean energy and the multiple associated socio-economic benefits including opportunities for income generation. The communities will be engaged in the design of the pilot initiatives and the selection of productive uses. Community representatives will be elected by the communities for

[94] Role as defined in the ACRE project documentation

participation in the Project Steering Committee and/or the Technical Advisory Committee as deemed most appropriate. It is hoped that active engagement of direct beneficiaries at pilot level will inform future developments in other communities.

The potential RE minigrid industry will also benefit from the investment in capacity building and the piloting of innovative business models that can guide future development and operation. REIAMA, the Renewable Energy Industries Association in the country, will be engaged as industry representative and Technical Advisory Committee member.

UNDP: UNDP is accountable to the GEF for the implementation of this project. This includes oversight of project execution to ensure that the project is being carried out in accordance with agreed standards and provisions. UNDP is responsible for delivering GEF project cycle management services comprising project approval and start-up, project supervision and oversight, and project completion and evaluation. UNDP is also responsible for the Project Assurance role of the Project Steering Committee and Technical Advisory Committee.

Project organisation structure:
The AMP will be incorporated under the existing structures of the ACRE project. The ACRE project has an established Project Steering Committee supported by a Technical Advisory Committee (TAC). While these structures will continue to serve the ACRE project, only the relationship to the AMP is depicted below. The project structures, as they apply to the ACRE project, is described in the ACRE project document, Figure 9.

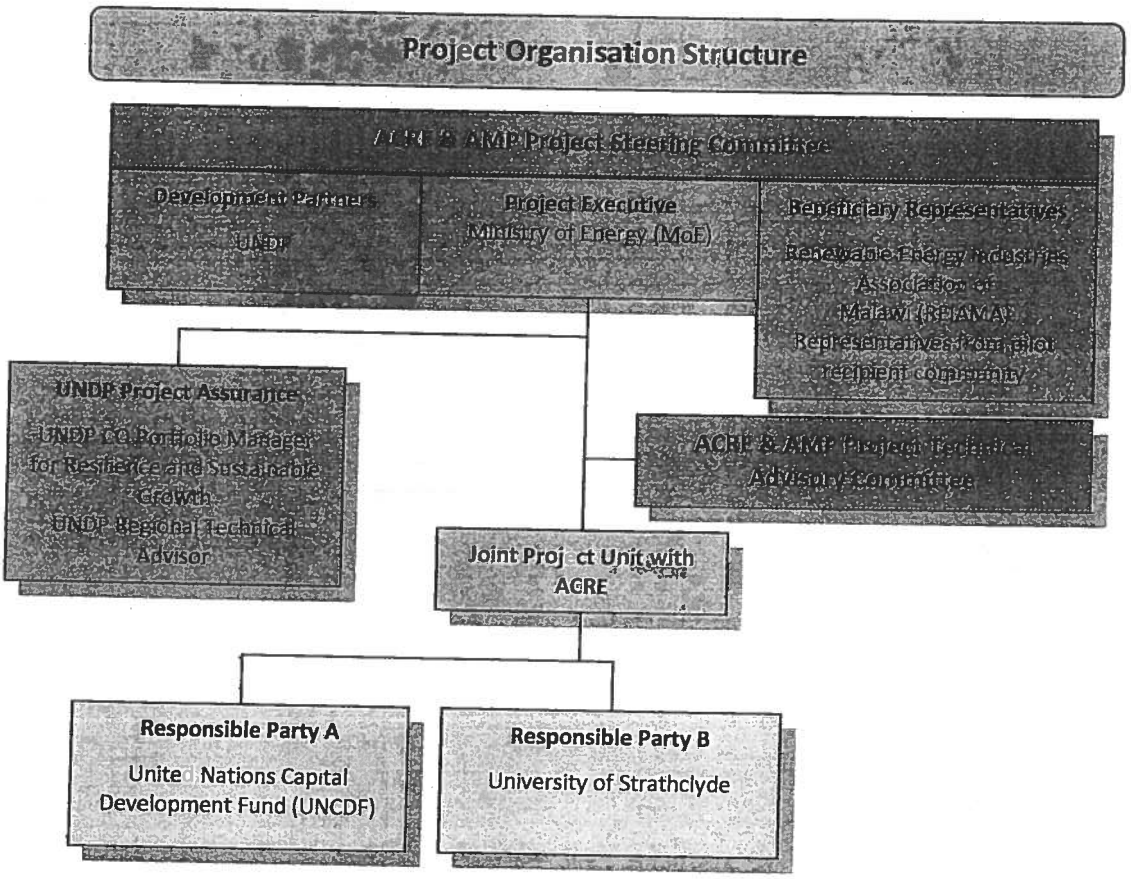


Figure 8: Project organizational structure (integrated into existing ACRE structures)

The existing ACRE Project Steering Committee will extend its management oversight role to include the AMP project. The Project Steering Committee is chaired by the Ministry of Energy and coordinated by the Secretariat, which is also led by the Ministry of Energy. The Steering Committee will provide strategic guidance to the Project and periodically review the initiatives undertaken by the project and responsible parties. It will be responsible for taking corrective action as needed to ensure the project achieves the desired results. In order to ensure UNDP's ultimate accountability, Project Steering Committee decisions should be made in accordance with standards that shall ensure management for development results, best value for money, fairness, integrity, transparency and effective international competition.

In case consensus cannot be reached within the Steering Committee, the UNDP Resident Representative (or their designate) will mediate to find consensus and, if this cannot be found, will take the final decision to ensure project implementation is not unduly delayed.

Specific responsibilities of the Project Steering Committee include:

- Provide overall guidance and direction to the project, ensuring it remains within any specified constraints;
- Address project issues as raised by the project manager;
- Provide guidance on new project risks, and agree on possible mitigation and management actions to address specific risks;
- Agree on project manager's tolerances as required, within the parameters set by UNDP-GEF, and provide direction and advice for exceptional situations when the project manager's tolerances are exceeded;
- Advise on major and minor amendments to the project within the parameters set by UNDP-GEF;
- Ensure coordination between various donor and government-funded projects and programmes;
- Ensure coordination with various government agencies and their participation in project activities;
- Track and monitor co-financing for this project;
- Review the project progress, assess performance, and appraise the Annual Work Plan for the following year;
- Appraise the annual project implementation report, including the quality assessment rating report;
- Ensure commitment of human resources to support project implementation, arbitrating any issues within the project;
- Review combined delivery reports prior to certification by the Implementing Partner;
- Provide direction and recommendations to ensure that the agreed deliverables are produced satisfactorily according to plans;
- Address project-level grievances;
- Approve the project Inception Report, Mid-term Review and Terminal Evaluation reports and corresponding management responses;
- Review the final project report package during an end-of-project review meeting to discuss lesson learned and opportunities for scaling up.
- Ensure highest levels of transparency and take all measures to avoid any real or perceived conflicts of interest.
- Designate the 'beneficiary representative' of the project on the AMP Regional Project's Steering Committee/Project Board

The existing Project Steering Committee already includes the following roles:

a. Project Executive: Is an individual who represents ownership of the project and chairs the Project Steering Committee. The Executive is normally the national counterpart for nationally implemented projects. The Project Executive is: Secretary of Energy, Ministry of Energy.

b. Development Partner(s): Individuals or groups representing the interests of the parties concerned that provide funding and/or technical expertise to the project. The UNDP and representatives from other Development Partners, as relevant to ACRE and AMP.

The Project Steering Committee is also required to include the following roles:

c. Project Assurance: UNDP performs the quality assurance and supports the Project Steering Committee and Project Unit by carrying out objective and independent project oversight and monitoring functions. This role ensures appropriate project management milestones are managed and completed, and conflict of interest issues are monitored and addressed. The Project Steering Committee cannot delegate any of its quality assurance responsibilities to the Project Unit. UNDP provides a three – tier oversight services involving the UNDP Country Offices and UNDP at regional and headquarters levels. Project assurance is totally independent of project execution.

d. Beneficiary Representative(s): Individuals or groups representing the interests of those who will ultimately benefit from the project. Their primary function within the board is to ensure the realization of project results from the perspective of project beneficiaries. Often civil society representative(s) can fulfil this role. The Beneficiary representative(s) are: Nominated representative from the Renewable Energy Industries Association (REIAMA) and elected representatives from the pilot project recipient community.

The Project Steering Committee is supported by the Project Technical Advisory Committee (TAC) established under ACRE. The TAC serves as a sub-committee of the Steering Committee, with specific focus on technical advisory support to guide implementation and coordination of the project. It is chaired by the Ministry of Energy and meets at least quarterly prior to and in preparation for the scheduled Project Steering Committee meeting.

Duties and responsibilities of the TAC include, among others:

- Generally, provide technical guidance to the Ministry of Energy on implementation of the project;
- Review of annual work plans and budgets as well as the annual procurement plan for the Project and make recommendations of the same for adoption by the Steering Committee;
- Review and approval of technical designs of items of project components;
- Oversight on the development of terms of references for external consultancies on the Projects;
- Review the effectiveness of the Project's technical standards, codes of practice and recommend remedial measures;
- Ensure that there is consistency between the technical Activities of the Project and relevant Government policies and Development Strategy;
- Review the technical aspects of any proposal that requires Steering Committee approval under the Projects; and
- Review and ensure linkages between the Project Outcomes with relevant Government bodies.

Regional Project Steering Committee / Project Board

The AMP national projects will be among the primary beneficiaries of regional project activities. As such and in line with established practice in similar global/regional projects, a representative of the project will sit on the project board/steering committee of the AMP Regional Project in a role as 'beneficiary representative.' It is expected that all AMP Regional Project board meetings will be held virtually (i.e. not in-person) and that beneficiary representatives will participate in project board meetings via video-conference. The representative of the project on the AMP Regional Project board will be from the Implementing Partner or a suitable delegate. It is expected that the AMP regional project board will meet a maximum of twice per year.

Project extensions: The UNDP Resident Representative and the UNDP-GEF Executive Coordinator must approve all project extension requests. Note that all extensions incur costs and the GEF project budget cannot be increased. A single extension may be granted on an exceptional basis and only if the following conditions are met: one extension only for a project for a maximum of six months; the project management costs during the extension period must remain within the originally approved amount, and any increase in PMC costs will be covered by non-GEF resources; the UNDP Country Office oversight costs in excess of the CO's Agency fee specified in the DOA during the extension period must be covered by non-GEF resources.

VIII. FINANCIAL PLANNING AND MANAGEMENT

The total cost of the project is USD 3,740,520. This is financed through a GEF grant of *USD* 396,125 administered by UNDP, USD 1,000,000 in cash co-financing to be administered by UNDP and additional support of USD 2,344,395. UNDP, as the GEF Implementing Agency, is responsible for the oversight of the GEF resources and the cash co-financing transferred to UNDP bank account only.

Confirmed Co-financing: The actual realization of project co-financing will be monitored during the terminal evaluation process and will be reported to the GEF. Note that all project activities included in the project results framework that will be delivered by co-financing partners (even if the funds do not pass through UNDP accounts) must comply with UNDP's social and environmental standards. Co-financing will be used for the following project activities/outputs:

Co-financing source	Co-financing type	Co-financing amount	Planned Co-financing Activities/Outputs	Risks	Risk Mitigation Measures
UNDP TRAC funding	Cash	USD 1,000,000	Made available to support implementation of the AMP project and allocated across all components.	None foreseen	N/A
Ministry of Energy	In-kind	USD 906,903	Project management, project assistance, M&E, office space and other related infrastructure support.	Capacity challenges hampering the availability of any of the planned resources	This commitment letter
Scottish Government EASE funding[95]	Grant	USD 793,492[96]	Parallel and complementary activities during two years of concurrent implementation	None foreseen (already committed)	N/A
UNCDF	In-kind	USD 644,000	Sharing of data resources, including a nationally representative FinScope consumer survey and a FinScope MSME survey, that will form the basis of further data mining, analysis and mapping work under the AMP.	None foreseen (already committed)	N/A

Budget Revision and Tolerance: As per UNDP requirements outlined in the UNDP POPP, the project board will agree on a budget tolerance level for each plan under the overall annual work plan allowing the project manager to expend up to the tolerance level beyond the approved project budget amount for the year without requiring a revision from the Project Board.

[95] For activities under the Energy Access through Social Enterprise (EASE) and Decentralisation project and administrated by University of Strathclyde

[96] £587,772 budget for 2021 - 2023 converted at an exchange rate of 1.35 Pounds Sterling to the US Dollar (19 December 2020)

Should the following deviations occur, the Project Manager/CTA and UNDP Country Office will seek the approval of the BPPS/GEF team to ensure accurate reporting to the GEF:
a) Budget re-allocations among components in the project budget with amounts involving 10% of the total project

b) Introduction of new budget items that exceed 5% of original GEF allocation.

Any over expenditure incurred beyond the available GEF grant amount will be absorbed by non-GEF resources (e.g. UNDP TRAC or cash co-financing).

Audit: The project will be audited as per UNDP Financial Regulations and Rules and applicable audit policies. Audit cycle and process must be discussed during the Inception workshop. If the Implementing Partner is an UN Agency, the project will be audited according to that Agencies applicable audit policies.

Project Closure: Project closure will be conducted as per UNDP requirements outlined in the UNDP POPP. All costs incurred to close the project must be included in the project closure budget and reported as final project commitments presented to the Project Board during the final project review. The only costs a project may incur following the final project review are those included in the project closure budget.

Operational completion: The project will be operationally completed when the last UNDP-financed inputs have been provided and the related activities have been completed. This includes the final clearance of the Terminal Evaluation Report (that will be available in English) and the corresponding management response, and the end-of-project review Project Board meeting. **Operational closure must happen with 3 months after posting the TE report to the UNDP ERC.** The Implementing Partner through a Project Board decision will notify the UNDP Country Office when operational closure has been completed. At this time, the relevant parties will have already agreed and confirmed in writing on the arrangements for the disposal of any equipment that is still the property of UNDP.

Transfer or disposal of assets: In consultation with the Implementing Partner and other parties of the project, UNDP is responsible for deciding on the transfer or other disposal of assets. Transfer or disposal of assets is recommended to be reviewed and endorsed by the project board following UNDP rules and regulations. Assets may be transferred to the government for project activities managed by a national institution at any time during the life of a project. In all cases of transfer, a transfer document must be prepared and kept on file[97]. The transfer should be done before Project Management Unit complete their assignments.

Financial completion (closure): The project will be financially closed when the following conditions have been met: a) the project is operationally completed or has been cancelled; b) the Implementing Partner has reported all financial transactions to UNDP; c) UNDP has closed the accounts for the project; d) UNDP and the Implementing Partner have certified a final Combined Delivery Report (which serves as final budget revision).

The project will be financially completed **within 6 months of operational closure or after the date of cancellation.** Between operational and financial closure, the Implementing Partner will identify and settle all financial obligations and prepare a final expenditure report. The UNDP Country Office will send the final signed closure documents including confirmation of final cumulative expenditure and unspent balance to the BPPS/GEF Unit for confirmation before the project will be financially closed in Atlas by the UNDP Country Office.

Refund to GEF: Should a refund of unspent funds to the GEF be necessary, this will be managed directly by the BPPS/GEF Directorate in New York. No action is required by the UNDP Country Office on the actual refund from UNDP project to the GEF Trustee.

---

[97] See https://popp.undp.org/_layouts/15/WopiFrame.aspx?sourcedoc=/UNDP_POPP_DOCUMENT_LIBRARY/Public/PPM_Project%20Management_Closing.docx&action=default.

IX. TOTAL BUDGET AND WORK PLAN

Total Budget and Work Plan			
Atlas Award ID:	00136404	Atlas Output Project ID:	00127321
Atlas Proposal or Award Title:	GEF Africa Minigrids		
Atlas Business Unit	MWL10		
Atlas Primary Output Project Title	GEF Africa Minigrids Program - Malawi		
UNDP-GEF PIMS No.	6512		
Implementing Partner	*Ministry of Energy, Malawi*		

Atlas Activity (GEF Component)	Atlas Implementing Agent (Responsible Party, IP or UNDP)	Atlas Fund ID	Donor Name	Atlas Budgetary Account Code	ATLAS Budget Account Description[3]	Amount Year 2022 (USD)	Amount Year 2023 (USD)	Amount Year 2024 (USD)	Amount Year 2025 (USD)	Amount Year 2026 (USD)	Total (USD)	*See Budget Note:*
COMPONENT 1: Policy and Regulation	**Ministry of Energy (IP); United Nations Capital Development Fund (UNCDF)**	**62000**	**GEF**	71300	Local Consultants	0	7,500	0	0	0	7,500	*1*
				72100	Contractual Services-Companies	15,000	50,500	0	0	7,000	72,500	*2*
					sub-total GEF	**15,000**	**58,000**	**0**	**0**	**7,000**	**80,000**	
		4000	**UNDP**	71200	International Consultants	0	40,000	0	5,000	0	45,000	*3*
				71300	Local Consultants	0	10,000	2,500	3,500	0	16,000	*4*
				72100	Contractual Services-Companies	0	142,000	52,500	0	20,000	214,500	*5*
				75700	Training, Workshops and Confer	0	5,000	5,000	5,000	0	15,000	*6*
				71600	Travel	0	7,500	0	2,500	0	10,000	*7*
					sub-total UNDP	**0**	**204,500**	**60,000**	**16,000**	**20,000**	**300,500**	
					Total Outcome 1	**15,000**	**262,500**	**60,000**	**16,000**	**27,000**	**380,500**	
COMPONENT 2: Business Model Innovation with Private Sector	**Ministry of Energy (IP); University of Strathclyde (UoS)**	**62000**	**GEF**	72100	Contractual Services-Companies	0	43,412	39,952	16,832	16,828	117,024	*8*
				72200	Equipment and Furniture	0	34,110	8,700	0	0	42,810	*9*
					sub-total GEF	**0**	**77,522**	**48,652**	**16,832**	**16,828**	**159,834**	
		4000	**UNDP**	71200	International Consultants	0	10,000	40,000	30,000	30,000	110,000	*10*

				72100	Contractual Services-Companies	0	17,500	21,666	37,933	25,93	103,036	11
				75700	Training, Workshops and Confer	0	2,000	5,000	1,500	1,500	10,000	12
					sub-total UNDP	**0**	**29,500**	**66,666**	**69,433**	**57,437**	**223,036**	
					Total Outcome 2	**0**	**107,022**	**115,318**	**86,265**	**74,265**	**382,870**	
COMPONENT 3: Digital, Knowledge Management and Monitoring and Evaluation	**Ministry of Energy (IP)**	**62000**	**GEF**	71200	International Consultants	0	5,000	0	5,000	0	10,000	13
				71300	Local Consultants	0	3,000	3,000	3,000	3,000	12,000	14
				72100	Contractual Services-Companies	0	65,291	13,000	19,000	13,000	110,291	15
					sub-total GEF *(Digital and KM)*	**0**	**73,291**	**16,000**	**27,000**	**16,000**	**132,291**	
		4000	**UNDP**	71200	*International Consultants*	*0*	*3,000*	*33,000*	*3,000*	*45,000*	*84,000*	*16*
				75700	*Training, Workshops and Confer*	*3,000*	*0*	*0*	*0*	*0*	*3,000*	*17*
					Subtotal(UNDP M&E subcomponent	***3,000***	***3,000***	***33,000***	***3,0***	***45,000***		
				71200	International Consultants	0	7,000	7,000	7,000	7,000	28,000	*18*
				71300	Local Consultants	0	14,375	11,750	11,750	11,750	49,625	*19*
				72100	Contractual Services-Companies	4,000	12,000	3,500	3,500	3,500	26,500	*20*
				74200	Audio Visual&Print Prod Costs	0	1,000	1,000	1,000	1,000	4,000	*21*
				72800	Information Technology Equipmt	0	2,339	0	0	0	2,339	*22*
				71600	Travel	0	13,500	17,500	13,500	17,500	62,000	*23*
				75700	Training, Workshops and Confer	0	13,000	10,000	10,00	10,000	43,000	*24*
					Subtotal UNDP (Digital and)	4000	63214	50750	46750	50750	215464	
					sub-total UNDP	**7,000**	**66,214**	**83,750**	**49,750**	**95,750**	**302,464**	
					Total Outcome 3	**7,000**	**139,505**	**99,750**	**76,750**	**111,750**	**434,755**	
Project management costs	**Ministry of Energy (IP)**	**62000**	**GEF**	74100	Professional Services	0	3,000	3,000	3,000	3,000	12,000	*25*
				71600	Travel	0	3,000	3,000	3,000	3,000	12,000	*26*
					sub-total GEF	**0**	**6,000**	**6,000**	**6,000**	**6,000**	**24,000**	

		4000	UNDP	71500	UN Volunteers	3,000	15,000	15,000	15,000	12,000	60,000	27
				71400	Contractual Services-Indvidial	0	0	0	60,000	54,000	114,000	28
					sub-total UNDP	**3,000**	**15,000**	**15,000**	**75,000**	**66,000**	**174,000**	
					Total Project Management	**3,000**	**21,000**	**21,000**	**81,000**	**72,000**	**198,000**	
					SUB-TOTAL GEF	**15,000**	**219,813**	**70,652**	**51,832**	**38,828**	**396,125**	
					SUB-TOTAL UNDP	**10,000**	**320,214**	**230,416**	**215,183**	**224,187**	**1,000,000**	
					PROJECT TOTAL	**25,000**	**540,027**	**301,068**	**267,015**	**263,015**	**1,396,125**	

Summary of funds (US Dollars)

	Amount Year 1[98]	Amount Year 2	Amount Year 3	Amount Year 4	Amount Year 5	Total
GEF	15,000	214,813	70,652	49,832	45,828	396,125
UNDP (Cash: $1 million)	10,000	315,214	225,416	210,183	239,187	1,000,000
Ministry of Energy (MOE) (In-kind)	6,903	225,000	225,000	225,000	225,000	906,903
EASE (parallel investment / grant)	132,249	528,995	132,249	0	0	793,492
UNCDF (In-kind)		429,333	214,667	0	0	644,000
TOTAL	**164,152**	**1,713,355**	**867,983**	**485,015**	**510,015**	**3,740,520**

Budget note number	Comments
1	Provision is made for input from a gender specialist to support data analysis and interpretation $2,000 per week for 3.75 weeks during 2022. An additional 1.25 weeks are funded from the UNDP funding allocation (see budget note 4 below)
2	Contractual services under Component 1 funded from the GEF allocation, are foreseen to include: - An allowance of $2,000 for the establishment, convening and hosting of a technical workgroup to oversee the geospatial mapping. [$2,000] - Allowance for an upgrade of the existing MOE data platform [$13,000]. - Part funding ($50,500) towards the sourcing of data and developing of GIS-based mapping information to supplement grid expansion planning and facilitate the identification of areas suited to mini-grids in Malawi. The complete contract value with the UNCDF is expected to be $260,000 (remainder funded from TRAC resources) over the first twenty-four months of implementation. [$50,500]

[98] [98] Assuming start in the last quarter of 2021, Year 1 will correspond with the last three months of 2021 and Year 5 will correspond with the first nine months of the 2025 calendar year.

Budget note number	Comments
	- An allowance of $ 7,000 to support the development of policy instruments identified by the DREI and National Dialogue and prioritized and endo ed by Government. [$ 7,000]
3	Procurement of services from a pre-qualified panel of service providers to develop the first full DREI techno-economic study for Malawi including data ana sis, drafting of report and dissemination of findings ($40,000). Additional ($5,000) allowance for technical support from DREI consultant or alternative international specialist fo he identification of a delivery model and development of policy action plan. [Total $45,000]
4	Procurement of services of a national service provider / consultant to support the DREI techno-economic study with data gathering and dissemination nder guidance of the international consultant ($10,000) (refer budget note 3). An additional allowance of $3,500 for a national consultant to support the development of the action plan. A provision of $2,500 is also made for the continued services of the gender analyst to support the finalisation of the mapping. [Total $16,000]
5	Contractual services under Component 1 funded from the UNDP allocation, are foreseen to include: - Part funding ($194,500) towards the sourcing of data and developing of GIS-based mapping information to supplement grid expansion planning ar facilitate the identification of areas suited to mini-grids in Malawi. This includes appliance survey, visualization of data collected by district energy officers and a igh-level value chain analysis as well as gender sensitive analysis work that forms part of the scope of mapping activities. The complete contract value with the UNCDF is expected to be $260,000 (remainder funded from GEF resources) over the first twenty-four months of implementation. [Total $194,500]. *Also note additional provision was made to secure input from a gender specialist to support data analysis and interpretation (refer local consultant Budget note 1).* - An allowance of contractual services to support the development of policy instruments identified by the DREI and National Dialogue and prioritize and endorsed by Government. [$ 20,000]. Supplemental to the allocation made from the GEF budget (refer Budget Note 2)
6	Provision for the organization, logistics and catering for a series of dissemination workshops or events to share the findings of the DREI study with stakeho ers ($5,000 per year over two years) plus allowance for a multi-day workshop with key stakeholders to refine the delivery model(s) and develop a policy action plan for the co ntry ($5,000). [Total $15,000]
7	Provision for travel and logistics by the DREI consultants during study, data collection and dissemination events (budgeted at $7,500 consisting of two re n flights at $1,800, accommodation (8 nights at $250 per night) and local car rental with driver at $1,900 for 10 days) and facilitation of multi-day planning workshop (budget d at $2,500 for one return flight and three nights' accommodation). [Total $10,000]
8	Contractual services under Component 2 funded from the GEF allocation, are foreseen to include: - Delivery and operation of PUE overlay including all logistics, design and development, implementation of appliance subsidies, PUE operational and usiness development training, agriculture field support to farmers, coordination of MFI financing offer, Social and environmental impact monitoring, gende action plan, stakeholder consultation as well as continued refinement to system utilisation, PUE operations and tariffs in response to feedback from techno-eco omic and business modelling. It also includes securing continuation of minigrid system operations support post 2023 (EASE co-finance until 2023)[99]. [Total $92,190] - Services including research and consultation, technical writing, editing and graphic design / layout and packaging to develop How To guides accordi g to workplan ($20,000 for first year and $4,834 contribution towards second year budget of $20,000). [Total $24,834]

[99] Entails complete delivery of Output 2.1 when considered with equipment costs (refer Budget note 9) and techno-economic modelling and business model development (budget note 10).

Budget note number	Comments
	- Procurement of service provider to develop a project website (or webpage on ACRE website) for ongoing publication of knowledge resources with counter of unique visits and registration system to track downloads. Allowance is made for an initial development fee of $5,000 with annual maintenance support at $1,000. [Total 8,000] - Appointment of service provider(s) (likely academic institutions) to analyse aggregated, anonymised data, trends and standard reports to develop knowledge products, publications, insight briefs, policy briefs, case studies, lessons learnt and other appropriate training or communication material ($40,000 available for the 4 years). - Procurement of service provider to support REIAMA with the formulation of a (1) value proposition for the minigrid sector and (ii) an accompanying marketing communication plan ($15,000) plus a once off review and update of the plans after two years ($6,000). [Total $21,000] - Monitoring framework to track reach and impact of industry association interventions developed and implemented ($2,000 per year for 4 years). [Total $8,000]
16	Under Component 3, UNDP funding allocation **M&E sub-component**, provision is made for the procurement of International Consultants for: - Support for the development and implementation of the monitoring framework with particular focus on M&E of indicators specific to the GEF core indicators and results framework including project monitoring, reporting and verification across all indicators to ensure data quality, integrity and compliance when integrated at program level. An annual provision of USD 3,000 for 4 years of implementation. [Total $12,000] - Conducting the independent midterm review ($30,000) and terminal evaluation of the project ($42,000) [Total $72,000]
17	Under Component 3, UNDP funding allocation **M&E sub-component**, provision is made for the procurement of Training, Workshops and Conferences for: - Provision for organization, logistics and catering for inception workshop. Once off budget of $3,000.
18	Under Component 3, UNDP funding allocation, provision is made for the procurement of International Consultants for: - Provision of additional USD 2,000 per year for Technical Advisory support from the Regional Project towards. - Technical Advisory support (potentially sourced from the Regional Project database of experts) to collaborate with the industry association for technical assistance and development of policy briefs to support well-informed discussions on specific issues. Provision of USD 5,000 per year for 4 years. [Total $20,000]
19	Local consultants for Component 3 funded under the UNDP budget allocation: - Provision for Stakeholder Engagement Specialist at a rate of $1,750 per week with 2.5 weeks in first year and one week per year thereafter to support the implementation of the project stakeholder engagement plan. [Total: $9,625] - Procurement of SES specialist to support the project as a whole and specifically data collection and reporting specific to socio-economic, gender and youth impacts from pilot projects (estimated at $16,000 for all 4 years). - Provision of $5,000 per year for a local consultant/technical writer to support the industy association with the development of submissions to government and $1,000 per year to support gender focused activities, capacity building, networking as per action plan. [Total $24,000]
20	Contractual services under Component 3 funded from the UNDP allocation, are foreseen to include: - Set up and maintenance of the Quality Assurance and Monitoring Framework with dashboard in compliance with guidance provided from the regional project and establishing data collection instruments ($14,000 development ($4000 in 2021 and $10,000 in 2022) plus $1,500 annual maintenance and support last three years). [$18,500] - Provision made for design of data collection instruments and collecting or procuring data for indicators e.g. surveys, audits, focus groups, etc ($2,000 per year) [$8,000]
21	Design and layout (packaging) of knowledge material / lessons learnt for online distribution and/or print budget at USD1,000 per year for 4 years of implementation. [Total $4,000]

X. LEGAL CONTEXT

This project document shall be the instrument referred to as such in Article 1 of the Standard Basic Assistance Agreement between the Government of Malawi and UNDP, signed on 15 July 1977. All references in the SBAA to "Implementing Partner" shall be deemed to refer to "Implementing Partner."

This project will be implemented by the Ministry of Energy ("Implementing Partner") in accordance with its financial regulations, rules, practices and procedures only to the extent that they do not contravene the principles of the Financial Regulations and Rules of UNDP. Where the financial governance of an Implementing Partner does not provide the required guidance to ensure best value for money, fairness, integrity, transparency, and effective international competition, the financial governance of UNDP shall apply.

The designations employed and the presentation of material on this map do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations or UNDP concerning the legal status of any country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries.

XI. RISK MANAGEMENT

Implementing Partner is a Government Entity (NIM)

1. Consistent with the Article III of the SBAA *[or the Supplemental Provisions to the Project Document]*, the responsibility for the safety and security of the Implementing Partner and its personnel and property, and of UNDP's property in the Implementing Partner's custody, rests with the Implementing Partner. To this end, the Implementing Partner shall:
   a) put in place an appropriate security plan and maintain the security plan, taking into account the security situation in the country where the project is being carried;
   b) assume all risks and liabilities related to the Implementing Partner's security, and the full implementation of the security plan.
2. UNDP reserves the right to verify whether such a plan is in place, and to suggest modifications to the plan when necessary. Failure to maintain and implement an appropriate security plan as required hereunder shall be deemed a breach of the Implementing Partner's obligations under this Project Document.
3. The Implementing Partner agrees to undertake all reasonable efforts to ensure that no UNDP funds received pursuant to the Project Document are used to provide support to individuals or entities associated with terrorism and that the recipients of any amounts provided by UNDP hereunder do not appear on the list maintained by the Security Council Committee established pursuant to resolution 1267 (1999). The list can be accessed via http://www.un.org/sc/committees/1267/aq_sanctions_list.shtml.
4. The Implementing Partner acknowledges and agrees that UNDP will not tolerate sexual harassment and sexual exploitation and abuse of anyone by the Implementing Partner, and each of its responsible parties, their respective sub-recipients and other entities involved in Project implementation, either as contractors or subcontractors and their personnel, and any individuals performing services for them under the Project Document.

- (a) In the implementation of the activities under this Project Document, the Implementing Partner, and each of its sub-parties referred to above, shall comply with the standards of conduct set forth in the Secretary General's Bulletin ST/SGB/2003/13 of 9 October 2003, concerning "Special measures for protection from sexual exploitation and sexual abuse" ("SEA").

or programme to comply with such standards, and (c) engage in a constructive and timely manner to address any concerns and complaints raised through the Accountability Mechanism. UNDP will seek to ensure that communities and other project stakeholders are informed of and have access to the Accountability Mechanism.

8. All signatories to the Project Document shall cooperate in good faith with any exercise to evaluate any programme or project-related commitments or compliance with the UNDP Social and Environmental Standards. This includes providing access to project sites, relevant personnel, information, and documentation.

9. The Implementing Partner will take appropriate steps to prevent misuse of funds, fraud or corruption, by its officials, consultants, responsible parties, subcontractors and sub-recipients in implementing the project or using UNDP funds. The Implementing Partner will ensure that its financial management, anti-corruption and anti-fraud policies are in place and enforced for all funding received from or through UNDP.

10. The requirements of the following documents, then in force at the time of signature of the Project Document, apply to the Implementing Partner: (a) UNDP Policy on Fraud and other Corrupt Practices and (b) UNDP Office of Audit and Investigations Investigation Guidelines. The Implementing Partner agrees to the requirements of the above documents, which are an integral part of this Project Document and are available online at www.undp.org.

11. In the event that an investigation is required, UNDP has the obligation to conduct investigations relating to any aspect of UNDP projects and programmes in accordance with UNDP's regulations, rules, policies and procedures. The Implementing Partner shall provide its full cooperation, including making available personnel, relevant documentation, and granting access to the Implementing Partner's (and its consultants', responsible parties', subcontractors' and sub-recipients') premises, for such purposes at reasonable times and on reasonable conditions as may be required for the purpose of an investigation. Should there be a limitation in meeting this obligation, UNDP shall consult with the Implementing Partner to find a solution.

12. The signatories to this Project Document will promptly inform one another in case of any incidence of inappropriate use of funds, or credible allegation of fraud or corruption with due confidentiality.

    Where the Implementing Partner becomes aware that a UNDP project or activity, in whole or in part, is the focus of investigation for alleged fraud/corruption, the Implementing Partner will inform the UNDP Resident Representative/Head of Office, who will promptly inform UNDP's Office of Audit and Investigations (OAI). The Implementing Partner shall provide regular updates to the head of UNDP in the country and OAI of the status of, and actions relating to, such investigation.

13. UNDP shall be entitled to a refund from the Implementing Partner of any funds provided that have been used inappropriately, including through fraud or corruption, or otherwise paid other than in accordance with the terms and conditions of the Project Document. Such amount may be deducted by UNDP from any payment due to the Implementing Partner under this or any other agreement. Recovery of such amount by UNDP shall not diminish or curtail the Implementing Partner's obligations under this Project Document.

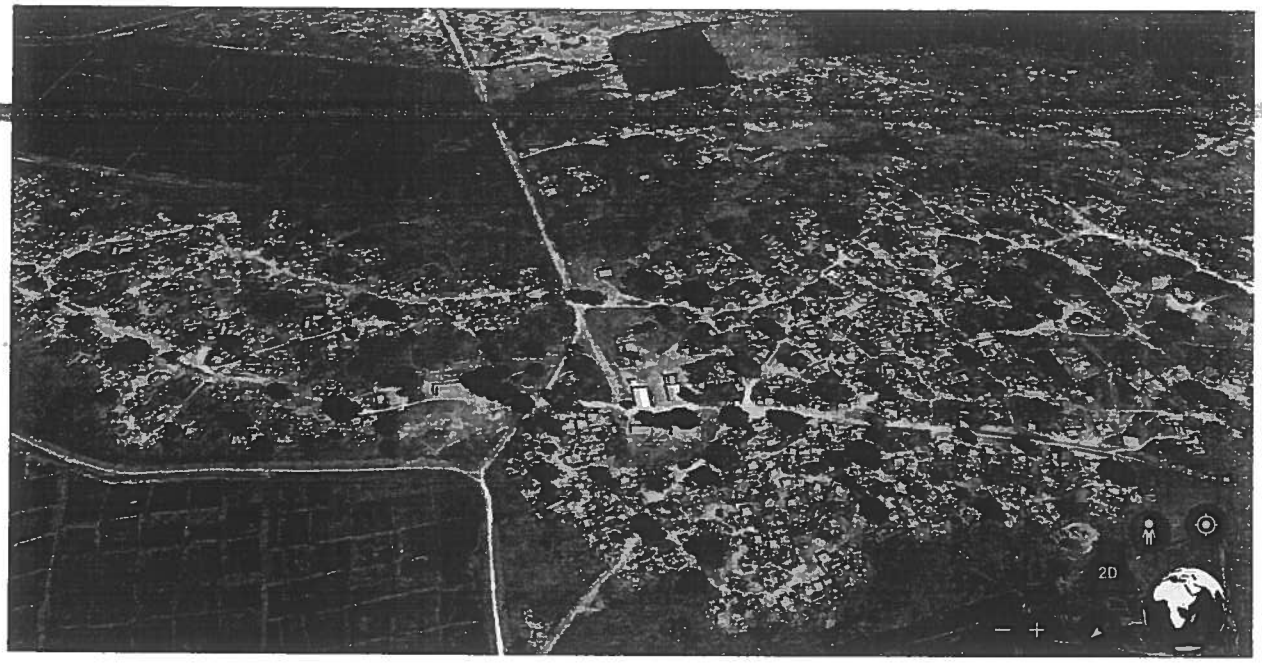
    Where such funds have not been refunded to UNDP, the Implementing Partner agrees that donors to UNDP (including the Government) whose funding is the source, in whole or in part, of the funds for the activities under this Project Document, may seek recourse to the Implementing Partner for the recovery of any funds determined by UNDP to have been used inappropriately, including through fraud or corruption, or otherwise paid other than in accordance with the terms and conditions of the Project Document.

    Note: The term "Project Document" as used in this clause shall be deemed to include any relevant subsidiary agreement further to the Project Document, including those with responsible parties, subcontractors and sub-recipients.

XII. MANDATORY ANNEXES

Annex 2: GEF execution support letter

Not Applicable



Kudembe is also located in Katchindamoto Traditional Authority in Dedza district relatively closer to Lilongwe than Mthembanji. The GPS coordinates for the site are -13.99833831 S, 34.19723709 E.


ional Park
Tunduma
Kasama
Mtwara
Songea
Likasi
Mzuzu
Lake Malawi
wezi
Kitwe
Ndola
Kasungu
Pemba
Zambia
Chipata
Malawi
Lilongwe
Mangochi
Kabwe
Nacala
Nampula
Lumbo
Lusaka
Zomba
Nametil
Mazabuka
Kafue
Tete
Blantyre
Mozambique
Harare
Quelimane

Comp.	Outcomes	Outputs	Year 1				Year 2			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
			activity. Finance data.	gender specific information. Identify suitable, free geospatial data on agricultural land use.	data translated to GIS. Analyse for points of potential energy input / value addition in agri value chains.			indicate / rank potential locations.		highlighting sites with significant potential to energize productive uses and value addition.
			Workstream 2. DEO and Energyscaping data. Agreement with supporting responsible party for this activity (UoS). Define preliminary metadata framework to standardize and guide data collection by DEOs.	Review existing DEO database for scope of initial mapping. In consultation with data working group, identify priority data types, formats, etc. and obtain guidance on best practice.	Using available data, develop visualization i.e. mapping of verified data points with GPS coordinates to visually represent locations and energy infrastructure.	Visualisation of available data (continued).	Use demonstrated visualization of data to inform DEO data collection activities and develop workplan to extend mapping. Review and refine metadata framework, as relevant.	Integrate mapping data with Workstream 1 to inform site selection for areas covered by DEO.	Develop training on metadata framework and practical implementation to enable consistency in data collection. Extend training to DEOs. Ensure full integration of mapping resources and protocols for handover and longevity.	-
			Workstream 3. Appliance survey to identify energy efficient, electrical appliances available in the country to support PUEs or for household use on mini-grids.	Engage EnDev regarding PUE equipment activity to inform appliance survey scope and find synergies (refer Partnerships, Section IV).	Scope appliance survey with guidance from regional project and data collection protocols/ guidance from data workgroup. Procure survey services.	Conduct appliance survey with geospatial distribution information.	Conduct appliance survey with geospatial distribution information.	Finalise survey and consolidate data for publication.	-	-

Comp.	Outcomes	Outputs	Year 1				Year 2			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
						stakeholders in a series of 3 – 4 dissemination events e.g. workshops or round tables.				
		1.3 An inclusive national dialogue to identify minigrid delivery models is facilitated, clarifying priority interventions for an integrated approach to off-grid electrificatio n.	-	-	-	-	-	Knowledge sharing event / webinar with Project Steering committee members and other key stakeholders on delivery models held prior to workshop.	Workshop(s) hosted and facilitated for key government stakeholders to review and assess delivery model for relevance to the country objectives.	If gaps in the delivery models are identified, the project can develop constructive proposals and make contributions to close them through respective measures.
Component 2	Innovative business models based on cost reduction operationali zed, with	2.1: Extension of two minigrid pilots with productive uses to identify business	Agreement with Responsible Party in place. PMU to develop short Minigrid Pilot Plan in	Project team meetings, as required. Implementation along two interrelated workstreams:	Project team meetings, as required. Implementation along two interrelated workstreams:	Project team meetings, as required. Implementation along two interrelated workstreams:	Project team meetings, as required. Implementation along two interrelated workstreams:	Project team meetings, as required. Implementation along two interrelated workstreams:	Project team meetings, as required. Implementation along two interrelated workstreams:	Project team meetings, as required. Implementation along two interrelated workstreams:

Comp.	Outcomes	Outputs	Year 1				Year 2			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
			impact monitoring and establish linkages/integration with Component 3 QAMF. Establish project team with UoS, UP, ACRE, SMEDI, etc., and interface with the TAC / Project SteerCo, as relevant.		metering infrastructure and social impact tracking.	PUEs and efficient appliances on minigrid capacity factor, revenue and business case, with the aim to determine the financial feasibility of a single minigrid utilising PUE. Collect operations data to assess load profile and load growth. Techno-economic modelling to inform business model.	Techno economic modelling. Utilise technical and economic outputs to develop detailed PUE business model templates focused within the Food-Energy nexus. Modelling to assess both local development and employment as well as increasing the capacity factor and financial viability of the minigrid. Assess contribution from value chain analysis and marketing for agricultural produce for generic application across different crops, agro-processing and value chain applications.	Techno economic modelling. Refinement of business model templates with further inputs. Investigate innovative finance of efficient electrical appliances, and opportunities for asset financing models for productive use assets. Continued support to WS1 for additional tweaks / refinements, tariff adjustments or any other interventions to enhance the usage and revenue of the system.	for social enterprises operating mini-grids at different scales, and fleets at regional and national scales, with policy integration and smart subsidies. Socio-economic impact assessment using existing monitoring and evaluation frameworks and additional focus group discussions. Continued support to WS1 for additional tweaks / refinements, tariff adjustments or any other interventions to enhance the usage and revenue of the system.	for social enterprises operating mini-grids at different scales, and fleets at regional and national scales, with policy integration and smart subsidies. Continued support to WS1 for additional tweaks / refinements, tariff adjustments or any other interventions to enhance the usage and revenue of the system.

Comp.	Outcomes	Outputs	Year 1				Year 2			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
							Assess business development training impact.			
		2.2: An online 'One Stop Information Centre' established with practicable guidance to developers for navigating unfamiliar and/or evolving regulatory processes from concept to commissioning.	Initiate baseline development. Activities foreseen for baseline development include: 1. Process definition from conceptualization to commissioning. 2. Identification of institutional processes and interfaces, including expected or indicated turnaround times by various institutions required to give inputs or authorisations. 3. Workflow analysis from first contact or submission to final approval and licensing of facility. 4. Quantification of average actual timelines	Finalise baseline to 1. identify areas where a step-by-step process or insight into the process or requirements will markedly reduce development timelines; and 2. Prioritise areas for which corresponding "How-to-Guides' are to be developed. Develop TOR and procure services for research, technical writing and development of set of practical guidelines / 'How To' guides. Establish project team with representation from AMP project, service	Review suggested topics, available material / information and potential sources of inputs. Scan stakeholders for most urgent requirements. Identify a prioritized list of guidelines and develop a workplan for development. Initiate data collection, interviews, etc. Establish online portal / interface and links to other relevant online knowledge resources.	Develop guidelines according to workplan. Submit drafts for review and sign off by project team. Submit signed off copies for graphic design, layout and packaging. Publish final approved guidelines online and as print ready copies.	Continue development, packaging and publication as per workplan. Official launch of the online resources once at least 3 guidelines are developed and published. Project team to define a target audience[102] and prepare a plan to introduce / share / disseminate 'How to Guides' e.g. workshops, webinars and/or newsletters. Include agreement to report delivery timelines with supporting evidence in exchange for accessing free	Continue development, packaging and publication as per workplan. Implement communication strategy. Track impact on timelines through surveys, questionnaires. If workflow data is available from government institutions, corroborate timelines where possible.	Continue development, packaging and publication as per workplan. Implement communication strategy. Analyse feedback from registration survey to assess value of material, identify additional topics of interest, understand actual market and identify opportunities to refine the above to be more inclusive or offer greater value. Track impact on timelines through surveys, questionnaires.	Continue development, packaging and publication as per workplan. Reassess topics included in the set of guidelines, assess relevance of existing guidelines. Identify required additions / revisions to list of topics to be developed and/or identify necessary updates, and update workplan. Track impact on timelines through surveys, questionnaires. If workflow data is available from government institutions,

[102] Anticipated to include newly appointed District Energy Officers, industry members, officials hosting the Energy Desk at the Malawi Investment and Trade Centre and any other interested parties from the public or private sector interested in more efficient and cost-effective delivery of minigrid developments.

Comp.	Outcomes	Outputs	Year 1				Year 2			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
			for each part of the process as experienced by various developers to inform baseline i.e. actual average development timelines between two points in the process.	provider, REIAMA, MoE and/or MERA as relevant. Confirm appropriate online location and format for guidelines.			"How-to" resources. Track impact on timelines through surveys, questionnaires. If workflow data is available from government institutions, corroborate timelines where possible.		If workflow data is available from government institutions, corroborate timelines where possible.	corroborate timelines where possible. Provide tracking data as input to PIR.
Component 3	Data and digitalization are mainstreamed, across stakeholders, into local minigrid market development. Increased knowledge, awareness and network opportunities in the minigrid market and among stakeholders, including benefitting from linkages to international	3.1: Quality Assurance and Monitoring Framework for measuring, reporting and verification of the sustainable development impacts of MGs, including GHG emission reductions is developed and operationalized based on standardized guidance from the	With guidance from the regional project, develop a framework incorporating all Quality Assurance and Monitoring, Reporting and Verification requirements.	Implement data framework, source necessary data and maintain data repository.	Implement data framework, source necessary data and maintain data repository. Implement digital strategy and maintain data repository.	Implement data framework, source necessary data and maintain data repository. Upload data resource to regional project.	Implement data framework, source necessary data and maintain data repository.	Implement data framework, source necessary data and maintain data repository.	Implement data framework, source necessary data and maintain data repository.	Implement data framework, source necessary data and maintain data repository. Upload data resource to regional project.

Comp.	Outcomes	Outputs	Year 1				Year 2			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
	good practice.	regional project.								
		3.2: A Project Digital Strategy is developed and implemented, including linkages to and following guidance from the regional project	With guidance from the regional project, define / scope a digital strategy for the project. Identify a Government champion and host for the central database. Establish memorandum of understanding / charter for hosting, maintenance and sharing of data once aggregated/ anonymized. Define access protocols for categories of stakeholders.	Define data collection and analysis protocols / procedures[103] in collaboration with regional project. Identify first phase pilot participants able and willing to share smart metering data and establish data interface and agreements for data sharing and utilization, as relevant. Establish data sharing interface with regional project. Implement protocols / procedures as defined. Define user specifications for central database in	Commission central database and related systems for data collection into central database with interface to regional project. Identify study / research partner(s) to utilize the aggregated data set to support the development of papers, publications, case studies, policy briefs, planning tools of interest to future developments. Invite proposals and/or contract partners & academic institutions, to set up standard reporting	Establish central database. Implement data collection and analysis protocols. Source and populate with historic data, collating it into anonymized dataset with smart meter data[104], generation data[105], social impact data and specific datasets arising from PUE activities into central database. Analyse available data. Share / publish aggregated, anonymous data and findings as relevant.	Continue data collection according to protocols Analyse available data. Share / publish findings as relevant. Develop additional research, technical and policy papers, industry briefs and case studies, as relevant.	Continue data collection according to protocols Analyse available data. Share / publish findings as relevant.	Continue data collection according to protocols Analyse available data. Share / publish findings as relevant. Develop additional research, technical and policy papers, industry briefs and case studies, as relevant.	Continue data collection and analysis according to protocols Conduct data audit. Use findings to invite additional participation from other minigrid operators or developers and expand dataset accordingly. Identify areas for further research or study. Reassess and refine data protocols. Reassess data access protocols and parameters.

[103] Protocols to ensure anonymity, collection format, frequency, maintenance, data integrity, etc.
[104] Including demand, load profiles, payment frequency, and ARPU data
[105] Including data regarding generation performance, faults and battery state of charge

Comp.	Outcomes	Outputs	Year 1				Year 2			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
				collaboration with stakeholders and regional project. Procure and implement IT infrastructure (database, remote data collection) to collate data into central database to specifications provided by the regional project.	outputs (user profiles, end-use profiles, seasonal trends, social impacts, GHG impacts, etc.) for continued tracking.					
		3.3 Minigrids digital platform implemented to run tenders and manage data from pilots, and to support minigrids scale-up and cost-reduction	Procure digital platform to meet generic specifications	Implement digital platform in support of the digital strategy. Conduct necessary capacity building and user training of key stakeholders, including the public focal point.	-	-	-	-	-	-
		3.4: Active interface with regional project established, including, but not	(i) Link with Regional Communities of Practice. -	Project Steering Committee to nominate representatives from key institutions to	Representatives to provide CoP feedback / updates to Project Steering Committee as per schedule.	Representatives to provide CoP feedback / updates to Project Steering Committee as per schedule.	Representatives to provide CoP feedback / updates to Project Steering Committee as per schedule.	Representatives to provide CoP feedback / updates to Project Steering Committee as per schedule.	Representatives to provide CoP feedback / updates to Project Steering Committee as per schedule.	Representatives to provide CoP feedback / updates to Project Steering Committee as per schedule.

Comp.	Outcomes	Outputs	Year 1				Year 2			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
		limited to, via (i) participating in Communities of Practice and (ii) capturing and sharing lessons learnt at national and regional level.		participate in CoP. Identify meeting dates (at least twice a year) for feedback and updates on progress from CoP. Identify preferred format for larger knowledge sharing events e.g. workshops, clinics, lectures or webinars to coincide with sharing of findings or outputs from the COP and/or technical cohorts.	With support from AMP, host and present any CoP outputs in one of preferred event formats (as relevant) to relevant audience(s).	With support from AMP, host and present any CoP outputs in one of preferred event formats (as relevant) to relevant audience(s).	With support from AMP, host and present any CoP outputs in one of preferred event formats (as relevant) to relevant audience(s)	With support from AMP, host and present any CoP outputs in one of preferred event formats (as relevant) to relevant audience(s)	With support from AMP, host and present any CoP outputs in one of preferred event formats (as relevant) to relevant audience(s)	With support from AMP, host and present any CoP outputs in one of preferred event formats (as relevant) to relevant audience(s).
			(ii) Lessons learned. Establish interface with regional project. Establish project website / webpage[106] to host all	-	With consideration of topics listed for this Output and stakeholder inputs, identify priority topics of interest to Mini-grid development and operations in Malawi.	Develop series of lessons learned according to schedule, with input from regional project, regional role players and local experience.	Develop series of lessons learned according to schedule, with input from regional project, regional role players and local experience.	Develop series of lessons learned according to schedule, with input from regional project, regional role players and local experience.	Develop series of lessons learned according to schedule, with input from regional project, regional role players and local experience.	Assess approach and value of developed material. Identify next tier of topics with input from stakeholders. Define a development schedule for the

[106] This may be a page on the existing ACRE website or a separate website for the purpose of sharing AMP information, publications and knowledge resources

Comp.	Outcomes	Outputs	Year 1				Year 2			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
			knowledge resources[107] Ensure the following are included on the website: 1. Registration system to identify users, track number of downloads and enable survey of users to obtain feedback, gauge value of material published and identify further topics of interest. 2. Details of project contacts and grievance mechanism as per SEP (Annex 9).		Ensure the schedule includes lessons from the pilot project as well specific findings related to youth and gender. Define a development schedule for the year. Identify interested stakeholders, define a dissemination approach and compile a distribution list.	Share with TAC, Steering Committee, Sector Working Group on Energy, Malawi Renewable Partnership Group, AMP regional project and other identified stakeholders. Ensure readily available online and other channels as relevant.	Share with TAC, Steering Committee, Sector Working Group on Energy, Malawi Renewable Partnership Group, AMP regional project and other identified stakeholders. Ensure readily available online and other channels as relevant.	Share with TAC, Steering Committee, Sector Working Group on Energy, Malawi Renewable Partnership Group, AMP regional project and other identified stakeholders. Ensure readily available online and other channels as relevant.	Share with TAC, Steering Committee, Sector Working Group on Energy, Malawi Renewable Partnership Group, AMP regional project and other identified stakeholders. Ensure readily available online and other channels as relevant.	next year – again ensuring inclusion of pilot project, youth and gender related lessons. Review and update list of interested stakeholders and dissemination approach, if required.
		3.5: Industry association strengthened to advocate for and actively engage Government on behalf of private sector	-	Establish working group within REIAMA to focus on growing relationships with industry players and formalizing and strengthening the interface	Support REIAMA to formulate a value proposition to the minigrid sector with an accompanying implementation / workplan based on	Implement both plans expected to include (i) development of technical assistance and policy briefs to support well-informed discussions on specific issues,	Implement according to workplan and marketing and communication plan. Implement M&E framework. Extend relationships to	Implement according to workplan and marketing and communication plan. Implement M&E framework. Continue to collect, assess	Review / assess implementation year. Review annual workplan plans and update with stakeholder inputs. Review reach and impact and	Continue implementation according to updated workplan and marketing and communication plan. Implement M&E framework.

107 Published knowledge resources to include lessons, all publications and material emanating from studies, data analysis, details and proceedings from training, workshops, events.

Comp.	Outcomes	Outputs	Year 1				Year 2			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
		minigrid developers and operators.		with Government entities on behalf of industry. Identify, in consultation with industry stakeholders, the most pertinent issues that would benefit from knowledge sharing, capacity building and/or to raise with government. Establish a platform for industry to submit topics, discussion points and/or issues for consideration and prioritization.	identified issues and topics. Develop a marketing and communication plan for all stakeholders. Establish a monitoring and evaluation framework that can track progress against both plans, report on reach and impact of interventions to refine the implementation approach and quantify the benefits of industry participation and/or membership. Ensure reach and impact (of all events, memberships, participants, active stakeholders), is tracked also in terms of inclusivity of gender and youth.	(ii) tapping into information and knowledge support available from the regional project, (iii) hosting knowledge sharing and networking events linked to the knowledge resources available to minigrid industry players at regional level, (iv) a roadshow and consultation / engagement with industry players to refine value proposition and build relationships, and (v) establish working interface with government for a to actively engage on industry related matters. Implement monitoring plan.	include other, related industry associations to ensure opportunities for the broader RE sector and localized industry development are collectively pursued. Continue to collect, assess and prioritise topics, discussion points and/or issues from industry. Adjust workplan to respond to any urgent arising issues (six monthly).	and prioritise topics, discussion points and/or issues from industry.	refine approach and workplan accordingly. Report participation numbers for the year for M&E and MTR purposes. Expand stakeholder list, if necessary. Update marketing and communication plan. Ensure the plan is informed by stakeholder feedback. It is likely that the focus might shift from roadshows to hosting of knowledge sharing events, webinars and other knowledge offerings that draws on the lessons, case studies and other resources developed by AMP Malawi and the regional AMP project.	Continue to collect, assess and prioritise topics, discussion points and/or issues from industry.

Comp.	Outcomes	Outputs	Year 1				Year 2			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
		3.6: M&E and Reporting including (i) Conducting inception workshop and preparing report, (ii) Ongoing M&E, (iii) Mid Term Evaluation and (iv) Terminal Evaluation	Inception Workshop conducted, and Inception Report submitted to UNDP Overall Project Board / Steering Committee established[108] / integrated under ACRE structures. Define calendar / schedule of meetings.	-	Project Board / Steering Committee meeting (anticipated, but dependent on schedule)	Annual PIR for the year completed at end June of current year. (Note. Quarters dependent on alignment with months, but expected to be Q4 of year 1)	Project Board / Steering Committee meeting, review of PIR. Assess any project changes (if needed) and implement adaptive management if required.	-	Project Board / Steering Committee meeting (proposed) Develop TOR and procure independent consultant for Mid Term Review (MTR).	Annual PIR for the year completed at end June of current year. (Note. Quarters dependent on alignment with months, but expected to be Q4 of year 2) Conduct MTR in accordance with GEF requirements and publish (refer Section VI) Management response to MTR recommendations posted in the Evaluation Resource Centre within six weeks of the MTR report's completion.

[108] Likely to be an integration of the AMP under the existing Steering Committee and structures for ACRE (refer Section VII, Governance and Management).

Years 3 and 4 Workplan

Table 11: Workplan continued (years 3 and 4)

Comp	Outcomes	Outputs	Year 3				Year 4			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Component 1	Stakeholder ownership in a national minigrid delivery model is advanced, and appropriate policies and regulations are adopted to facilitate investment in RE minigrids.	1.1 Energyscaping, Micro-, Small- and Medium Sized Enterprises and productive uses data digitized, mapped and shared on a suitable open access, online platform.	- *no further activities planned for this output*	-	-	-	-	-	-	-
		1.2 Mini-grid DREI techno-economic analyses carried out to propose most cost-effective basket of policy and financial derisking instruments.	-	-	-	-	-	Initiate and facilitate the process for the national follow up, "light" quantitative DREI analyses. Procurement is expected to be centralized, and administered and performed by the regional project. Liaise with the regional project regarding the appointment of international consultant with technical	Conclude DREI update analysis and deliver update note specifically focusing on changes in (i) the risk environment, (ii) financing costs, hard and soft costs, and LCOE. Share update with the National Dialogue (Output 1.2), relevant national	-

Comp	Outcomes	Outputs	Year 3				Year 4			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
								support from the DREI Core Team. Ensure consultant(s) have access to all materials from first full quantitative DREI.	stakeholders, regional project and as input into Terminal Evaluation. Facilitate any other dissemination activities.	
		1.3 An inclusive national dialogue to identify minigrid delivery models is facilitated, clarifying priority interventions for an integrated approach to off-grid electrificatio n.	- no further activities foreseen / planned, but may be guided by the findings from the review and recommended actions.	-	-	-	-	-	-	-
Component 2	Innovative business models based on cost reduction operationali zed, with strengthene d private sector participation	2.1: Extension of minigrid pilots with productive uses to identify business models suitable to small	Workstream 1. Continued operation of / electricity supply to PUE facilities, as relevant. Business development refresher, if required.	Workstream 1. Continued operation of / electricity supply to PUE facilities, as relevant.	Workstream 1. Continued operation of / electricity supply to PUE facilities, as relevant. Business development refresher, if required.	Workstream 1. Continued operation of / electricity supply to PUE facilities, as relevant. Implement any additional support or system	Workstream 1. Continued operation of / electricity supply to PUE facilities, as relevant. Implement any additional support or system	Workstream 1. Continued operation of / electricity supply to PUE facilities, as relevant. Implement any additional support or system	Workstream 1. Continued operation of / electricity supply to PUE facilities, as relevant. Implement any additional support or system	Ensure measures in place for sustainability of operations.

Comp	Outcomes	Outputs	Year 3				Year 4			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
	in RE minigrid developmen t.	minigrid operations.	Refinement to the business model and suite of interventions, if necessary – informed by WS2.		Refinement to the business model and suite of interventions, if necessary – informed by WS2.	adjustments informed by WS2.	adjustments informed by WS2.	adjustments informed by WS2.	adjustments informed by WS2.	
			Workstream 2. Ongoing data capture, monitoring and analysis. Collaborate with WS1 to identify any refinements / enhancements to the business model or interventions for improved feasibility Report raw data to Component 3, Outputs 3.1 and 3.4. Share business modelling findings using academic papers, policy briefs, data sets and webinars. Share outputs to one stop	Workstream 2. Ongoing data capture, monitoring and analysis. Report raw data to Component 3, Outputs 3.1 and 3.4. Continued dissemination of data and findings, as relevant. Continued support to WS1 for additional tweaks / refinements, tariff adjustments or any other interventions to enhance the usage and revenue of the system.	Workstream 2. Continued monitoring and reporting. Dissemination of data and findings, as relevant. Continued support to WS1 for additional tweaks / refinements, tariff adjustments or any other interventions to enhance the usage and revenue of the system.	Workstream 2. Continued monitoring and reporting. Dissemination of data and findings, as relevant. Develop a case study with experience and learnings from the pilot project. Continued support to WS1 for additional tweaks / refinements, tariff adjustments or any other interventions to enhance the usage and revenue of the system.	Workstream 2. Continued monitoring and reporting. Reassess findings against any developments or updated impacts. Collaborate with WS1 to identify any refinements / enhancements to the business model or interventions for improved feasibility. Dissemination of data and findings, as relevant.	Workstream 2. Continued monitoring and reporting. Dissemination of data and findings, as relevant. Continued support to WS1 for additional tweaks / refinements, tariff adjustments or any other interventions to enhance the usage and revenue of the system.	Workstream 2. Continued monitoring and reporting. Dissemination of data and findings, as relevant.	Workstream 2. Close out report, updated case study(ies). Provide feedback to TAC and / or Steering Committee.

Comp	Outcomes	Outputs	Year 3				Year 4			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
			information centre (Output 2.2) and Component 3 including Lessons learned and QAMF (Outputs 3.2 and 3.4)							
		2.2: An online 'One Stop Information Centre' established with practicable guidance to developers for navigating	Continue development, packaging and publication as per workplan. Implement communication strategy. Track / monitor feedback and / or industry	Continue development, packaging and publication as per workplan. Implement communication strategy. Track / monitor feedback and / or industry	Continue development, packaging and publication as per workplan. Implement communication strategy. Track / monitor feedback and / or industry	Continue development, packaging and publication as per workplan. Implement communication strategy. Analyse feedback from registration	Continue development, packaging and publication as per workplan. Reassess topics included in the set of guidelines, assess relevance	Continue development, packaging and publication as per workplan. Implement communication strategy. Track impact on timelines through	Continue development, packaging and publication as per workplan. Implement communication strategy. Track impact on timelines through	Implement updates or additions as per workplan. Track impact on timelines through surveys, questionnaires. If workflow data is available from

Comp	Outcomes	Outputs	Year 3				Year 4			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
		unfamiliar and/or evolving regulatory processes from concept to commissioning.	development to flag any urgent revisions or additions. Track impact on timelines through surveys, questionnaires. If workflow data is available from government institutions, corroborate timelines where possible.	development to flag any urgent revisions or additions. Track impact on timelines through surveys, questionnaires. If workflow data is available from government institutions, corroborate timelines where possible.	development to flag any urgent revisions or additions. Track impact on timelines through surveys, questionnaires. If workflow data is available from government institutions, corroborate timelines where possible.	survey to assess value of material, identify additional topics of interest, understand actual market and identify opportunities to refine the above to be more inclusive or offer greater value. Provide tracking data as input to PIR.	of existing guidelines. Identify required additions / revisions to list of topics to be developed and/or identify necessary updates, and update workplan. Track impact on timelines through surveys, questionnaires. If workflow data is available from government institutions, corroborate timelines where possible.	surveys, questionnaires. If workflow data is available from government institutions, corroborate timelines where possible.	surveys, questionnaires. If workflow data is available from government institutions, corroborate timelines where possible.	government institutions, corroborate timelines where possible. Review impact and reach and provide tracking data as input to PIR. Prepare and submit impact summary for TE purposes. Use impact data to secure support for sustainability / continuation of the online "one-stop" platform beyond project timeframe.
Component 3	Data and digitalization are mainstreamed, across stakeholders, into local minigrid market development. Increased knowledge, awareness and network	3.1: Quality Assurance and Monitoring Framework for measuring, reporting and verification of the sustainable development impacts of	Implement data framework, source necessary data and maintain data repository.	Implement data framework, source necessary data and maintain data repository.	Implement data framework, source necessary data and maintain data repository.	Implement data framework, source necessary data and maintain data repository. Upload data resource to regional project.	Implement data framework, source necessary data and maintain data repository.	Implement data framework, source necessary data and maintain data repository.	Implement data framework, source necessary data and maintain data repository.	Implement data framework, source necessary data and maintain data repository. Upload data resource to regional project.

Comp	Outcomes	Outputs	Year 3				Year 4			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
	opportunities in the minigrid market and among stakeholders, including benefitting from linkages to international good practice.	MGs, including GHG emission reductions is developed and operationalized based on standardized guidance from the regional project.								
		3.2: A Project Digital Strategy developed and implemented, including linkages to and following guidance from the regional project	Continue data collection according to protocols Analyse available data. Share / publish findings as relevant. Develop additional research, technical and policy papers, industry briefs and case studies, as relevant.	Continue data collection according to protocols Analyse available data. Share / publish findings as relevant.	Continue data collection according to protocols Analyse available data. Share / publish findings as relevant. Develop additional research, technical and policy papers, industry briefs and case studies, as relevant.	Continue data collection and analysis according to protocols. Conduct data audit. Use findings to invite additional participation from other minigrid operators or developers and expand dataset accordingly. Identify areas for further research or study. Reassess and refine data protocols.	Continue data collection according to protocols. Analyse available data. Share / publish findings as relevant. Develop additional research, technical and policy papers, industry briefs and case studies, as relevant.	Continue data collection according to protocols. Analyse available data. Share / publish findings as relevant.	Continue data collection according to protocols. Analyse available data. Share / publish findings as relevant. Develop additional research, technical and policy papers, industry briefs and case studies, as relevant.	Continue data collection and analysis according to protocols. Conduct data audit. Ensure sustainable platform for hosting and maintenance of the database beyond implementation timeframe. Reassess data access protocols and parameters including a possible fee or membership structure, or alternative funding source,

Comp	Outcomes	Outputs	Year 3				Year 4			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
						Reassess data access protocols and parameters.				as appropriate, to support the sustained hosting, maintenance, collection and analysis of data.
		3.3 Minigrids digital platform implemented to run tenders and manage data from pilots, and to support minigrids scale-up and cost-reduction	-	-	-	-	-	-	-	-
		3.4. Active interface with regional project established, including, but not limited to, via (i) participating in Communities of Practice and (ii) capturing and sharing lessons learnt at	Representatives to provide CoP feedback / updates to Project Steering Committee as per schedule. With support from AMP, host and present any CoP outputs in one of preferred event formats (as relevant) to relevant audience(s).	Representatives to provide CoP feedback / updates to Project Steering Committee as per schedule. With support from AMP, host and present any CoP outputs in one of preferred event formats (as relevant) to relevant audience(s).	Representatives to provide CoP feedback / updates to Project Steering Committee as per schedule. With support from AMP, host and present any CoP outputs in one of preferred event formats (as relevant) to relevant audience(s)	Representatives to provide CoP feedback / updates to Project Steering Committee as per schedule. With support from AMP, host and present any CoP outputs in one of preferred event formats (as relevant) to relevant audience(s).	Representatives to provide CoP feedback / updates to Project Steering Committee as per schedule. With support from AMP, host and present any CoP outputs in one of preferred event formats (as relevant) to relevant audience(s).	Representatives to provide CoP feedback / updates to Project Steering Committee as per schedule. With support from AMP, host and present any CoP outputs in one of preferred event formats (as relevant) to relevant audience(s).	Representatives to provide CoP feedback / updates to Project Steering Committee as per schedule. With support from AMP, host and present any CoP outputs in one of preferred event formats (as relevant) to relevant audience(s).	Representatives to provide CoP feedback / updates to Project Steering Committee as per schedule. With support from AMP, host and present any CoP outputs in one of preferred event formats (as relevant) to relevant audience(s)
			Develop series of lessons	Develop series of lessons	Develop series of lessons	Assess approach and value of	Develop series of lessons	Develop series of lessons	Conclude series of publications	Assess value, impact and

Comp	Outcomes	Outputs	Year 3				Year 4			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
		national and regional level.	learned according to schedule, with input from regional project, regional role players and local experience. Share with TAC, Steering Committee, Sector Working Group on Energy, Malawi Renewable Partnership Group, AMP regional project and other identified stakeholders. Ensure readily available online and other channels as relevant.	learned according to schedule, with input from regional project, regional role players and local experience. Share with TAC, Steering Committee, Sector Working Group on Energy, Malawi Renewable Partnership Group, AMP regional project and other identified stakeholders. Ensure readily available online and other channels as relevant.	learned according to schedule, with input from regional project, regional role players and local experience. Share with TAC, Steering Committee, Sector Working Group on Energy, Malawi Renewable Partnership Group, AMP regional project and other identified stakeholders. Ensure readily available online and other channels as relevant.	developed material. Identify next tier of topics with input from stakeholders. Define a development schedule for the next year – including topics related to socio economic impact, gender and youth related findings in addition to technical and operational lessons. Review and update list of interested stakeholders and dissemination approach.	learned according to schedule, with input from regional project, regional role players and local experience. Share with TAC, Steering Committee, Sector Working Group on Energy, Malawi Renewable Partnership Group, AMP regional project and other identified stakeholders. Ensure readily available online and other channels as relevant.	learned according to schedule, with input from regional project, regional role players and local experience. Share with TAC, Steering Committee, Sector Working Group on Energy, Malawi Renewable Partnership Group, AMP regional project and other identified stakeholders. Ensure readily available online and other channels as relevant.	according to schedule. Share with TAC, Steering Committee, Sector Working Group on Energy, Malawi Renewable Partnership Group, AMP regional project and other identified stakeholders. Ensure readily available online and other channels as relevant.	reach of the material shared. Ensure sustainable platform for hosting of knowledge resource beyond implementation timeframe.

Comp	Outcomes	Outputs	Year 3				Year 4			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
		3.5: Industry association strengthened to advocate for and actively engage Government on behalf of private sector minigrid developers and operators.	Implement according to workplan and marketing and communication plan. Implement M&E framework. Continue to collect, assess and prioritise topics, discussion points and/or issues from industry. Adjust workplan to respond to any urgent arising issues (six monthly).	Implement according to workplan and marketing and communication plan. Implement M&E framework. Continue to collect, assess and prioritise topics, discussion points and/or issues from industry.	Review annual workplan plans and update with stakeholder inputs. Review value proposition with stakeholder feedback to ensure sustainability of the value offering and service. Review reach and impact and refine approach and workplan accordingly. Expand stakeholder list, if necessary. Update marketing and communication plan.	Implement according to updated workplan and marketing and communication plan. Implement M&E framework. Continue to collect, assess and prioritise topics, discussion points and/or issues from industry.	Implement according to workplan and marketing and communication plan. Implement M&E framework. Continue to collect, assess and prioritise topics, discussion points and/or issues from industry. Adjust workplan to respond to any urgent arising issues (six monthly).	Implement according to updated workplan and marketing and communication plan. Implement M&E framework. Continue to collect, assess and prioritise topics, discussion points and/or issues from industry.	Review / assess implementation year. Report attendance numbers for the year for M&E and TE purposes. Based on stakeholder feedback and measured impacts, assess the value proposition and refine / distill to ensure service to industry is relevant and effective. Continue implementation according to all plans.	Ensure mechanisms are in place for the continued delivery of the service to industry. Update implementation plans with input from review process.

Comp	Outcomes	Outputs	Year 3				Year 4			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
		3.6: M&E and Reporting including (i) Conducting inception workshop and preparing report, (ii) Ongoing M&E, (iii) Mid Term Evaluation and (iv) Terminal Evaluation	Project Board / Steering Committee meeting, review of PIR. Assess any project changes (if needed) and implement adaptive management if required.	-	Project Board / Steering Committee meeting (proposed)	Annual PIR for the year completed at end June of current year. (Note. Quarters dependent on alignment with months, but expected to be Q4 of year 2)	Project Board / Steering Committee meeting, review of PIR. Assess any project changes (if needed) and implement adaptive management if required.	-	Project Board / Steering Committee meeting (proposed) Develop TOR and procure independent consultant for Terminal Evaluation.	Final PIR and TE for discussion at final Project Board / Steering Committee meeting. Conduct TE and publish (refer Section VI) Management response to TE findings posted in the ERC within six weeks of the report's completion.

Annex 5: Monitoring Plan

This Monitoring Plan and the M&E Plan and Budget in Section VI of this project document will both guide monitoring and evaluation at the project level for the duration of project implementation.

Monitoring	Indicators	Targets	Description of indicators and targets	Data source/Collection Methods[109]	Frequency	Responsible for data collection	Means of verification	Risks/Assumptions
Project objective from the results framework. Supporting access to clean energy by increasing the financial viability and promoting scaled-up commercial investment in minigrids in Malawi.	***Indicator 1:*** *Greenhouse gas emissions mitigated (metric tons of carbon dioxide equivalent)* *(Units of measure: metric tons of CO2e)*	*Midterm* N/A *End of project:* 1,068 (direct) 2,043,000 (indirect)	The target is stated as additional emission reductions resulting from the added clean energy usage as quantified by the AMP Model minus the 10% allocation to the regional project[110]. Targets were calculated based on the direct, additional emission reductions and clean energy use from PUE addition.	Baseline: Taken as zero, relative to the additional[111] clean energy usage ascribed to the AMP PUE overlay. Data source/ collection: Additional, clean energy consumption for both pilot projects to be monitored and emissions reductions calculated using the AMP Model (refer Annex 13).	Annually from commissioning of PUE overlay to Mthembanji and Kudembe pilots.	System operator, PU, Country Office.	Records of units of electricity sold or consumed generated from RE minigrid systems. Modelling output.	Development of the pilot projects delayed or not implemented as planned.

[109] Data collection methods should outline specific tools used to collect data and additional information as necessary to support monitoring. The PIR cannot be used as a source of verification.
[110] In line with the protocol established in the AMP Program PFD, 10% of the consequential/indirect GHG impacts calculated for this project are allocated to the regional child project core results indicator, in line with the apportioning of the overall program budget. This reflects the benefits of this and all other national child projects accessing the regional child project's support.
[111] Energy consumption and emission reductions of the Mthembanji minigrid to be confirmed at start of implementation. Consumption data at the start of May 2021 showed consumption averaged between 10 and 15 kWh per day, i.e. 300 – 450kWh per month and between 0.16 and 0.25kWh per customer per day.

Monitoring	Indicators	Targets	Description of indicators and targets	Data source/Collection Methods[109]	Frequency	Responsible for data collection	Means of verification	Risks/Assumptions
	Indicator 2. Number of direct beneficiaries benefitting from energy access via minigrids, disaggregated by gender and by customer segment (residential, social, commercial/productive use), as co-benefit of GEF investment *(Units of measure: Absolute numbers of people who are direct beneficiaries)*	*Midterm* 500 additional of which at least 250 women *End of project:* 763 additional persons of which 389 women --- 600 people (residential) 16 people (social) 147 people (commercial/PUE) 763 people (total) 120 connections (residential) 4 connections (social) 49 connections (commercial/PUE) 173 connections (total)	The target is stated as additional beneficiaries who are directly benefitting from energy access via minigrids.	Baseline: Taken as zero, relative to the specific activities that will be implemented by the AMP. Data source/ collection: All individuals and connections to the pilot minigrids across the categories defined in Annex 13.	Annually Reported in DO tab of the GEF PIR	Project Unit (PU) with support from responsible parties and beneficiaries of support	Annual reports	Reach of activities not as wide as foreseen, limiting the number of direct beneficiaries. Tracking and monitoring of data not implemented diligently.

Monitoring	Indicators	Targets	Description of indicators and targets	Data source/Collection Methods[109]	Frequency	Responsible for data collection	Means of verification	Risks/Assumptions
	Indicator 3: Number of direct primary jobs created in the minigrid sector, disaggregated by gender, for minigrid development, operation and productive use. *(Units of measure: Absolute number of direct jobs created)*	Midterm: 5 additional of which at least 2 women End of project: 10 additional of which at least 5 women	The target is stated as the count of people who have found direct employment in the minigrid sector as a consequence of the AMP interventions.	Baseline: Taken as zero, relative to the employment associated with the AMP project interventions. Employment opportunities are expected to be found in (i) Output 2.1 & 3.4, Strengthening of industry association and hosting of online information centre, and (ii) Output 2.1. Operation and management of productive use overlays and training[112].	Annually	Minigrid System operator, Industry association, PU	Confirmed employment numbers from Industry Association, Online information centre and pilot sites.	Reskilling of existing employees rather than new appointments.
Project Outcome 1. Stakeholder ownership in a national minigrid delivery model is advanced, and appropriate	***Indicator 4.*** Policy and regulatory action plan formulated and endorsed by key stakeholders	*Midterm* Remaining development risks identified on the basis of the Derisking of Renewable Energy	Indicator confirms the formulation and endorsement of a policy and regulatory action plan for Malawi based on the intelligence	Baseline: Minigrid regulatory Framework was newly published in July 2020. The resulting changes in the investment environment have	Annually.	PU and Implementing Partner as custodian of policy development	Outputs (DREI analysis, action plan) produced as planned. Endorsement of policy and regulatory action plan confirmed in minutes or	Meeting this target assumes that: The DREI findings will provide clear direction with regards priority policy instruments. Key government stakeholders will

[112] For the pilot projects, the targeted number is based on the expected new productive users to be connected to the two minigrid systems (at least 10)

Monitoring	Indicators	Targets	Description of indicators and targets	Data source/Collection Methods[109]	Frequency	Responsible for data collection	Means of verification	Risks/Assumptions
policies and regulations are adopted to facilitate investment in RE minigrids.	*(Units of measure: Absolute number of policy derisking instruments)*	Investments study. Next tier of policy and regulatory interventions for derisking identified and prioritized for Malawi. Policy and regulatory action plan formulated and endorsed by key stakeholders. *End of project* At least 1 new policy derisking instrument for RE minigrids investment (e.g. standards, financial incentives / subsidy, etc.) identified and endorsed by the national government.	provided by the DREI study. The aim is to gauge the extent to which the DREI analysis and access to regional knowledge resources allows the country to develop a clear, prioritized action plan to support accelerated development of clean energy minigrids in line with national targets. The target is stated as having a plan formulated and endorsed.	not been assessed. Data source/ collection: Completion of full, 4-stage DREI analysis with all standard outputs shared in publicly available deliverables. Workshop(s) with key stakeholders to assess DREI findings and formulate a national minigrid policy action plan. Plan developed and endorsed by key stakeholders.			suitable alternative record of proceedings.	actively participate in translating the findings of the DREI analysis and other knowledge resources into a clearly prioritised action plan appropriate to Malawi. All participants will be adequately engaged and supportive of the action plan to endorse it. Once endorsed, the Action Plan will be implemented.
	Indicator 5. MSME, productive uses and	*Midterm* First iteration of map, visualizing	Tracks the development and availability of additional GIS-	Baseline. Least cost electrification plan for Malawi has been	Annually	PU and Implementing Partner as	Data mapped, available as overlays to the base map and	It is assumed that the existing online platform, identified for the purpose by

Monitoring	Indicators	Targets	Description of indicators and targets	Data source/Collection Methods[109]	Frequency	Responsible for data collection	Means of verification	Risks/Assumptions
	district level data mapped and shared online to inform minigrid developments *(Units of measure: binary (1/0))*	relevant data produced and shared. *End of project:* Updated map incorporating MSME, productive uses and energyscaping data published on an open access, online platform.	based mapping information that are key to identifying viable minigrid sites and integration of this data with conventional planning data and maps to inform site selection for minigrids. (Note: gender-sensitive data to be collected and shown where possible).	prepared, not including the proposed detail of interest to minigrids. Malawi Rural Electrification Plan published. Data source/ collection: Data sourcing and map development progress tracked during first two years. Additional data developed and mapped, available as overlays to the base map and published and/or available in the public domain	Progress on key outputs tracked in PIR.	owner of base map	published and/or available in the public domain.	the MoE, is suitable and will be available to host mapping data and will be publicly accessible. Risks include: Not all anticipated data inputs suitable for visualization or not available (i.e. UNCDF MSME and productive use data, District Energy Officers data, appliance data) Integration of overlays to base map not implemented. Mapping data not shared publicly to support planning by the private sector.
Project Outcome 2. Innovative business models based on cost reduction operationalize	***Indicator 6.*** 'Blueprint' for financially self-sustainable, small scale minigrid operations defined	*Midterm* Productive use offtake on two small minigrids significantly developed to identify inflection point	The indicator gauges whether a 'blueprint' business model for small scale minigrid operations was defined with guidance to achieve	Baseline: Currently none of the minigrids operating in Malawi are self-sustainable[114]. The baselines for the two pilot	Annually	Responsible party to provide data of project financials. Progress and delivery of	Blueprint business model / business model templates developed and shared / published. Academic papers, policy briefs, data	A fully self-sustainable business model might not be achieved, but significant advances can be demonstrated with recommendations to achieve a financially

[114] Reconfirmed by system operators of 5 recent minigrid systems in Malawi during an EASE information sharing session, 29 April 2021.

Monitoring	Indicators	Targets	Description of indicators and targets	Data source/Collection Methods[109]	Frequency	Responsible for data collection	Means of verification	Risks/Assumptions
d, with strengthened private sector participation in RE minigrid development.	*(Units of measure: binary (1/0))*	for self-sustainability. *End of project* Business model defined with recommendations to guide future implementation of minigrids.	(or approach) self-sustainability[113]. The business model will be shaped and tested by assessing the costs and impacts of introducing a basket of interventions that draws together learnings from existing minigrids in Malawi, knowledge from the regional project, system operator experience and the analytical capacity of the project team. The target is defined as the delivery of a template business model with guidance for achieving (or approaching) self-sustainability	systems will be defined at the start of implementation to allow each AMP intervention to be assessed in terms of financial impact / contribution. Data source/ collection: Record of interventions and data showing corresponding impact on grid utilization / capacity factor, revenue, and financials. Techno-economic modelling results. Delivery of detailed PUE business model templates. Business modelling findings shared using academic papers,		outputs tracked by PU.	sets and webinars sharing business modelling findings and recommendations. Additional verification can be done, if needed, using 'raw' system data.	self-sustainable, small scale minigrid operation.

[113] Used to describe a system that is at least able to cover all operating costs and equipment replacement costs over its full life cycle.

Monitoring	Indicators	Targets	Description of indicators and targets	Data source/Collection Methods[109]	Frequency	Responsible for data collection	Means of verification	Risks/Assumptions
				policy briefs, data sets and webinars.				
	Indicator 7. Number of minigrid pilots implemented that demonstrate a delivery model, cost-reduction measure(s) and/or productive use of electricity *(Units of measure: Absolute number of minigrid sites where pilots are implemented with project support)*	*Midterm* Two pilot sites demonstrating improved feasibility with PUE overlay *End of project* No further target.	The number of pilot projects implemented that demonstrate a delivery model, cost-reduction measure(s) and/or productive use of electricity.	Baseline: Taken as zero, measured relative to the AMP interventions.	Annually	PMU / MoE	Physical installations	Development of second pilot site delayed.
	Indicator 8. Shortened development timelines for minigrid systems *(Units of measure: percentage reduction in*	*Midterm* Baseline developed. First set of How to Guides and 'One Stop Information Centre' established. Development	The indicator is targeting a marked (25%) reduction in the time it takes for users of the online facility to advance projects through processes and approvals by different authorities by	Baseline: Baseline to be quantified at start of implementation. Processes were reported by multiple developers to be lengthy and unclear, especially for first time	Annually	REIAMA as host of online One Stop Information Centre, PU to consolidate, confirm and if needed, commission	Record of agreements captured on registration to access "How-to" guides / online resources. Review / analysis of timelines reported by	Baseline not appropriately defined to gauge time saving. Commitment from developers to provide feedback and evidence not obtained.

Monitoring	Indicators	Targets	Description of indicators and targets	Data source/Collection Methods[109]	Frequency	Responsible for data collection	Means of verification	Risks/Assumptions
	development timelines)	timelines monitored for users of the facility. *End of project* Development timelines for new minigrid systems improved by 25% relative to baseline.	providing clear practical guidance on contact points, requirements, order of authorisations, critical paths, preparation timelines, etc. The indicator is intended to track the time it takes to progress between two defined points in the process (or parts of the process) relative to a baseline. The baseline methodology will inform the approach to monitoring to ensure consistent measuring.	developers, but timelines have not been quantified / measured. Data source/ collection: Development timelines monitored for users of the online One Stop facility using questionnaires, surveys, follow up emails, requesting supporting documentation[115] Corroborate with relevant government institutions where workflow data is available. If possible, time savings experienced by users of the One Stop Information Centre can also be assessed against the experience of		an evaluation against the baseline.	developers and any reported data from government institutions. If needed, additional verification can be done on 'raw' data including survey data, questionnaire feedback, submitted supporting data, etc.	Supporting evidence not requested, pursued or effectively captured to be able to demonstrate the impact on timelines. Discrepancies or disputes between developer and government records.

[115] Ideally evidence will be provided by system generated acknowledgements of submissions, process milestones and approvals generated by a workflow management system. Where this is not available, supporting evidence could be provided in the form of any communication confirming submission dates, feedback, further requests for information and approval dates of all or parts of the process.

Monitoring	Indicators	Targets	Description of indicators and targets	Data source/Collection Methods[109]	Frequency	Responsible for data collection	Means of verification	Risks/Assumptions
				non-users with data collected through survey or interviews if & as appropriate.				
Project Outcome 3. Data and digitalization are mainstreamed, across stakeholders, into local minigrid market development. Increased knowledge, awareness and network opportunities in the minigrid market and among stakeholders, including benefitting from linkages to international good practice.	***Indicator 9.*** A digital strategy for the project is prepared and implemented by the relevant Project Unit to contribute to project implementation and local minigrid market development. *(Units of measure: binary (1/0))*	*Midterm* Digital strategy developed and being implemented for the project. Data from all participating minigrid pilot projects actively aggregated, anonymized, analysed, interpreted and utilized / processed into knowledge resources. *End of project* Project Digital Strategy implemented. Complete dataset of all outputs and measured data	The indicator checks whether a digital strategy that aligns with the regional project's data requirements was both developed and implemented. Implementation will be assessed by the physical existence of a database, knowledge resources and integration with the regional project. It should additionally assess whether a centrally located, readily available facility (online and otherwise, as needed) containing all AMP knowledge resources was put in place as a national resource.	Baseline: This indicator is newly introduced for the AMP and therefore no digital strategy is currently in place. Baseline data from Mthembanji minigrid pilot project, Sitolo Minigrid and Mulanje Electricity Generation Company are being collected by the respective system operators but, is not aggregated. Data source/ collection: Confirmation or sign-off from the regional project confirming the strategy meets requirements.	Dependent on digital strategy and regional project guidance. Different data sets will be collected monthly, quarterly and/or ad hoc as relevant, and collated and reported annually. Confirm up to date every six months.	PU, Country Office	Physical inspection of (i) data base or bank of collected data, (ii) knowledge resources made available on the website, and (iii) submissions to regional project against approved strategy.	Digital strategy not consistently followed resulting in an incomplete or outdated data set.

Monitoring	Indicators	Targets	Description of indicators and targets	Data source/Collection Methods[109]	Frequency	Responsible for data collection	Means of verification	Risks/Assumptions
		from pilot projects. Comprehensive country specific knowledge resource with case studies, communications and training material.		Confirmation that the strategy includes a section on collating and managing knowledge resources for the country. Strategy in place and implemented to collate data and knowledge resources from various sources and activities, including: *Smart metering data from AMP and other pilot projects.* *Surveys, focus groups, interviews, and any other data collection instruments used.* *CSO statistics and publications.* *MERA minigrid application and licensing statistics.* *Any publications, insight or policy*				

Monitoring	Indicators	Targets	Description of indicators and targets	Data source/Collection Methods[109]	Frequency	Responsible for data collection	Means of verification	Risks/Assumptions
				briefs, case studies, papers, etc.				
	Indicator 10. Number of minigrid pilots sharing data on minigrid performance with the regional project and other stakeholders following best practices and guidance provided by the AMP Regional Project. *(Units of measure: Absolute number of pilots reporting data)*	*Midterm* The project's 'digital & data management platform' is procured and operational, ready for data collection from the project's mini-grid pilot(s), and for data sharing with the AMP regional project's digital platform. Both (2) AMP minigrid pilot sites collecting and sharing data with the AMP Regional Project using the project's 'digital & data management platform'. *End of project*	*The indicator counts the number of minigrid pilot sites that are contributing data to the regional project.*	Baseline: No pilot data currently linked to regional project. Data source/ collection: Confirm data sharing agreements in place. Confirm mechanism and protocol for sharing data in place for each site. Confirm data sharing with pilot owner. Confirm receipt of data with regional project. Physical evidence of and reports on consolidated data at regional level.	Reporting to be informed by the strategy, but expected to include: Monthly collection of metering data Annual collection of socio-economic impact data. Frequency of interface with regional project to be defined by the digital strategy.	Pilot project operator or owner, PU (with support of appointed service providers if required)	Digital strategy documented. Physical data sets. Corresponding CSO data where relevant.	Agreements or protocol do not provide adequate assurance to system owners that data will be treated as confidential. Metering systems not functioning as planned, preventing data from being collected and shared as planned/ agreed. Remote reading of data not actively implemented and/or interface with regional project not operational.

Monitoring	Indicators	Targets	Description of indicators and targets	Data source/Collection Methods[109]	Frequency	Responsible for data collection	Means of verification	Risks/Assumptions
	OR accessibility[117] of the equipment or facility(ies) to women	OR any improvement over baseline	managers of rice and oil processing, or other "large," equipment OR assessing the accessibility/ availability of the equipment or facility(ies) to women and any barriers to adoption.	specialist for QAMF where relevant OR survey of / interviews with community members and local farmers.		collected and reported	If needed, can be verified through a physical site visit	
	Percent of male and female micro- and small enterprises connected to and using MG electricity	At least 40% of connected 'second layer' micro-enterprises are female-led;	Baseline: No deliberate targets set for outreach to support of female-led businesses using electricity. Percent of male and female micro- and small enterprises connected to and using MG electricity	Data reported by system operator/ owner on behalf of Responsible Party and confirmed by gender analyst and/or social and environmental safeguards specialist for QAMF where relevant	Annually	United Purpose as system operator/owner to collect data PU and Implementing Partner to ensure data is collected and reported	Review of monitoring reports, data collected and provided for QAMF framework, SES and/or gender specialist reports If needed, can be verified through a physical site visit	None foreseen
	Presence/ absence of demand and affordability feasibility analysis for	Publication of technical/ economic/gender feasibility analysis for MG-powered EPCs	Baseline: No experience with EPCs Presence/ absence of demand and	Data reported by system operator/ owner on behalf of Responsible Party and confirmed by	Annually	United Purpose as system operator/own	Review of monitoring reports, data collected and provided for QAMF	None foreseen

[117] If used on a fee-for-service basis, availability/accessibility of the equipment and facilities and barriers to adoption can be assessed (e.g., Do women feel comfortable going to the location and interacting with the operator? Is the service available at times when women are also available?). PUE operators can consult with project gender specialist to make their service offering as accessible and inclusive as possible.

Monitoring	Indicators	Targets	Description of indicators and targets	Data source/Collection Methods[109]	Frequency	Responsible for data collection	Means of verification	Risks/Assumptions
Add indicators included in gender action plan, stakeholder engagement plan or other monitoring plans as needed.								
Gender Component 1, Output 1.1	Percentage of digitally mapped data entries or digitally catalogued appliances having some associated gender information	20% of digitally mapped data entries can be associated with a gender variable and 50% of catalogued appliances are linked to form of gender information	Baseline: No local gender analysis aggregated of energy infrastructure and potential demand, including appliances. Percentage of digitally mapped data entries (MSMEs, enabling organizations, energy assets, energy needs) or digitally catalogued appliances having some associated (i.e., database relational) gender information	Count of data entries or appliance records captured for Output 1.1	As for Indicator 5	UNCDF PU and Implementing Partner as owner of base map	Review of mapping data in Output 1.1	Gender data points not distinctly captured
Gender, Component 2, Output 2.1	Number of all-female or gender balanced lessees of rice and oil processing, or other "large," equipment[116]	At least 1/3 of 'large' anchor users are women- (or gender diverse) controlled enterprises;	Baseline: No female ownership/management of MG-connected rice processing equipment or oil pressing machines. Number of all-female or gender balanced lessees or	Data reported by system operator/ owner on behalf of Responsible Party and confirmed by gender analyst and/or social and environmental safeguards	Annually	United Purpose as system operator/owner to collect data PU and Implementing Partner to ensure data is	Review of monitoring reports, data collected and provided for QAMF framework, SES and/or gender specialist reports	None foreseen

[116] If leased to a single or small number of enterprises rather than fee-for-service based operation, track gender composition of enterprise owners or management.

Monitoring	Indicators	Targets	Description of indicators and targets	Data source/Collection Methods[109]	Frequency	Responsible for data collection	Means of verification	Risks/Assumptions
		At least 4 minigrid pilots are collecting and sharing data with the AMP Regional Project using the project's 'digital & data management platform'.						
	Indicator 11. Measurement, Reporting and Verification (MRV) framework linked to and compliant with regional project requirements.	*Midterm* MRV framework designed to meet at least regional project requirements. Indicators monitored and captured to specification. *End of project* MRV framework complete, up to date and integrated into regional project	The indicator confirms that a MRV framework has been established, is implemented and linked to the regional project to ensure (i) compliance with the requirements of the GEF and UNDP and (ii) that all project impacts can be adequately assessed and demonstrated.	Baseline: No MRV framework in place. Data source/ collection: MRV framework designed and established. Datasets and reports with evidence that indicators identified in the MRV framework are being monitored with data collated and reported. Confirmed receipt of complete and compliant data by regional project.	As defined by the MRV framework, but not less frequent than annually. Progress on key outputs tracked in PIR.	PU, Country Office Implementing Partner (accountable)	Framework documented Physical data and status of indicators	Data collection instruments necessary to inform the MRV indicators not defined, put in place on time and implemented to adequately demonstrate progress and impact.

Monitoring	Indicators	Targets	Description of indicators and targets	Data source/Collection Methods[109]	Frequency	Responsible for data collection	Means of verification	Risks/Assumptions
	inclusive organization		inclusive organization	feedback forms or attendance registers				
Environmental and Social risks related studies, as relevant[118].	N/A at this stage	N/A at this stage	N/A at this stage	As per ESMF	Annually	Project Manager and UNDP CO	Project terminal report	To be determined individually for each pilot/activity

[118] See ProDoc, Annex 10 - ESMF, Section IX for further details.

Annex 6: UNDP Social and Environmental Screening Procedure (SESP)

Refer separate document.

Annex 7: UNDP Risk Register

#	Description of risk (grouped by category)	Impact & Probability (I, L)[119]	Risk Treatment / Management Measures	Risk Owner
	Strategic Risk			
1	Failure to achieve a financially viable business model for small minigrids.	If the pilot project fails to demonstrate or achieve a fully financially viable business model for small minigrids, the objectives of encouraging private sector participation and accelerating minigrid uptake will not be achieved. Moderate (I = 3, L = 3)	Even if not fully achieving a viable business model at this scale, the project should have made significant progress towards demonstrating improved financial viability and will be well placed to recommend additional measures or amendments needed towards this goal. Findings should also provide valuable guidance of interest to larger scale systems. Should this be the case, the most promising business model and suite of initiatives will be defined detailing findings and recommendations from the pilot experience as it relates to tariffs, revenue collection, share and types of PUEs, grid utilization, operational costs and efficiencies, value addition, significance and scope of small business development support, Microfinance for small businesses, and/or any other aspect of significance in developing a viable minigrid business model. It will also document learnings to serve as input into future developments as well as planning and policy development.	AMP/ACRE Project unit, University of Strathclyde, United Purpose Malawi
	Regulatory risk			
2	Failure to implement continual refinement of the policy and regulatory environment to effectively achieve national objectives.	An iterative process has proven critical to shape the minigrid regulatory framework. Failure to incorporate lessons and experiences from pilot projects, any other developments in the country as well as industry feedback, might limit the contribution from minigrids towards the targeted outcomes for the country. Substantial (I = 4, L = 3)	Nominations by the Steering Committee for representatives from key institutions to participate in the regional CoP with structured feedback will support active knowledge exchange The project makes provision for key stakeholders to actively engage with the outputs of the DREI study and use findings and inputs from the study (and other resources and sources) to inform the formulation of an action plan for further inclusion or refinement of policy instruments. The AMP/ACRE Project Steering Committee and the Technical Advisory Committee will facilitate a feedback loop of data and findings to policy and decision-makers. The Industry Association and linkages to the regional Community of Practice will	AMP/ACRE Project unit, technical advisor (output 1.1) and REIAMA (output 3.3)

[119] I = Impact; L = Likelihood

#	Description of risk (grouped by category)	Impact & Probability (I, L)[119]	Risk Treatment./ Management Measures	Risk Owner
			facilitate engagement laterally and with government. The strong focus on data analysis and knowledge management in Component 3 should serve as valuable input to the Steering Committee and key stakeholders to inform planning and policy direction.	
	Operational Risk			
3	Limited Government capacity for project delivery under a full National Implementation Modality.	Restructuring within the newly created Ministry of Energy, coupled with capacity constraints and cumbersome procurement processes will present a challenge for delivery under a full National Implementation Modality. Substantial (I = 5, L = 3)	Project management activities for the AMP will be incorporated under the ACRE project unit, located within the Ministry of Energy, with support from a UN Volunteer funded under the TRAC co-finance allocation. Participation by the Ministry of Energy and other key stakeholders in the Community of Practice will support capacity building. Where necessary, additional consultants with technical and procurement expertise will be brought in to support the Ministry with procurement.	AMP/ACRE Project unit, UNDP Country Office
4	Limited cash budget to fund a project management team.	Under the GEF allocation, the cash budget available to fund dedicated project team resources is severely limited and inadequate to support a dedicated Project Manager and Administrative/Finance Associate. Without these people delivery of the project scope within the given timeframe will not be possible. Substantial (I = 5, L = 3)	As above, the project management function for the AMP will be incorporated under the ACRE project with support from an UN Volunteer to alleviate the additional pressure on the existing ACRE project team. Government will assign officers who will dedicate part of their time to the day-to-day operation of the Project. Two responsible parties have been identified for the AMP in Malawi to lead the delivery of defined Outputs. Additional opportunities to contract suitable qualified responsible parties for the delivery of defined Outputs should be sought during implementation. TRAC funding has been allocated to extend the services of the ACRE PM to oversee delivery during the last two years of AMP.	AMP/ACRE Project unit, UNDP Country Office
5	Delayed project start will impact the opportunity for synergies with parallel projects.	The AMP has been aligned with two in country projects to best leverage the available funding. As these projects are scheduled to complete in 2023, a delayed start to the AMP will impact the opportunity of synergies.	For the pilot projects, budget has been allocated to retain some capacity/availability from the team to ensure monitoring, evaluation and continued support during the last two years. Significant preparation work (meetings, planning discussion, activity planning) has been done to ensure activities and project partners are ready to start.	AMP/ACRE Project unit, UNDP Country Office

#	Description of risk (grouped by category)	Impact & Probability (I, L)[119]	Risk Treatment / Management Measures	Risk Owner
		Alignment with the ACRE and EASE projects as well as coordinated activities across the regional project (e.g. DREI) means the earliest possible starting date should be targeted for the AMP in Malawi to optimally utilize the window period during which all resources are fully available. Substantial (I = 5, L = 3)	In support of an early and efficient start, a detailed workplan has been developed for the most critical outputs of the project. The workplan has also been frontloaded to encourage and facilitate implementation in such a way as to maximise the first two years of implementation that coincides with the ACRE and EASE projects. The DREI analysis has been scheduled to start in parallel with the other AMP countries and accordingly, resources (TORs for consultants, implementation guidelines, a list of qualified DREI practitioners, etc.) have already been prepared at the regional project level.	
6	Delay with the procurement / establishment of the digital platform will cause detrimental delays to project implementation.	Given the digital platform's central importance to the project's functioning, successfully procuring the digital platform will be a critical activity, which may otherwise result in significant detrimental delays to project implementation. Moderate (I = 4, L = 2)	Procurement of the platform should be performed as a priority in the first half of year 1. This has been incorporated into all relevant documentation, including the workplan and procurement plans. Procurement will be done by the ACRE Project unit that is already established and operational, therefore well placed to proceed without delay. Additionally, a generic set of specifications has been developed for the digital platform as initial guidance for the TOR during implementation and hence facilitate the procurement process. The regional project will also provide updated guidance on TORs during implementation.	AMP/ACRE Project unit, Implementation partner
7	Reliance on ACRE project infrastructure past its implementation period.	The ACRE project is currently scheduled to conclude in December 2023. As noted above, AMP project implementation will be incorporated under the ACRE project to optimally utilize and share resources. This presents a risk for implementation structures during the last two years of AMP implementation. Substantial (I = 5, L = 3)	UNDP is committed to energy up to the year 2030. The Country Office has indicated their expectation that additional TRAC resources will be allocated to support the AMP PMU for the remaining implementation period (although this cannot be confirmed before internal processes have been concluded). Budget from the TRAC funding has been allocated to extend the contract of the ACRE PM to oversee, with the continued support of the UN Volunteer, the delivery of the AMP outputs after ACRE concludes at the end of 2023. The budget allocation for a UN Volunteer to support project implementation has been made for 4 years. As noted above, the Ministry has also indicated Government's intent to assign	AMP/ACRE Project unit, UNDP Country Office Implementation partner, Project Board / Steering Committee,

#	Description of risk (grouped by category)	Impact & Probability (I, L)[119]	Risk Treatment / Management Measures	Risk Owner
		availability of material and equipment due to reduced manufacturing capacity impacting planned delivery timelines. - **Availability of implementation teams.** Increased absenteeism of resources due to sickness, the need to care for others, or restrictions on travel may impact project efficiency or progress. - **Time and cost impact of COVID compliance.** Project timelines may be delayed when scheduling around social distancing requirements and/or costs may increase to ensure compliance with COVID-19 guidance. Moderate (I = 4, L = 2)	- Assessing cost impacts of enhanced cleaning, reduced workforce, and other modifications. - Assessing what services can be continued offsite to limit schedule delays.	
	Financial			
9	If co-financing is not realized as anticipated, it will significantly limit the contribution of the AMP.	Considering the size of the GEF allocation for Malawi under the AMP, the scope of implementation will be enormously confined without additional cash funding. The current project design is dependent co-finance in the form of cash has been committed. Substantial (I = 5, L = 3)	Co-financing commitments from the UNDP TRAC funding, EASE project, Ministry of Energy and UNCDF are confirmed. Tracking and reporting of co-financing commitments throughout project implementation. Additional co-financing and collaboration opportunities to be sought and leveraged during the implementation phase.	Implementation partner, Project Board / Steering Committee, AMP/ACRE PU
	Social and Environmental			
10	Risk of inadequate social and environmental	As an overlay to the Mthembanji and Kudembe pilot projects,	The Mthembanji pilot project has complied with all national requirements with respect social and environmental safeguards (SES).	AMP/ACRE Project unit, University of

#	Description of risk (grouped by category)	Impact & Probability (I, L)[119]	Risk Treatment / Management Measures	Risk Owner
12	Minigrid system, structures and operation would be vulnerable to the climate hazards and risks associated with extreme and changing weather conditions.	Moderate (I = 4, L = 2)	Climate risk has been considered and mitigated into the planning, design, structure and operations of the pilot sites. Detail of the specific mitigation measures are included in Annex 17 of this document.	University of Strathclyde, United Purpose Malawi
13	External environmental factors, like for example the effects of climate change (such as the volume and quality of rainfall, rising temperatures, floods, droughts, violent winds, earthquakes, landslides, severe winds, storm surges, etc.) could lead to delay or abandonment of the project.	Low (I = 4, L = 1) [120]	This is an external risk to the project that will be mitigated in the context of a variety of other third-party activities by the Government. Furthermore, external environmental factors likely to be a risk have been considered within this project as part of the feasibility/assessment studies established in the ESMP for each site. These will use conservative assumptions to successfully operate. Therefore, this risk is assumed to be LOW under the assurance that this project will be guided by the ESMF / ESMP.	UNDP Country Office, AMP/ACRE Project Unit
14	Potential negative environmental impacts resulting from the project, either routine or non-routine based, could lead to adverse local, regional, and/or transboundary impacts causing a delay or abandonment of it.	Moderate (I = 3, L = 3)	This is an external risk to the project that will be mitigated in the context of a variety of other third-party activities from the Government. Furthermore, external social factors likely to be a risk will be considered within this project as part of the feasibility/assessment studies established in the ESMF for each site, which will use conservative assumptions to successfully operate.	UNDP Country Office, AMP/ACRE Project Unit
15	External social factors, for example poverty, health or other service delivery, slow recovery from COVID and other issues, could lead to delay, abandonment of the project or decrease the ability of people to pay for the services.	Moderate (I = 3, L = 3)	During Project preparation similar Project activities have been visited and/or consulted by the team of experts to evaluate the risks. Principal social risks have been framed at this stage (Project Preparation Grant, PPG) and they will continue to be assessed along the entire project cycle for each chosen sites. Based on that, a pertinent due diligence project development process, monitoring of operations, and active intervention are foreseen according to such social safeguards established in this project through the ESMF to ensure operation	UNDP Country Office, AMP/ACRE Project Unit

[120] Based on climate change indexes internationally recognised: https://germanwatch.org/en/cri and https://ccpi.org/ (released on 7 Dec), Malawi is vulnerable to climate risks, as follows 1) Climate risk: Stable trend from 1999 to 2018 at the SUBSTANTIAL range of countries affected by climate risks and surrounded in part by a HIGH climate risk country. 2) Malawi's capacity to fight climate change is not expected to be among the best countries internationally. Climate risk is therefore considered as HIGH (to be conservative) in the coming years.

#	Description of risk (grouped by category)	Impact & Probability (I, L)[119]	Risk Treatment / Management Measures	Risk Owner
			creation and highlighting the job opportunities in the renewable energy sector available to those currently working with diesel generators.	
	Gender Equality and Inclusion			
18	Productive use benefit captured disproportionately by one gender.	There is a risk that the productive use benefit will be captured disproportionately by one gender, either exacerbating existing inequality or leading to backlash. Low (I=2, L=2)	Eventually conducting focus group discussions in the affected communities will offer more insight into the likelihood of technological appropriation of the rice mills and other equipment, along with collaborative problem-solving around how to address any specific barriers to asset ownership and use faced by women's businesses or cooperatives.	AMP/ACRE Project unit, University of Strathclyde, United Purpose Malawi

Consultant	Time Input	Tasks, Inputs and Outputs
		• *Assess major and minor amendments to the project within the parameters set by UNDP-GEF;* • *Monitor implementation plans including the gender action plan, stakeholder engagement plan, and any environmental and social management plans;* • *Monitor and track progress against the GEF Core indicators.* • *Support the Terminal Evaluation process.* • *Add technical tasks as necessary* • *Liaise with the AMP Regional Project PMU Staff to request and receive operational and technical support as needed, to participate in activities led by the AMP Regional Project, and share data and information with the AMP regional Project as required.* The Terms of Reference (ToR) for this position should include a clear statement indicating that a minimum of 10% of the person's time will be allocated to AMP Regional Project activities. If the PM is also delegated as the 'beneficiary(ies) representative' on the AMP Regional Project board, this should also be included in their ToR.
Project and Finance Assistant *UN Volunteer* *Rate: $12,000/year (total cost to project)*	*Full time over 4 years*	*Duties and Responsibilities* *Under the guidance and supervision of the Project Manager, the Project Assistant will carry out the following tasks:* • *Assist the Project Manager in day-to-day management and execution of project activities;* • *Assist the M&E officer in matters related to M&E and knowledge resources management;* • *Assist in the preparation of progress reports;* • *Ensure all project documentation (progress reports, consulting and other technical reports, minutes of meetings, etc.) are properly maintained in hard and electronic copies in an efficient and readily accessible filing system, for when required by PB, TAC, UNDP, project consultants and other Project Unit staff;* • *Provide Project Unit-related administrative and logistical assistance.* *Duties and Responsibilities with support and oversight from UNDP Country Office and Project Manager* • *Keep records of project funds and expenditures, and ensure all project-related financial documentation are well maintained and readily available when required by the Project Manager;* • *Review project expenditures and ensure that project funds are used in compliance with the Project Document and UNDP financial rules and procedures;* • *Validate and certify FACE forms before submission to UNDP;* • *Provide necessary financial information as and when required for project management decisions;* • *Provide necessary financial information during project audit(s);* • *Review annual budgets and project expenditure reports, and notify the Project Manager if there are any discrepancies or issues;*

Consultant	Time Input	Tasks, Inputs and Outputs
International / Regional and global contracting		
Technical expert on GIS-based modelling for PUE, MSME and value-chain overlays *Indicative Rate: $ 800/day* *[**Note**. These services are expected to be recruited by UNCDF, as responsible party for Output 1.1. and costing is therefore incorporated under Contractual Services as part of the turn-key delivery of this output.]*	*62 days during years 2 and 3*	*The Technical Expert on GIS modelling will be responsible for the delivery of the data overlays and map analysis for minigrid potential for Malawi that clearly demarcates areas best suited to minigrid developments in the country (Output 1.1).* • *Sourcing and analyzing spatial data through the use of mapping software.* • *Performing data munging and cleaning to convert data into its desired form.* • *Identifying patterns and trends through spatial mapping of data.* • *Producing map overlays showing the spatial distribution of various kinds of data, including MSMEs, PUEs, sattelite / value chain analysis data, mobile network data.* • *Contributing spatial modeling to build on World Bank least-cost electrification base map* • *Produce reports on geographic data utilizing data visualizations.* *Inputs: GEF financing resources + UNCDF data resources + agricultural value chain data + District Energy Officers data + appliance survey data + Gender analyses on all layers of data + Malawi Least Cost Electrification Map* *Outputs: (1) Data overlays to least-cost electrification options and map indicating minigrid potential in Malawi (2) Reports / data visualisation of minigrid potential*

International DREI Expert
Rate: $ 800/day
	50 days in Year 1	*A Technical Expert qualified to perform a full DREI analysis, preparing a DREI report, and disseminating the findings for solar PV-battery minigrids in Malawi under the guidance of the regional project. A complete TOR for this role has been drafted and is available at the regional project.*
		
		<u>Duties and Responsibilities</u>
		• *Conduct a full DREI analysis for solar PV-battery minigrids in Malawi, including:*
		  ○ *Risk environment. Data collection and market research to assess the risk environment and develop DREI financing cost waterfalls to describe the contribution of risk to financing costs.*
		  ○ *Public instrument selection. Overview of the public instruments in place and an assessment of the risk mitigation potential of instruments*
		  ○ *Levelised cost of electricity (LCOE) modelling.*
		  ○ *Evaluation and sensitivity analysis*
		  ○ *Cross cutting activities e.g. developing and maintaining an Assumptions Book and feedback on the methodology for contimual improvement*

Consultant	Time Input	Tasks, Inputs and Outputs
		• *At least 3 years' experience with knowledge exchange and capacity building within the public sector, among industry players, NGOs and/or rural communities related to off-grid or minigrid power systems;* • *At least 3 years' experience with data analytics, techno-economic modelling;* • *Previous experience in development assistance or related work for a donor organization, governmental institutions, NGO or private sector / consulting firm;* • *Strong analytical, drafting and communication skills; and* • *Strong research skills.*
Outcome 1, 2 and 3		
Local / National contracting		
Gender Analyst / Specialist *Rate: $ 2,000/week* *The budget for the gender analyst has been indicated in the TBWP across outputs 1.1, 1.2, 3.1 and 3.3*	*14.5 weeks over 4 years*	*The Gender Analyst(s) will be responsible to provide high quality technical support in ensuring the quality of the gender-responsiveness and mainstreaming of the project, as well as knowledge and capacity building activities, in accordance with the objective and outcomes of the project document and the Gender Action Plan.* *Expert or Specialist services have been planned for activities identified in the Gender Action Plan for Outputs 1.1, 2.1, 3.1 and 3.4.* *<u>Duties and Responsibilities</u>* • *Ensuring the quality of the gender-responsiveness and mainstreaming of data analysis and visualization activities;* • *Guidance for improved gender representation in all project related activities,* • *Ensure inclusivity and gender sensitive communication and consultation,* • *Recommendations for tailored approaches to prioritize women's needs and identified gender equality priorities in the pilot project development,* • *Ensure gender sensitivity in digital strategy, data collection frameworks, monitoring, analysis and reporting,* • *Support knowledge sharing, documentation and dissemination of good practices on gender equality, women's empowerment and rights within the project.*
Project Environment and Social Safeguards Officer / Specialist	*8 weeks over 4 years*	*The national expert will be recruited by the AMP project unit to (i) support the overall project, particularly as it relates to monitoring and reporting against social and environmental impacts indicators and (ii) to provide additional oversight, guidance and support to the pilot projects to help ensure existing measures are adequate for compliance UNDP policy requirements.*

Consultant	Time Input	Tasks, Inputs and Outputs
		• *Previous experience in development assistance or related work for a donor organization, governmental institutions, NGO or private sector / consulting firm is a very strong advantage;* • *Strong analytical, drafting and communication skills;* • *Experience in the usage of computers and office software packages (MS Word, Excel, PowerPoint, etc.) and advance knowledge of spreadsheet and database packages, experience in handling of web-based management systems;* • *Strong research skills.*
Stakeholder engagement specialist *Rate: $ 1,750/week*	*5.5 weeks over 4 years*	*Provide expert stakeholder engagement guidance and support to the PMU in developing pilot projects, needs assessments, community engagement (consultation and information sharing), impact assessments and design of grievance mechanism with specific consideration of inclusivity of gender, youth and other vulnerable groups.* *Expert or Specialist input supported by contracted services for consultation activities such as surveys, focus groups, etc.*
International / Regional and global contracting		
AMP Regional Project Panel of Technical Experts *Rate: $ 800/day*	*81.25 days over 4 years*	*Drawing from the pool of technical experts (offering mixed skills relevant to the minigrid sector) available at the regional project. Technical advisory support is expected to be required for:* • *Designing the QAMF to correspond and integrate with the regional fraemwork (Output 3.1);* • *Ensuring data quality, integrity and compliance of project monitoring, reporting and verification across all indicators when integrated at program level (Output 3.1);* • *Designing of the digital strategy and MRV framework (Outputs 3.2)* • *Technical support to the industry association for development of policy briefs to support well-informed discussions on topic-specific issues.*

While rural electrification programs are crucial to improve living conditions and promote development, they may also have unintended adverse impacts. These may include changing cultural or social practices, localized impact on the environment where construction occurs, increased light pollution, increased usage of water for economic activities, among other.

The SESP has identified the following potential areas of risk arising from the implementation of the project:

Overarching Principle 1: Leave No One Behind
Programming Principle 2: Human Rights
Programming Principle 3: Gender Equality and Women's Empowerment
Programming Principle 4: Sustainability and Resilience[2]
Programming Principle 5: Accountability
Project- level Standard 1: Biodiversity Conservation and Sustainable Natural Resource Management
Project- level Standard 2: Climate Change and Disaster Risk
Project- level Standard 3: Community Health, Safety and Security
Project- level Standard 4: Cultural Heritage
Project- level Standard 5: Displacement and Resettlement
Project- level Standard 6: Indigenous Peoples
Project- level Standard 7: Labour and Working Conditions
Project- level Standard 8: Pollution Prevention and Resource Efficiency

The number of direct project beneficiaries is expected to be around 763 persons, of which approximately 389 women. The lifetime global environmental benefits that will accrue from the adoption of off-grid solar technologies is estimated at 1,068 tCO_2e. Consequential emission reductions amounting to ~2,043,000 tCO_2e are expected between 2021 and 2025 predominantly through the replication of the sustainable technology value chain. The project yields a GEF abatement cost of 199 USD/tCO_2e.

The monitoring of identified impacts will form part of the project. Pilot projects are particularly important for understanding and quantifying impact including unexpected impacts. Stakeholders are key to this process. Active stakeholder engagement is therefore a priority and the focus of this plan.

2. Regulations and Requirements

The Environment Management Act (EMA) of 2017 (replacing the first EMA of 1996), the National Environmental Action Plan (NEAP) published in 1994, the Environmental Impact Assessment Guidelines of 1997 and (Revised) National Environmental Policy (NEP) (2004) collectively provide for a coordinated and comprehensive legal framework for environmental protection and management as well as the conservation and sustainable use of natural resources. The NEP is an umbrella framework guiding different lead agencies and stakeholders on activities that affect the environment and natural resources management, including how to minimize impacts of environmental degradation. The overall goal of the policy promotion of sustainable social and economic development through the sound management of the environment and natural resources. The Director of Environmental Affairs is responsible to determine the measures required for the management and mitigation of environmental impacts associated with proposed activity/project. These instruments of policy also guide facilitation of active participation by local communities and other stakeholders in development programmes. Other than this guidance, at the time of developing this SEP, there were no other legally binding policies or explicit regulations in the country identified as pertaining to stakeholder engagement as a legal requirement. UNDP will take a lead role in coordination between stakeholders throughout the project duration by means of this SEP.

- Renewable Energy private companies and Organizations[123]
  - SITE Engineering
  - Community Energy Malawi
  - United Purpose Malawi
  - Sonlite Solar & Electrical
  - Anderson Engineering Ltd
  - Inflo Ltd Energy Systems
  - FISD Ltd
  - Coolite Engineering
  - Global Solar Ltd
  - iMoSyS Energy
  - Gac energy systems

3.3 Development partners with minigrid and renewable energy projects in Malawi

- African Development Bank (AfDB)
- European Union (EU) Malawi
- United Nations Capital Development Fund (UNCDF) and Finmark Trust
- United Nations Children's Fund (UNICEF)
- United States Agency for International Development (USAID)
- Department for International Development United Kingdom (DFID)
- Gesellschaft für Internationale Zusammenarbeit (German Corporation for International Cooperation) (GIZ)
- World Bank (WB)

3.4 Local communities

Local communities of relevance to the project can be categorized into two groups: communities in the pilot location (Mthembanji Village) and communities in non-pilot locations. Representatives of each group will be identified at AMP implementation. Both groups have been and will be further studied during the site assessment to be conducted during project implementation.

3.5 Additional groups (to be further defined during implementation)

- Direct beneficiaries
  - Pilot community
  - Recipients of training
  - Industry participants
- Indirect beneficiaries
  - Industry groups (agriculture, fisheries, manufacturing)
  - Non-governmental Organization (NGOs) working on relevant projects and initiatives
    - World Vision (children's rights)
    - Youth Net and Counselling (YONECO)
    - Plan International Malawi (children's right)
    - African network for Prevention and Protection Against Child Abuse and Neglect (ANPPCAN)
    - SOS Children's Villages International
    - Save the Children

[123] In addition to these listed, an additional 9 companies were identified that provide supplies hardware or do solar PV installations.

Table 12: Stakeholder list

#.	Stakeholder Organization	Stakeholder category	Interest	Impact	Contact Person	Contact details
1	African Development Bank (AfDB)	Development Partner / Financial Institution	Medium	Medium	Jonathan Banda	j.banda@afdb.org
2	Community Energy Malawi (CEM)	Minigrid operator	High	High	Lusungu Kumwenda	kumwendalusungu2014@gmail.com
3	Cooperation Network for Renewable Energy in Malawi[124] (CONREMA)	NGO, Sustainable Energy industry	High	Medium	Devine Matare Thomson Jere	devine.matare@renewnablemalawi.org finance@renewnablemalawi.org
4	DFID	Development Partner	Medium	Low	Daniel Kachale	dkachale@dfid.gov.uk
5	EGENCO	Parastatal / Baseline energy provider	Medium	Medium	Hilda Singo Regina Bonya -James Labren Sondhi Steven Kayira Harry Msosa	hsingo@egenco.mw rbonya@egenco.mw lfsondhi@egenco.mw skayira@egenco.mw hmsosa@egenco.mw
6	ESCOM	Parastatal/Baseline energy provider	Medium	Medium	Evilasio Mwale	emwale@escom.mw
7	Department of Economic Planning and Development	Government (Planning Institution)	Medium	Low	Allan Jere	jereallan@ymail.com
8	EU Malawi	Development partner	Medium	Low	Odran Hayes	odran.hayes@eeas.europa.eu
9	FinMark Trust	Development partner	High	Medium	Innocent Njati	InnocentN@finmark.org.za
10	GIZ	Development Partner	High	Medium	Gift Chunda Achim Kress	gift.chunda@giz.de achim.kress@giz.de
11	Lilongwe University of Agriculture and Natural Resources Science Technology	Academic institution	Medium	Medium	Dr Thawani Sanjika	sanjikat@bunda.luanar.mw
12	Ministry of Local Government	Government	Medium	Medium	Moses Zuze	zuzeaaron@yahoo.com; zuzeaaron@gmail.com

[124] initiated by Renew'N'Able Malawi a local non-governmental organization and think-tank focused on renewable energy

#.	Stakeholder Organization	Stakeholder category	Interest	Impact	Contact Person	Contact details
25	United Purpose (UP)	Minigrid operator	High	High	Elizabeth Banda Lloyd Archer	Elizabeth.Banda@united-purpose.org Lloyd.Archer@united-purpose.org
26	University of Malawi	Academic institution	Medium	Medium	Esther Phiri	ephiri@poly.ac.mw
27	University of Strathclyde (UoS)	Academic institution	High	High	Aran Eales Damien Frame	aran.eales@strath.ac.uk damien.frame@strath.ac.uk
28	USAID	Development Partner	Medium	Medium	Grace Simwaka	gsimwaka@usaid.gov
29	World Bank	Development Partner	Medium	Medium	Kagaba Paul Mukiibi; Dhruva Sahai	kmukiibi@worldbank.org; dsahai@worldbank.org
30	World Vision	Children's rights	Low	Low	-	Website: www.wvi.org Tel:+265 1 750 543
31	Malawi Environment Endowment Trust (MEET)	Environment Organisation			-	Email: meet@naturetrust.mw Phone:01820303
32	YONECO	Children's Rights / Youth	Low	Low	-	Website: yoneco.org Tel: +265 1 526 199 +265 888 958 726 Email: director@yoneco.org.mw
33	Plan International Malawi	Children's rights	Low	Low	-	Website: plan-international.org Tel: +265 999970400/401/402/403/404 Email: Malawi.Co@plan-international.org
34	UN WOMEN	Women's Rights	Low	Low	Pamela Mkwamba Habiba Osman	Email: Pamela.Mkwamba@unwomen.org Habiba.Osman@UNWOMEN.ORG
35	National Business Women's Association	Women's Rights	Low	Low	-	Email: nabw@nabwmalawi.org
36	African Network for Prevention and Protection Against Child Abuse and Neglect (ANPPCAN)	Children (Labour/Rights)	Low	Low	General contact for the region. Malawi hosts a chapter office, ANPPCAN Malawi	http://www.anppcan.org regional@anppcan.org Tel: +265 Cell: {+265} 08 88573 595 Phone – cell 265 888573595 Email: anppcanmalawichapter@yahoo.com

#.	Stakeholder Organization	Stakeholder category	Interest	Impact	Contact Person	Contact details
					of Legal information (ITTIG) Marja Hinefelaar, Director of Research and Programs, Southern African Institute for Policy and Research (SAIPAR)	marja.hinfelaar@saipar.org
49	AfricanLII	Law Defenders	Low	Low	None specified	https://africanlii.org/
50	Employers Consultative Association of Malawi	Worker rights	Low	Low	George Khaki	Website: www.ecammw.com Tel: +265 99 5 18 9391 Email: ecam@ecammw.com
51	Malawi Congress of Trade Unions	Worker rights	Low	Low	General Contact Only	Tel: +265 755 614 Email: mctusecretariat@gmail.com
52	Ministry of Labour	Law Defenders	Low	Low	General Contact Only	www.motpwh.gov.mw Tel:+265 773 277
53	Malawi Law Society	Law Defenders	Low	Low	General Contact Only	malawilawsociety.net Tel: +265 1 8 21 043 Email: info@malawilawsociety.net
54	Malawi Law Commission	Law Defenders	Low	Low	General Contact Only	Website: lawcom.gov.mw Tel: +265 1 773 996 +265 1 772 822 Email: lawcom@lawcom.gov.mw
55	Malawi Human Rights Commission	Law Defenders / Human Rights	Low	Low	General Contact Only	Website: www.mhrcmw.org Tel: +265 1 750 900 Email: info@mhrcmw.org
56	Direct beneficiaries of the pilot project	Impacted communities	High	Medium	TBC	TBC

4. Stakeholder Consultation and Engagement during PPG Development

As part of the PPG development, and in addition to the desk review and data collection exercise, the PPG team of National and International Consultants identified key stakeholders and engaged with them in a series of in-person and online meetings. The purpose of these meetings was to discuss the project objective, the suitability of the proposed strategy to the present needs of Malawi and its alignment with national plans and ongoing market development. The discussions also aimed to identify the gaps which the AMP can work to fill, especially in the presence of significant activity related to minigrids as well as several projects targeting energy access and renewable energy development financed by development partners other than the UNDP.

Due to COVID-19 pandemic, the PPG International Consultants were not able to perform a field mission to meet with national stakeholders in-person. Stakeholder engagements were therefore done using a combination of online meetings, in person meetings or taking a hybrid approach. Where COVID-19 restrictions and bandwidth allowed, meetings were led by the National Consultant in person, with the International Consultant joining online. Consultation meetings and bilateral calls conducted online during the period from September 2020 to February 2021 are captured in Table 13:

Table 13: Stakeholder engagement during PPG development

Interaction type	Type of information disclosed	Location and dates	Individuals, groups and/or organisations consulted	Key issues discussed and concerns raised	Responses to issues raised	Process to provide feedback to stakeholders
Workshop (inception meeting)	Introduction to the scope of AMP program and national project	11 September 2020, online	17 organisations represented by 31 people (AfDB, CONREMA, DFID, EGENCO, EP&D, EU, GIZ, Local Government, MERA, MoE, MUST, REIAMA, UNCDF, UNDP, UNICEF, USAID, independent x 2)	Battery waste was raised as an environmental concern. The approach to gender and social and environmental safeguards was shared with stakeholders.	Concern noted and used to inform project design	Stakeholder interview process initiated for individual inputs.
Stakeholder interviews	Obtaining input from stakeholders regarding priorities and needs to shape the project design.	Conducted online and in person on multiple dates between September and January 2020	20 organisations (Ministry of Energy, MERA, EGENCO, ESCOM, MEGA, MBS, MUST, UNICEF, World Bank, USAID, CEM, JICA, CONREMA, MZUNI, UNITED PURPOSE, UNCDF, Scottish Govt & Strathclyde University, LUANAR, GIZ, S.I.T.E Engineering)	In additional to matters of design and priority for the sector, issues of social and environmental concern were covered through a questionnaire designed by the Social and Environmental Specialist. Concerns spanned a range of issues related to disposal of battery waste, electric shock, environmental impacts of	Concerns were used to inform Project design, ESMF and the Gender Action Plan. Monitoring of indicators will be used to track and quantify the impacts and contributions.	Validation workshop and copy of Project Document circulated for comment

Interaction type	Type of information disclosed	Location and dates	Individuals, groups and/or organisations consulted	Key issues discussed and concerns raised	Responses to issues raised	Process to provide feedback to stakeholders
				site clearance and construction, dust, gender issues, risk of HIV/AIDS, security risks, etc. Socio-economic benefits were also noted by stakeholders including reduced emissions (burning firewood/other), business opportunities, education, training, women owned businesses and empowerment.		
Stakeholder consultation at the second pilot site (Ekubekezeleni, Bulimeni area)	Informal consultation to enquire about needs, interest and affordability.	November 2020	Informal conversations with community members	Discussions confirmed interest in energy access. Existing challenges with limited road access and absence of electricity were raised. No other social or environmental issues received spontaneous mention.	N.A.	Community members will be actively engaged in more comprehensive consultation as part of the project development and implementation.
Sharing of project information with workshop invitation	Draft project documentation shared for preparation	5 January 2020	Invitations extended to more than 70 stakeholders across 15 stakeholder categories	N.A.	N.A.	N.A.
Workshop (Validation meeting)	Overview of project design	9 February 2021	Participation by 41 stakeholders from 23 organisations (Ministry of Energy, Rocky Mountain Institute (RMI), Community Energy Malawi (CEM), Cooperation Network for	No environmental concerns raised. Request for more deliberate inclusion of youth in project activities.	Project Document amended to reflect this priority.	Validation report with response matrix and amended Project Document

Interaction type	Type of information disclosed	Location and dates	Individuals, groups and/or organisations consulted	Key issues discussed and concerns raised	Responses to issues raised	Process to provide feedback to stakeholders
			Renewable Energy in Malawi (CONREMA), EGENCO, ESCOM, EU, GIZ, Local Government, MERA, Malawi Polytechnic, Malawi University of Science and Technology (Malawi Industrial Research and Development Centre) (MUST), SITE Engineering, UNCDF, United Purpose (UP), University of Strathclyde (UoS), World Bank, YONECO, South African Centre for Renewable Energy and Energy Efficiency (SACREE), Africa Minigrid Developers, Association (AMDA), Malawi Congress of Trade Unions, Africa Grant Advisors.			

Table 14: Stakeholder engagement at the Mthembanji Village pilot project preceding PPG development

Interaction type	Type of information disclosed	Location and dates	Individuals, groups and/or organisations consulted	Key issues discussed and concerns raised	Responses to issues raised	Process to provide feedback to stakeholders
Stakeholder Consultation meeting 1	Project information regarding the EASE project and the Mthembanji microgrid was shared in presentation format by United Purpose Malawi project coordinator. The stakeholders were interviewed	Local Authority, Dedza District Council Offices, 20 December 2018	The meeting was attended by 48 participants	In addition to general project information and consultation, community engagement enquired about support for refrigeration, rice farming and extending the grid to more households.	Modular nature of the solar power would allow future expansion and refrigeration is allowed and can be accommodated even though there was no evidence of this	Stakeholder discussions and responses on the day. Documented in ESMP.

Interaction type	Type of information disclosed	Location and dates	Individuals, groups and/or organisations consulted	Key issues discussed and concerns raised	Responses to issues raised	Process to provide feedback to stakeholders
	through focus group discussions and general community engagement meetings.				being used in the village at present. Approval granted for the project.	
Stakeholder Consultation meeting 2	Project details were shared followed by discussions and questions.	Local Authority, Kachindamoto 22 January 2019	Attended by 27 (24M; 3F) participants	In addition to discussing project details, questions related to (i) using welding machines and maize/rice mills with the available electricity, (ii) restrictions related to energy use at night from battery power, (iii) local employment on the construction, (iv) connection fee, (v) connecting more than 50 customers, (vi) extending the network to areas with grid power to improve reliability,	Guidelines for appliance usage will be provided. There will be local employment opportunities. Connection fees will be payable. The system may be expanded in time, but will focus on unelectrified areas. Approval granted for the project.	Stakeholder discussions and responses on the day. Documented in ESMP.
Stakeholder Consultation meeting 3	Project details were shared followed by discussions and questions.	Mthembanji Village heads and community members on the 23rd of January 2019	15 (10M; 5F) people in attendance, led by the senior group village head	Questions related to (i) restrictions on the size of electrical appliances, (ii) types of appliances that could be used by households, (iii) employment of local people, (iv) use grinders, welding machines and maize/rice mills, (v) will standalone solar systems be included, (vi) safety risks of solar power, (vii)	Confirmed that there will be recommended specifications (sizes/efficiencies) for the electrical appliances that can be connected to the grid including TVs, radios, fans, etc.	Onsite Q&A. Stakeholder discussions and responses on the day. Documented in ESMP.

Interaction type	Type of information disclosed	Location and dates	Individuals, groups and/or organisations consulted	Key issues discussed and concerns raised	Responses to issues raised	Process to provide feedback to stakeholders
				Land use for the MG system and (viii) type of roof structure that will be allowed to connect to the grid.	Installation scheduled to start in 2019. Project will not include SHS. Solar power has the same risks as any electricity, but training will be done with all end users. Land will be identified in consultation with the local authority and community structures and rent will be paid.	

The dissemination of project information during PPG consultations constituted sharing of a discussion outline and questions of relevance to the stakeholder, presentation of PowerPoint slides to stakeholders who had not attended the inception meeting, followed by an exchange of additional information by e-mail, as required.

In inviting feedback on the project document and participation in the validation workshop, stakeholders were offered a non-government contact point should there be any questions or sensitive issues they wanted to raise or discuss. Similarly, those facing challenges attending or participating in the online meeting, were invited to submit their contact details to be contacted by either the social and environmental specialist or the national consultant.

Initial comments and feedback from participants in the meetings and workshops were summarized in the Stakeholder Engagement - Action Plan Report (issued in November 2020). The comments and recommendations from stakeholders and the UNDP review team shaped the updated project strategy which has been presented to stakeholders at end of the PPG phase to obtain final comments on the design and validate the overall project strategy before submission to GEFSEC.

SEP Development: Strategy for Stakeholder Engagement during Project Implementation

5. Stakeholder Engagement Program (SEP)

5.1 Purpose and objectives

The overall objective of the stakeholder engagement program is to achieve a transparent decision-making process with greater input from stakeholders and their support of the decisions that are taken. The program seeks to define a technically and culturally appropriate approach to consultation and disclosure.

The goal of this SEP is to improve and facilitate decision making and create an atmosphere of understanding that actively involves project-affected people and other stakeholders in a timely manner, and that these groups are provided sufficient opportunity to voice their opinions and concerns that may influence project decisions. The SEP is intended as a useful tool to guide communications between the AMP project and stakeholders.

Unlike gird-connected power plants, the successful operation of minigrids requires continuous collaboration between operators and end-users. In the design of the pilots under the AMP in Malawi, it is important to understand the needs and priorities of minigrid system operators, but also the needs and priorities of the communities in which the minigrids will be located, to obtain the necessary local support and ensure sustainability and longevity of the intervention.

Furthermore, the enhancement of the commercial viability of solar PV systems depends on the level of flow of information between stakeholder from the private sector and decision makers in the public sector. This flow will guarantee that the decisions made are well-informed and constitute the best use of resources to serve the best interest of the country and beneficiaries. The flow will also guarantee that investors, developers and minigrid system operators are actively engaged in the continued development of regulations governing the energy sector before they become legally binding and are given the opportunity to utilize their technical expertise in the formulation of national plans and laws aiming to increase energy access rates and elevate the living conditions for populations in the rural areas.

The program therefore notes the methods and channels through which to disseminate project information as well as to ensure regular, accessible, transparent and appropriate consultation. The scope and frequency of communication will be tailored to the identified stakeholder list and the initial analysis of levels of interest for each stakeholder. The aim is to appropriately and effectively consult with and engage stakeholders to achieve transparency without overload. Accordingly, stakeholders with a high level of interest will be actively engaged, while others may receive less frequent and more targeted updates.

5.2 Engagement methods and communication mediums

Notwithstanding the COVID-19 restrictions and social distancing recommendations, different types of engagement mediums is possible inside Malawi. The following list presents the main engagement mediums to be utilized by the project team during implementation to ensure continuous engagement and active participation of stakeholders.

1) In-person meetings:
    - Consultation workshops: These workshops will have a pre-structured agenda which will be designed to present a specific result/report and discuss with stakeholders the best way forward. These workshops will also be an opportunity to gain consensus from stakeholders on a specific action plan prior to proceeding with implementation. Therefore, stakeholder consultation meetings and workshops are included in the project design as part of the main activities to be carried out by the consultants in charge of each output.
    - Interviews and focus groups: These will be conducted with different groups of indirect beneficiaries, with special attention to System Operators and NGOs, to overcome their generally low participation capacity and ensure that their input is integrated in the different stages of project implementation. The Project Manager will be responsible for ensuring that these interviews and focus groups have been conducted by the responsible consultants, as appropriate.
    - Community based consultations and focus groups: These consultations will focus on the pilot location to identify and discuss stakeholder concern, needs and experience/impact within the community environment, but will also extend to neighboring villages and communities. The project office, with support from the system operator or appointed service providers, will be responsible for conducting these consultations on a regular basis and reporting to the Project Steering Committee and/or TAC, as relevant.

2) Written communication:
    - Emails: Email communication is widely used in Malawi to provide direct access to individuals and representatives of organizations. Emails will be used as the main tool for organizing meetings, i.e. sending invitations to participants, sending the meeting minutes after the meeting, etc.
    - Letters: Being the formal method for communication and conveying messages between public parties, letters will be requested by the project team and provided by the relevant authority, as appropriate.
    - Survey forms: Several activities under the project implementation strategy constitute undertaking a needs assessment or other types on analyses, with some involving undertaking a survey to collect information. The responsibility for the surveys is that of the consultant undertaking the analysis. However, the project office will be responsible for supporting the project consultants with the sampling process and surveying procedure to the results are as representative and inclusive as possible.
    - Project brochures and manuals to present the results of specific studies and outcomes of certain activities.

3) Online meetings and phone calls: Virtual communication is sometimes preferred since it is quicker and easier compared with email and letters, and a viable alternative to in-person meetings. Online applications and telecommunication tools will be used throughout project implantation to facilitate the work and ensure the project team has easy access to stakeholders, and vice versa.

4) Capacity development and training. The pilot project will provide support for small business development to the pilot community through training and capacity building/support programs with a particular focused on women-owned businesses. Small business development support will be offered in partnership with the Small Medium Enterprise Development Institute (SMEDI) under the under the Ministry of Industry to support the establishment, formalisation and growth of small businesses and cottage industries through training

and mentoring, value chain development, developing linkages to market and opening trade opportunities to regional and global networks.

5) Other engagement activities including community needs assessment. Another element foreseen for the pilot is making electrical equipment or appliances available to households or small businesses in the community with support from microfinance institutions and subsidies. The exact scope, focus and structure will be dependent on a status quo and needs assessment and consultation with the community.

Although the mode of communication may vary according to task and participants, all consultations and engagement activities will be undertaken with the goal of ensuring full participation of relevant stakeholders, whereby all participants will be provided sufficient notice to prepare well and provide input for the project. Moreover, the AMP in Malawi project will also use all possible opportunity, i.e. workshops, meetings, trainings and awareness events, to promote diversity and gender balance. Balanced representation of relevant stakeholders will be ensured by reaching out to both men and women and different groups through appropriate communication means and encouraging their participation, noting the most socially and culturally acceptable method of communication and language and consultations for each group of stakeholders.

While engagement is expected to be part of all activities, engagement activities are foreseen as a key part of the following project activities:

- **Output 1.1, Geospatial mapping.** The energyscaping component in particular as well as the market survey of available energy efficient appliances will actively incorporate stakeholder engagement. The mapping aspect of the energyscaping is focused on translation data collected by District Officers. The appliance market survey will collect data from importers/wholesalers, retailers as well as development partners (e.g. EnDev and UNICEF) or other stakeholders actively supporting the availability of and distribution networks for equipment for productive uses of energy.
- **Output 1.2, DREI Analysis**. Risk analysis and risk costing developed based on interviews and meetings with industry stakeholders held during the first nine months of implementation.
- **Output 1.3.** National dialogue between key stakeholders to identify a delivery model(s) and translate DREI findings into a policy action plan.
- **Output 2.1, PUE overlay pilot projects**. Stakeholder consultation to identify preferred / priority PUEs and electrical equipment or appliances for pilot implementation. Stakeholder engagement (surveys, focus groups, interviews, etc.) to track socio-economic and environmental impacts with specific focus on gender and youth. Mechanisms offered to receive questions, feedback and concerns or issues. Participation of community representatives on the Project Steering Committee.
- **Output 2.2, One Stop Information Centre.** Capacity building for potential developers and operators, including public sector players involved in project design and evaluation of proposals. Training material to incorporate experience gained from country-specific experience and pilot projects. It is foreseen that participation in the initial training courses will be (in part or fully) sponsored by the AMP to encourage participation and reach. Inclusion of women and youth in training will be given priority, targeting at least 50% participation by women and appropriate representation by youth and other vulnerable groups, as relevant.
- **Output 3.2, Digital Strategy including smart metering data collection.** Central database to be hosted by Government. Interfaces to be established and grown with minigrid pilot projects and operators to collect data. Interfaces to be established with academia and other research partners to support development of aggregated, anonymized data into knowledge resources, case studies, policy briefs, technical papers, etc. Interface with the regional project established to guide data collection and analysis protocols and to share data with consolidated regional database. Other linkages and interfaces are likely to be established e.g. REIAMA, AMDA, CONREMA, other.
- **Output 3.3, Lessons learned**. Website established as part of digital strategy to provide access to all project information and provide contact details / options available to stakeholders as detailed under Public Disclosure of Information and Grievance Mechanism in this plan. Development of lessons learned and case studies to

incorporate stakeholder inputs on experiences and impacts and also dissemination to local, national and regional project stakeholders.

- **Output 3.4. Strengthening of Industry Association**. The support to the industry association is focused of giving a voice to and creating a platform for industry role-players to (i) effectively engage government, (ii) engage industry members and other, related industry associations, and (iii) encourage knowledge sharing, collaboration and innovation related to mini-grid development and rural energy access (both peer-to-peer and by accessing regional industry knowledge resources). Issues and discussion points are to be identified and prioritised by stakeholders. Interface with regional project to access knowledge resources, cross-country experiences and South-South learning. Stakeholder feedback will also be used to refine the value proposition and service offering of REIAMA to industry generally and, more specifically, association members.
- **Output 3.5. Inception meeting** including broad stakeholder representation across all the categories and stakeholder groups already identified. **Evaluations**. Stakeholder interviews included as part the midterm review and terminal evaluation.

5.3 Public Disclosure of Information (PDI)

Project-affected, marginalized, and disadvantaged stakeholders at the pilot location will be identified during site selection and assessment, including persons with disabilities and other disadvantaged groups as per the list of stakeholder groups provided above. For each group, the following assessments will be conducted as part of the stakeholder engagement, taking into account their involvement in each project component:

- Identify limitations for understanding project information and participating in consultation process (e.g. language differences, lack of transportation, accessibility of venues, disability)
- Develop measures to support and accommodate engagement (e.g. provide information in accessible formats, choose convenient locations for consultations, ensure venues are accessible, provide transportation to meetings, change time of meetings to accommodate needs, provide facilitation and explain complex issues and terminology, provide support workers for assisting participants with disabilities, provide simultaneous interpretation (including sign language).

At the national level, methods to receive feedback and to ensure ongoing communications with stakeholders (outside of a formal consultation meeting) will be developed as part of the project's knowledge management and dissemination plans (to be developed as part of the implementation of Component 3), including:

- An AMP project webpage or website will be created to make available all project related information including reports, publications, events, training opportunities, etc.
- The project website will provide a facility to receive feedback and to ensure ongoing communications with stakeholders (outside of a formal consultation meeting). Additionally, a contact point within the project office will be provided for this purpose.
- The Grievance Mechanism (Section 8 below) further describes channels and opportunities for feedback and concerns to be raised.

5.4 Diversity, inclusion and gender-balance

From the social and environmental safeguards perspective this is ensured by including at least one representative from each stakeholder group, including those representing vulnerable or disadvantaged groups. Additionally, the Gender Action Plan establishes the requirements for this purpose.

6. SEP Implementation: Resources, Responsibilities and Timeline

The size of the project does not allow for extensive stakeholder engagement measures or dedicated / full time staff for this purpose. It is also acknowledged that the PUE overlays will build on a pilot project developed and operated in compliance with national requirements as well as those of the donor. Extensive stakeholder consultation is already pursued as reflected in Section 4 above. For the AMP, the additional measures introduced are focused on providing oversight, guidance and additional safeguards across all the project activities.

As part of the management arrangements, provision has been made for a Stakeholder Engagement Specialist to support the project for 5.5 weeks over the 4-year implementation period and a Social and Environmental Specialist to support the project for 8 weeks over the same period. The focus of these roles will be on providing expert guidance and support to the project unit, that is anticipated to focus on:

- Overseeing the implementation of the ESMF and continuous review and update of associating studies, including the Stakeholder Engagement Plan (SEP) and the Gender Action Plan (GAP).
- The stakeholder engagement specialist will be the responsible person for SEP implementation and advise on activities including needs assessments, community engagement (consultation and information sharing), impact assessments and design of grievance mechanism with specific consideration of inclusivity of gender, youth and other vulnerable groups.
- Inform and guide data collection, monitoring and reporting on relevant indicators and measures under the QAMF and relevant plans including the GAP, SEP, ESMF and environmental management plan as relevant.
- Reviewing and approving detailed plans before activities start. For example, Component 3, Outcome 3.5 anticipates the development of a value proposition and communication plan for the Industry Association with a strong focus on inclusivity for both gender and youth. It also calls for a monitoring plan to track impact of the engagements. Both these will benefit from specialist guidance and require review and approval. Similarly, each component/outcome/indicator will reflect the appropriate inclusiveness as the project advances.
- Reviewing, providing input and approving specific activities before they commence, ensuring the timeline provides a schedule outlining dates/periodicity and locations where various stakeholder engagement activities, including consultation, disclosure, and partnerships will take place and the date by which such activities will be undertaken to the extent possible.

The fees for the specialists are accounted for in the project budget corresponding with the allocated service duration. Moreover, the project budget for each component allocates an amount for expenditures on training, workshops, conferences, etc. Expenses under this category are expensed to the UNDP-GEF under an independent budget code (number 75700) and include allocation of funds to ensure proper consultation of stakeholders from the different groups throughout project implementation. Based on the work requirement during implementation, the project may hire a qualified Community Liaison Officer to undertake all or portions of the stakeholder engagement activities. This may include, where necessary, community facilitators/assistants who are able to work in local languages (where relevant, ideally from the same ethnic group/culture). The budget for SEP activities has been included in the budgets of related outputs, notably the interfacing for training with the regional program, National Dialogue, Community of Practice, stakeholder consultation for pilot projects and extensive data collection for the monitoring of impacts and Geospatial mapping.

Stakeholder engagement will form part of the broader interactions with project stakeholders and timing will follow the overall workplan. The frequency of communication will be guided by the specific level of stakeholder interest. Specific opportunities for engagement will coincide with anticipated outputs and the development phases for deliverables and milestones towards outputs. More deliberate consultation and engagement activities will be implemented for the two pilot projects and as part of the project monitoring and reporting activities.

The anticipated stakeholder interfaces, parties responsible to lead engagement and ensuring communication to specified stakeholders as well as the frequency of communication is provided below:

Table 15: Stakeholder engagement plan

#	Stakeholder category (alphabetically listed)	Engagement approach[125]	Type of Information (shared and collected)	Communication channels or methods	Frequency[126]	Responsible party for engagement
1.1	Academic community (general, possible partner(s) on data collection and analysis)	Involve (potentially partner for data collection)	Policy, regulatory, technology /industry and project developments. Training needs and training offerings. Aggregated anonymized data from central database for the sake of analysis and interpretation into knowledge resources. Raw data from the central database, on condition of confidentiality / non-disclosure, for analysis, interpretation and recommendations/findings to inform policy briefs, research studies, publications, etc.	Emails, website, webinars, workshops, community of practice events, meetings, training events. Access to online, central database. Appropriate channels identified for sharing of confidential data.	Frequent	Project team, Relevant host of central database within the Ministry of Energy.
1.2	Academic community (partner on pilot project)	Collaborate / Partner	Active participation in project design and industry developments. Pilot project developments. Update on outputs and findings. Detailed information related to pilot project, linkage to regional expertise and project information, sharing of pilot project data with regional project and national fora. Policy, regulatory, technology /industry and project developments.	Responsible Party, progress updates, emails, newsletters, website, webinars, workshops, community of practice events, meetings, training events.	Very Frequent	Project team, Implementation Partner
2	Baseline energy supplier(s) (non-Government)	Consult / Keep informed	General information on clean energy minigrid sector developments. Detailed information related to pilot	Progress updates, emails, newsletters, website, webinars, workshops, community of	Frequent	Project team, REIAMA and

[125] Inform (provide stakeholders with balanced and objective information to assist them with understanding developments, progress, issues, opportunities and solutions). Consult (obtain feedback from stakeholders on design, findings, analyses, options and/or decisions). Involve (Work directly with stakeholders throughout the process to ensure concerns and/or views are consistently understood and considered. Collaborate (Collaborate with stakeholders as partners throughout the process, including in the analyses and development of solutions and in making decisions).

[126] Where Very frequent is likely to be ongoing or at least once a month, Frequent is likely to be monthly to quarterly, Less frequent: once or twice a year and Occasional: on an ad hoc basis, but with all general information readily available for access.

#	Stakeholder category (alphabetically listed)	Engagement approach[125]	Type of Information (shared and collected)	Communication channels or methods	Frequency[126]	Responsible party for engagement
			project scope of activities. Pilot project developments. Update on outputs and findings. Feedback on Government engagements. Participation in submissions on policy issues to Government.	practice events, meetings, training events.		Community of Practice
3	Children protection / rights	Keep informed	General information on clean energy minigrid sector developments. Detailed information related to pilot project scope of activities. Invite questions and inputs on risks, opportunities and developments.	Newspapers, radio, website. All project information available online and from the PMU.	Occasional	Project team
4.1	Development Partner (general)	Consult	Policy, regulatory, technology /industry and project developments. Project developments. Update on outputs and findings.	Progress updates, emails, newsletters, website, webinars, workshops, community of practice events, meetings, training events.	Less frequent	Project team, Implementation Partner
4.2	Development Partner (co-financier)	Involve	Policy, regulatory, technology /industry and project developments. Pilot project developments. Update on outputs and findings. Active participation in project design details and alignment / interface requirements, as relevant for areas of co-finance.	Progress updates, emails, newsletters, website, webinars, workshops, community of practice events, meetings, training events. If interested, may participate in Project Board / Steering Committee.	Frequent	Project team, Project Board, Implementation Partner
5	Energy sector, suppliers and businesses	Involve	Policy, regulatory, technology /industry and project developments. Project developments. Update on outputs and findings. Invite inputs on design and sector developments.	Interviews with stakeholder representatives, Surveys, polls, and questionnaires, Public meetings, workshops, and/or focus groups with specific groups. Training and knowledge sharing events. Community of Practice.	Less frequent	Project team, identified project partners and Community of Practice

#	Stakeholder category (alphabetically listed)	Engagement approach[125]	Type of Information (shared and collected)	Communication channels or methods	Frequency[126]	Responsible party for engagement
6	Environmental activists / organisation(s)	Consult	Policy, regulatory, technology /industry and project developments. Project developments. Invite questions, concerns and inputs on risks, opportunities and developments.	Interviews with stakeholder representatives, Surveys, polls, and questionnaires, Public meetings, workshops, and/or focus groups with specific groups. Training and knowledge sharing events.	Frequent	Project team, identified project partners and Community of Practice
7	General public	Inform	General information on clean energy minigrid sector developments. Detailed information related to pilot project scope of activities. Invite questions, concerns and inputs on risks, opportunities and developments.	Newspapers, radio, website. All project information available online and from the PMU.	Occasional	Project team
8.1	Government (directly involved)	Collaborate / Partner	General information on clean energy minigrid sector developments. Detailed information related to pilot project scope of activities. Active engagement on industry / sector development, opportunities. Recipient of DREI analysis and any data, findings and publications.	Part of Project Board / Steering Committee, progress updates, emails, newsletters, website, webinars, workshops, community of practice events, meetings, training events.	Very frequent	Project team, Project Board, REIAMA
8.2	Government (less directly involved)	Consult	Share general information on clean energy minigrid sector developments. Consult regarding opportunities for collaboration and coordination. Invite questions, concerns and inputs on risks, opportunities and developments.	Emails, website, webinars, newsletters. Invite to knowledge sharing events. Interviews / meetings with stakeholder representatives.	Less frequent	Project team, Implementation Partner
9	Human rights protection / Law defenders	Keep informed	General information on clean energy minigrid sector developments.	Newspapers, radio, website. All project information available online and from the PMU.	Occasional	Project team

#	Stakeholder category (alphabetically listed)	Engagement approach[125]	Type of Information (shared and collected)	Communication channels or methods	Frequency[126]	Responsible party for engagement
			Invite questions, concerns and inputs on risks, opportunities and developments.			
10	Impacted communities	Involve (potentially partner)	Detail pilot project information, design information and consultation on design elements, needs assessments, priorities, etc. (Specific focus on youth, women and other vulnerable or marginalized groups that are identified).	Interviews with stakeholder representatives, surveys, polls, and questionnaires, Public meetings, workshops, and/or focus groups with specific groups (youth, women, etc.) Compliance with government and UNDP stakeholder consultation / project disclosure with appropriate disclosure periods, as relevant.	Very frequent	Project team, Project Board, Implementation Partner
11	Land rights	Keep informed	General information on clean energy minigrid sector developments. Invite questions and inputs on risks, opportunities and developments.	Newspapers, radio, website. All project information available online and from the PMU.	Occasional	Project team
12	People with disabilities	Keep informed	General information on clean energy minigrid sector developments. Invite questions and inputs on risks, opportunities and developments.	Newspapers, radio, website. All project information available online and from the PMU.	Occasional	Project team
13.1	Regulatory body (Energy)	Involve	General information on clean energy minigrid sector developments. Detailed information related to pilot project scope of activities. Active linkages to data and knowledge management to shape regulatory environment. Recipient of DREI analysis and any data, findings and publications.	Participant in Project Board / Steering Committee, progress updates, emails, newsletters, website, webinars, workshops, community of practice events, meetings, training events.	Very frequent	Project team, Project Board, Implementation Partner

#	Stakeholder category (alphabetically listed)	Engagement approach[125]	Type of Information (shared and collected)	Communication channels or methods	Frequency[126]	Responsible party for engagement
13.2	Regulatory body (Environment, other)	Consult	General information on clean energy minigrid sector developments, highlighting specific matters with regulatory scope or area of interest. Invite questions and inputs on risks, opportunities and developments.	Emails, website, webinars, newsletters. Invite to knowledge sharing events. Interviews / meetings with stakeholder representatives. Consult with regards specific regulatory aspects.	Frequent	Project team, Project Board, Implementation Partner
14	Sustainable energy sector	Consult	Policy, regulatory, technology /industry and project developments. Project developments. Update on outputs and findings. Invite inputs on design and sector developments.	Interviews with stakeholder representatives, Surveys, polls, and questionnaires, Public meetings, workshops, and/or focus groups with specific groups. Training and knowledge sharing events. Community of Practice.	Less frequent	Project team, identified project partners and Community of Practice
15	Women	Consult	General information on clean energy minigrid sector developments, highlighting specific relevance to women equity and empowerment. Invite questions, concerns and inputs on risks, opportunities and developments.	Specific gender engagement as captured in gender action plan (Annex **Error! Reference source not found.**). Pilot project beneficiaries as detailed for Impacted communities. Women in general: newspapers, radio, website and targeted communication to national women's organizations. All project information available online and from the project office.	Less frequent	Project team
16	Worker unions	Keep informed	General information on clean energy minigrid sector developments.	Newspapers, radio, website. All project information available online and from the project team.	Less frequent	Project team

#	Stakeholder category (alphabetically listed)	Engagement approach[125]	Type of Information (shared and collected)	Communication channels or methods	Frequency[126]	Responsible party for engagement
			Invite questions, concerns and inputs on risks, opportunities and developments.			
17	Youth	Keep informed	Policy, regulatory, technology /industry and project developments. Training and/or career opportunities. Withing pilot project communities,	Newspapers, radio, website. Pilot project beneficiaries as detailed for Impacted communities. All project information available online and from the project team.	Less frequent	Project team

In implementing the SEP, the following requirements will apply:

- All communication will be available in English, the official language and official medium of instruction in Malawi. English will be used to facilitate a common and broader project understanding outside of the country borders.
- Despite English being the official language, the 2008 Census reported that only 26% of the population above the age of 14 is able to speak English.
- As the discretion of the Project team, translations of printed material, written and spoken communication, will be available in the relevant vernacular. At the very least, communications to impacted communities i.e. beneficiaries of the pilot project, must be available in both English and a language most relevant to the local community, if not English.
- The COVID pandemic has had an impact on stakeholder engagement, limiting engagement to online channels and excluding communities with limited or no access to online facilities. The extent to which this will continue into the implementation phase is uncertain, but should it persist, alternate opportunities to allow the information flow and ensure participation must be implemented. Examples may include delivery of information through the local radio, paper posts on key local community places, word to mouth through local leaders, among others.

8. Grievance Mechanism

As part of the project's compliance with the UNDP SES requirements, the project shall ensure setting up a suitable Grievance Redress Mechanism (GRM). This includes a procedure for stakeholders and affected communities to express their grievances and communicate their concerns and recommendations to the project team, as well as a procedure for the project team to address these grievances by taking the necessary actions, i.e. providing clarifications, opening investigations, or making changes to the project's implementation plan as may be required.

In the area of ensuring open communication on grievances, the project intends to implement the following measures:

1) Two boxes will be installed at the pilot project site. The first will be placed inside the pilot boundaries while the second will be located outside the project boundaries. These boxes will be checked on a regular basis by the system operator to check for new comments from stakeholders.
2) A dedicated email will be established or earmarked for stakeholders to use for questions, recommendations and grievances. The email address will be made available on all printed material, in the email signature of the Project team and displayed on the sign carrying the name of the pilot projects.
3) The contact details for the project officers will be displayed at several central locations around the pilot location, i.e. community centers at villages receiving electricity from the pilot project and nearby villages as appropriate.

The responsibility of responding to or addressing the grievances received will depend on the nature of the grievance. Nevertheless, the project team will be responsible for following up until actions are taken to close a grievance, including communicating with relevant persons and/or authorities on behalf of the project.

While it is not anticipated in Malawi, it should also be clarified to all relevant parties at pilot sites that there will be zero tolerance for any reprisals or retaliatory actions against any stakeholders. Should it be necessary, preventative and response measures specific to the circumstances should be identified together with relevant stakeholders. Measures may include respect for confidentiality; adjustments to means and timing of communications, meetings, transportation; use of trusted intermediaries, interpreters, facilitators and other consultants; clear response protocols for notification, reporting, and support for protection strategies.

All stakeholders should also be informed of the availability of UNDP's Accountability Mechanism (Stakeholder Response Mechanism, SRM, and Social and Environmental Compliance Unit, SECU) as additional avenues of grievance redress.

9. Monitoring and Reporting

Component 3 calls for annual progress reporting to include monitoring of any gender, environmental and social risks and related management plans. The need for social (including gender and youth) and environmental impacts to be baselined and tracked is also included as a priority under the respective pilot projects. Engagement for monitoring and reporting will take the approach detailed under Section 5.2, as relevant for each stakeholder group and data integrity. Feedback from stakeholder engagements will be reported back to project-affected and broader stakeholder groups using a relevant channel or media which may include verbal feedback, tailored newsletters/bulletins or sharing of social and environmental assessment reports or monitoring reports.

As project information changes, the SEP should be reviewed and modified accordingly to ensure its effectiveness in securing meaningful and effect stakeholder participation. Hence, the SEP presented in this document will undergo further review and development by the project team throughout the project lifetime. Similarly, the scope and focus of the SEP will be modified to reflect the lessons learned from the implementation of SEP in Malawi, but also in other national projects participating in the Regional AMP. Equally important is the review and update of the SEP procedure based on the feedback that would be received form the project team and stakeholders. Further details on the M&E plan for the SEP for each stage of project implementation will be developed as part of the Quality Assurance and Monitoring Framework under Component 3.

Annex 10: Environmental Social Management Framework (ESMF)

Available as a separate document.

Annex 11: Gender Analysis and Gender Action Plan

1. Background

UNDP prioritizes gender mainstreaming as its main strategy to achieve gender equality and women's empowerment. Gender mainstreaming is the process of assessing any planned action in all areas and levels to determine the implication for women and men. It is a strategy for making women's, as well as men's, concerns and experiences an integral dimension of the design, implementation, monitoring and evaluation of projects so that women benefit equally. Gender mainstreaming aims to transform unequal social and institutional structures in order to make them profoundly responsive to gender, and, when realized, it ensures that both women and men benefit equally from the development process. It involves much more than simply adding women's participation to existing strategies and programmes. Special attention and action is often required to compensate for the existing gaps and inequalities that women currently face.

The UNDP Gender Equality Strategy 2018-2021 is aligned with the 2030 Development Agenda and UNDP's Strategic Plan. The strategy recognizes gender equality as a human right as well as instrumental to the achievement of sustainable development. It considers women and men as active agents of change and development, not simply beneficiaries and vulnerable groups and it recognizes how working with men and boys is of critical importance to change gender norms and attitudes and achieve gender equality.

The GEF Council approved a new GEF Policy on Gender Equality[127], in November 2017. The policy outlines the need to address gender equality and promote women's empowerment across GEF operations, and, in particular, in its projects and programs. The policy requires gender-responsive actions, from design to implementation, monitoring and evaluation to ensure that GEF programs and projects are not only designed with a good understanding of relevant gender differences, roles and needs, but also actively pursue activities that contribute to equal access to and control over resources, decision-making, and empowers women and girls.

Both UNDP and the GEF require a gender responsive approach, an approach in which the particular needs, priorities, power structures, status and relationships between men and women are recognized and adequately addressed in the design, implementation and evaluation of activities. The approach seeks to ensure that women and men are given equal opportunities to participate in and benefit from an intervention and promotes targeted measures to address inequalities and promote the empowerment of women.

2. Context and gender situation in Malawi

2.1 Basic demographics

Malawi has made significant and consistent strides in reducing under 5 mortality, which was 100 per 1,000 births in 2000 and has fallen to 30 in 2019, well below the sub-Saharan average of around 50 (2017).[128] At the same time, fertility has also been consistently declining from a high in 1980 of seven and half children per woman to 4.2 in 2018, while maternal mortality fell from 942 (per 100,000 births) in 2000 to 451 in 2016.[129] In total, the population has growing between 2.5% and 3% per year for the last two decades, and if it continues at that rate can be expected to double in about 25 years (i.e. by 2035).

Malawi has an age dependency ratio (% of young and old dependents relative to the working age population) of 85% (2019), but this has been falling steadily from its high of 97% in 2002.[130] In 2016/7, fully 56% of the population was under the age of 20.[131] As care duties typically fall disproportionately on women and adolescent girls within households, this is part of the explanation for why females are especially time constrained, though Malawi's dependency ratio is not significantly different from the average for sub-Saharan Africa.

---

[127] GEF/C.53/04 (http://www.thegef.org/sites/default/files/council-meeting-documents/EN_GEF.C.53.04_Gender_Policy.pdf)
[128] World Bank, "World Development Indicators | DataBank."
[129] World Bank.
[130] World Bank.
[131] National Statistical Office, "Malawi Demographic and Health Survey: 2015-16."

The adolescent fertility rate is 132 births per 1,000 girls between the ages of 15 and 19 (2018),[132] which is ninth highest in the world. Early marriage and childbearing often contribute to lower human capital in the form of health complications and missed schooling, along with lower lifetime earnings and reduced bargaining power within households. Some early marriage in Malawi may be linked to the combination of poverty with customary payments of bridewealth.

The human capital index is .4 (2017),[133] meaning children's lack of schooling and poor health is expected to render them only 40% as productive as in a counterfactual without health and education constraints. While economic growth undoubtedly plays a role in increasing human capital, so do more targeted interventions that support parents, especially mothers, in caring for their children. Some of these interventions—such as freeing up women's and girls' time, powering health services, increasing the availability of clean water and irrigation, enabling communications, and more—could potentially be enhanced in the context of a well-planned and holistic roll out of mini-grid infrastructure. A landmark study, Duflo (2003), suggested that the gender of South African pensioners receiving cash payments influenced the degree of spending on female children's welfare in the household.[134] The possibility that male and female expenditure patterns also diverge in Malawi is an added argument for ensuring economic benefits of electrification are not limited to just men.

Roughly a quarter of households in Malawi are likely female headed, with a higher prevalence in rural areas.[135] Considering only the gender of the household head can often obscure other important dynamics, such as the total number of able-bodied adults in the household and the number of dependents, which may be better predictors of the household's degree of vulnerability. Of married households in Malawi (2016/17), over 90% are male headed whereas of widowed or divorced households, over 90% are female headed (see Table 16).

Table 16: Distribution of Households by Sex of Household Head (2016/17)[136]

	Sex of household head	
	Male (%)	Female (%)
National	74.8	25.2
Place of residence		
Urban	80.5	19.5
Rural	73.4	26.6
Region		
North	77.5	22.5
Central	79.5	20.7
South	69.6	30.4
Marital status of the household head		
Never married	59.2	7.1
Married	92.9	7.1
Divorced/separated	9.5	90.5
Widowed/Widower	8.1	91.9
Districts		
Dedza	74.9	25.1

[132] World Bank, "World Development Indicators | DataBank."
[133] World Bank.
[134] Duflo, "Grandmothers and Granddaughters."
[135] Republic of Malawi, "Integrated Household Survey 2016-2017."
[136] Republic of Malawi.

The dependency ratio is also much higher for divorced and separated households than for other types (see Figure 9). Households headed by women who are divorced, separated, or widowed, and who have a large number of child dependents could potentially be targets for special assistance with connections or even tariff rates.

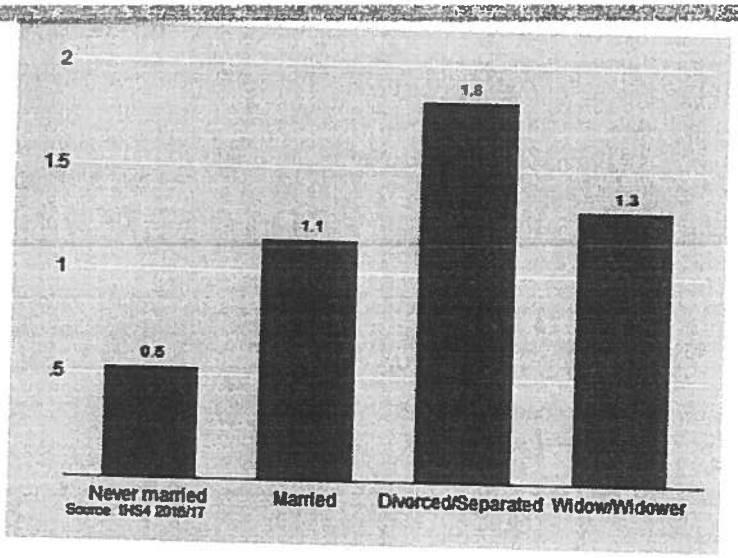


Figure 9 Dependency ratio by marital status of household head[137]

2.2 Legal rights and framework

The Constitution, originally adopted in 1994 and amended as recently as 2017, grants men and women equal rights. Gender equality is even listed first under the section entitled "Principles of National Policy," and the heading, "Rights of Women," is included as its own article (§24), which covers among other things: equal protection; freedom from discrimination; equal capacity under the law as related to contracts, property ownership, child custody, and citizenship; and equitable treatment upon marital dissolution.[138]

The Constitution is complemented by a number of laws pertaining to women vis-à-vis family relationships, such as the Marriage, Divorce and Family Relations Act (2015), which offers recognition of civil, customary, religious and some types of informal marriages, while outlawing polygamous unions, and it offers protections for the welfare and maintenance of spouses, unmarried couples and their children, and single mothers.[139] As a result of this Act, the Constitution was amended (2017) to make the legal age of marriage 18 years. The **Deceased Estates Act** (2011) gives female spouses and children the right to inherit after the death of a husband or father.[140] The **Prevention of Domestic Violence Act** (2006), and the **Child Care, Protection and Justice Act** (2010) extend protections to women and girls from abuse, including physical, sexual, psychological, or financial abuse, as well as any "social or customary practice that is harmful to the health or general development of the child."

The Gender Equality Act (2012) targets additional areas of concern to women and girls, including tackling discrimination, gender-based violence, education, sexual health, and public sector employment.[141] In particular, it:

- ...Prohibits discrimination on the basis of sex (punishable by a fine up to one million Kwacha and five years' imprisonment);

[137] Republic of Malawi.
[138] Republic of Malawi, "Constitution."
[139] Parliament of the Republic of Malawi, "Marriage, Divorce and Family Relations Act."
[140] Parliament of the Republic of Malawi, "Deceased Estates Act."
[141] Parliament of the Republic of Malawi, "Gender Equality Act."

- ...Prohibits "harmful practices"[142] (punishable by a fine up to one million Kwacha and five years' imprisonment);

- ...Requires the government to take active measures to ensure employers have and implement workplace policies countering sexual harassment;

- ...Stipulates that no gender shall occupy more than 60% of appointed or recruited positions in the Public Service;

- ...Requires the government to take "active measures" to ensure enrollment at tertiary institutions comprises no more than 60% of either gender and that primary and secondary curricula are gender mainstreamed;

- ...Grants a right to sexual and reproductive health;[143] and

- ...Compels the government to promote civic awareness of gender equality issues.

The Customary Land Act (2016) aims to improve women's input and decision making with respect to land issues by ensuring equal representation in customary land tribunals; it also enables women and minors to register land in their own names rather than that of a male relative.[144]

The Government established a National Gender Policy (2015) that provides a framework for the realization of gender equality and women's economic empowerment, though it does not explicitly make a link between gender and electrification. The Parliament also ratified the protocol to the African Charter on Human and People's Rights on the Rights of Women in Africa ("The Maputo Protocol") in 2005, officially domesticating its provisions.

2.3 Culture

Despite codified civil protections, certain discriminatory gendered cultural practices persist. Malawi is a patriarchal society—despite the existence of both matrilineal and patrilineal inheritance systems—where women often have a subordinate status in relation to male relatives. The Southern Region is more matrilineal and matrilocal while the Norther Region is more patrilineal and patrilocal; the Central Region lies somewhere between the other two in its mix of lineality and locality, and cities have the highest relative rates of mixed inheritance (35%) and couples living apart from either family (10%).[145]

Marriage is almost universal in Malawi and the median age of first marriage for women is 18.2 years (for men it is 23 years),[146] meaning nearly half of women's first marriages can be classified as "early." In 2015/16, 13% of married women reported their husbands were polygynous and that they had co-wives,[147] even though this had recently been banned by the 2015 Marriage, Divorce and Family Relations Act. Living in rural areas, particularly the North, being older, and having less education were all correlated with an increased likelihood of a woman having co-wives. In the Dedza District where the PUE pilots will take place, however, Theresa Kachindamoto is the Inkosi (senior chief) with authority over almost a million inhabitants in more than 500 villages, including Mthembanji and Kudembe. Since stepping into this leadership role in 2003, she pressured all of the sub-chiefs to ban child marriages and has broken up roughly 3,500 child marriages by relying on a "mothers group" network of informers.[148]

An estimated 62% of surveyed marriages in rural areas involved the payment of bride price (versus 49% in urban areas) and the practice is more common in the North (95% of unions involved bride price and

[142] "A social, cultural or religious practice which on account of sex, gender or marital status does or is likely to (a) undermine the dignity health or liberty or any person, or (b) result in physical, sexual, emotional or psychological harm to any person."
[143] Abortion is criminalized by Penal Code 1930, except in order to save the mother's life.
[144] Republic of Malawi, "Customary Land Act."
[145] Makwemba et al., "Traditional Practices in Malawi Survey Report."
[146] National Statistical Office, "Malawi Demographic and Health Survey: 2015-16."
[147] National Statistical Office.
[148] Flanagan, "Tribal Chief Defies Death Threats to Save Child Brides in Malawi."

10% involved dowry payments).[149] The bride price paid to the woman's family, especially if they are poor, can encourage early marriage of their daughters, resulting in higher female dropouts and teenage pregnancies. Bride wealth can also discourage wives from leaving troubled marriages because it generally must be returned to the husband's family in the event of marital dissolution, which often has the effect of eroding the woman's ability to bargain/negotiate in the relationship.

Regional cultural differences are relevant for land tenure and ownership. There are three types of land in Malawi: Public, private, and customary land, the latter of which is under the jurisdiction of traditional local leaders. Matrilineal customs, more prevalent in the Southern Region and the Central Region, have historically granted women more land rights, making them less vulnerable after a husband's death, and resulting in Malawi being one of the rare countries where women, in aggregate, own and manage land plots at rates comparable to, even higher than, men (though on average women's plots are smaller).[150] The relatively recent (2016) Customary Land Act, however, still recognized women as being disadvantaged with regards to land acquisition/use, and sought to establish remedies.

The absence of a severe gender gap in land ownership, however, can mask a complex reality of household decision-making, which disfavors women. Culturally, men are expected to be heads of household (regardless of who holds the land rights) meaning they often decide how to allocate agricultural investments and productive inputs, perhaps the most crucial of which is labor.[151] One study found female-managed plots were 25% less productive than male-managed ones, and that the great majority of this gap was due to women's inability to command male labor and acquire the necessary inputs to cultivate higher value crops.[152] Another cultural norm that puts women at a disadvantage is involves the gendered division of labor within households (see section 0 for more information).

2.4 Gender-based Violence (GBV)

In addition to the Gender Equality Act (2012), the Prevention of Domestic Violence Act (2006), the Child Care, Protection and Justice Act (2010), **Penal Code 1930 also addresses the issue of gender-based violence,** stating that "...any person who unlawfully and indecently assaults any woman or girl shall be liable to imprisonment for fourteen years" and punishing the crime of rape[153] by death or imprisonment for life.

According to the Health and Demographic Survey, 34% of women have experienced physical violence since the age of 15, by relatives or non-relatives, and 20% have experienced sexual violence. Domestic violence constitutes a significant form of total gender-based violence and is acknowledged as a major concern in Malawi where a quarter (24%) of ever-married women have experienced at least three forms of spousal control and 42% have experienced spousal violence.[154] Some interviewees report anecdotally that newly available electricity in rural areas has decreased marital conflict through such means as: decreasing competing demands on wives' time so they are better able to manage the household to their husbands' liking; reducing night-time trips by husbands and children to other locations for television viewing; enabling women's cottage industry that relieves some of the financial burden on male breadwinners; providing better light to cook by so that food is tastier.

Attitudes towards spousal violence are somewhat surprising, with more women than men agreeing that beating a wife is justified in certain scenarios (see Figure 10).[155] This may indicate that among some women, gender inequality and discrimination have been 'internalized,' that is, has been accepted to such a point that it is considered "normal." If true, this holds implications for the business development, technical training, and any credit support activities the program may direct towards women. In order for

---

[149] Makwemba et al., "Traditional Practices in Malawi Survey Report."

[150] Slavchevska et al., "Beyond Ownership."

[151] Djurfeldt et al., "'The Family Farms Together, the Decisions, However Are Made by the Man' —Matrilineal Land Tenure Systems, Welfare and Decision Making in Rural Malawi."

[152] Kilic, Palacios-Lopez, and Goldstein, "Caught in a Productivity Trap: A Distributional Perspective on Gender Differences in Malawian Agriculture."

[153] The Penal Code's definition of rape, "carnal knowledge" without consent or via coercion, only applies to female victims and does not include victims of marital rape.

[154] National Statistical Office, "Malawi Demographic and Health Survey: 2015-16."

[155] National Statistical Office.

women to fully benefit from these interventions, providing time and space for them to build their confidence, envision success, and improve certain so-called soft skills may be warranted.

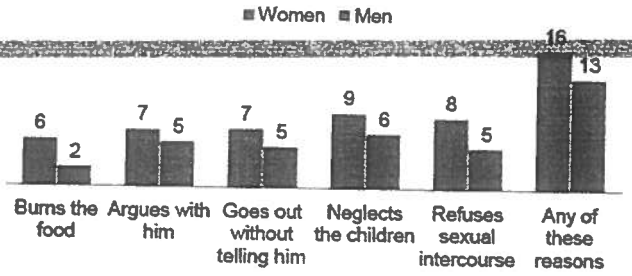


Figure 10 Percentage of women and men, 15-49, who agree a husband is justified to beat his wife for specific reasons[156]

2.5 Education

Female literacy rate for individuals 15 years and older stands at 66% (2016/17), compared to 81% for males, and urban areas had a higher literacy rate (90%) than rural ones (68%).[157] Though the primary enrollment and completion gender gaps have now been closed, 19% of women have never been to school, compared with 9% of men; also the never-enrolled rates were higher in rural compared to urban areas meaning there are relatively more older women in rural areas, where micro-grids may be developed, who have never attended school.[158] For older women, particularly widows, to benefit as domestic and enterprise electricity customers, accommodations may need to be made to compensate for lower literacy and numeracy levels.

There largest remaining gender gap in education in Malawi is at the tertiary level (Gender Parity Index = .64).[159] The World Bank writes in two of its project appraisal documents, "Out of every 100 girls who begin Standard 1 of primary school, only three will enter secondary education. Of those three, only one will enter university,"[160] and, "In 2017, only 32 percent of the students enrolled in STEM fields were female."[161] This has potential supply side implications for mini-grid development and operations, if the lack of relevant educational (and, by extension, work) experience hinders women's career participation and income/profit-generating opportunities. In the near term, advertising mini-grid development opportunities to STEM alumnae is one possibility, as is supporting women who might be lacking certain paper qualifications to acquire hands-on learning experience with mini-grids through apprenticeship placements.

2.6 Work

Malawi has modest gender gap in 2020 in terms of labour force participation (81% for men ages 15 and over versus 73% for women according to the modelled estimate of the International Labour Organisation).[162] However, the nature of work differs significantly for men and women, with men more likely to have formal employment and higher earnings. In the Demographic and Health Survey, 70% of married women reported earning less than their husbands, compared to 8% of husbands who earned less than their wives.[163]

2.6.1 Agricultural work and food production

[156] National Statistical Office.
[157] Republic of Malawi, "Integrated Household Survey 2016-2017."
[158] Republic of Malawi.
[159] World Bank, "World Development Indicators | DataBank."
[160] World Bank, "PAD3415."
[161] World Bank, "Malawi Electricity Access Project Project Appraisal Document."
[162] World Bank, "World Development Indicators | DataBank."
[163] National Statistical Office, "Malawi Demographic and Health Survey: 2015-16."

Malawian economy is highly dependent on agriculture, accounting for 28% of GDP in 2017 when 72% of the population was employed in the sector.[164] Within agriculture, men and women can often perform different roles. The plots themselves, the types of crops cultivated, even the steps in a single crop's production can all be gendered, and though there are some generalities (e.g., men are more involved in tilling, women in weeding; men cultivate more cash crops, women cultivate more crops for own use or local market sales; women predominate in manual post-harvest processing and men in mechanized activities, etc.), actual practice varies considerably by locality.

Women account for 59% of crop farmers in Malawi, but tend to be less productive, with a gender productivity gap of around 28-31% arising from the fact that women infrequently grow cash crops and have relatively more difficulty securing inputs such as land,[165] labor, and labor-saving technology.[166] For this reason, it is important that rural electricity provision, and related electrical machines, don't become by default yet another agricultural input to which women have less access, potentially perpetuating or exacerbating gender inequalities. According to UN Women, [167] raising Malawian women farmers' productivity to that of men would result in an annual additional value creation of USD 100 million and lift around 240,000 people out of poverty. Doing so requires supporting women's diversification into high value crops and combatting the male labor shortage on women's plots through improved seeds, fertilizer, and labor-saving technology,[168] the latter of which mini-grids can help power.

While men and women are both engaged in rice farming in Malawi, there are anecdotal reports that men may spend more time, relatively speaking, in on-field cultivation whereas women are more involved, comparatively, in processing steps such as sorting. This is relevant to the mini-grid site near Mthembanji (Bangani), where rice growing is widespread. The organization Christian Aid has worked on a number of initiatives related to rice growing, including the provision of farm implements, improved seed varieties, cooperative formation and the launch of the National Rice Platform, a consortium of more than a dozen cooperatives, and is eager to see women especially benefit from the higher prices that be fetched for quality Malawian rice.

Groundnut is the most important legume and oilseed crop in Malawi including for food security, cash income, and improving soil fertility, and its production is typically a female endeavor.[169] Women are extensively involved in cultivation, harvest, and small scale and manual post-harvest processing; though when there is increasing scale, mechanization and profitability, men are found participating to a greater extent.[170] The Bambara groundnut, which is a highly heat and drought tolerant crop, in some parts of the country, however, is exclusively grown by women. Symbolizing both life and death, there are beliefs that only women who have lost a child may safely grow it, and its consumption by various types of individuals is also strongly governed by local beliefs, bringing either death, healing, or fertility depending on the circumstances.[171]

Even though women are highly represented in the groundnut sector, they still face barriers. At least one Oaxaca-Blinder decomposition[172] analysis showed a total gender productivity gap of 28% in the sector; but 21% (76% of the overall gap) was attributed to observable differences in factors of production (e.g., use of manure, improved seed varieties, access to labor and labor-saving technology, etc.) and only 7% (14% of the overall gap) was left "unexplained" and therefore attributable to structural factors.[173] Additionally, there is evidence from focus groups that male and female farmers select seeds with different

---

[164] FAOSTAT, "Malawi."

[165] Though plot ownership rates don't show evidence of a major gender gap, men's plots tend to be larger and of greater value in terms of quality and location (Gondwe, "Gender Segmented Markets and Production Systems in Malawi.")

[166] UN Women, UNDP-UNEP Poverty Environment Initiative, and World Bank, "The Cost of the Gender Gap in Agricultural Productivity in Malawi, Tanzania, and Uganda."

[167] UN Women, UNDP-UNEP Poverty Environment Initiative, and World Bank.

[168] Kilic, Palacios-Lopez, and Goldstein, "Caught in a Productivity Trap: A Distributional Perspective on Gender Differences in Malawian Agriculture."

[169] Muricho et al., "Estimating and Decomposing Groundnut Gender Yield Gap."

[170] Tyroler, "Gender Considerations for Researchers Working in Groundnuts."

[171] Forsythe et al., "Beliefs, Taboos and Minor Crop Value Chains."

[172] This statistical method is used to explain the difference in the means of a dependent variable (e.g. per acre farm productivity) between two groups (e.g. male and female managers) by decomposing the gap into that part attributable to differences in the mean values of the independent variable within the groups versus the group differences in the effects of the independent variable.

[173] Muricho et al., "Estimating and Decomposing Groundnut Gender Yield Gap."

priorities in mind according the their intended uses for the crop; for example, women may prioritize taste or ease of shelling while men select those with the highest absolute yields for sale into markets.[174] The mini-grid project should account for men and women both working in various steps of value chains as well as operating in parallel groundnut value chains. It should also ensure they have equitable access to productive inputs.

There have been longstanding efforts to make groundnut sector developments gender inclusive, and the mini-grid pilot in Kudembe will benefit from these efforts and accumulated knowledge. For example, a consortium including Compatible Technology International (CTI), the Malawi Department of Agriculture Research Services (DARS) and ICRISAT developed lifters, strippers, and shellers as labor-saving technologies for smallholder groundnut farmers,[175] the designs of which were adapted to women's physical characteristics and desire to work together and socialize.[176] The USAID-funded Feed the Future program in Malawi also has a strong gender component in its promotion of groundnut production and is a source of valuable information and practice suggestions (See Tyroler, 2018).[177] The differentiated roles of women and men in mitigating the risks associated with aflatoxin poisoning throughout the production cycles are also crucial for the mini-grid pilot to understand, especially if there are practices whereby farmers or processors hold back lower quality (i.e. more contaminated) nuts for home consumption.

Soybeans share many characteristics with groundnuts; both can be used for oil production and women in focus groups in central Malawi liked both because they were easy to sell in any quantity, had versatile uses, and were well-liked by children and nutritious.[178] Though considered by some as a stereotypically female crop, one gender assessment with Malawian focus groups and key informant interviews, however, found that soybeans were only considered as "women's crops" if they were either for home consumption or were not the main source of the household's cash income.[179] This aligns with a focus group intervention from another study, where a male respondent reported, *"You really can't touch the beans or attempt to take them to the market as doing so will result into picking a quarrel with the wife. To avoid quarrelling we focus on soybean production as we can sell the harvest freely without being controlled."*[180]

Oil production for both groundnut and soybean are multi-step processes, some of all of which may be performed by electric machinery. It involves variously removing shells/pods, cleaning/sorting, roasting, removing skins, expelling the oil, filtering the oil, and packaging and labeling. Dry cake byproducts, for example soy cake used as animal fodder or peanut cake that can be ground into powder, must also be handled and marketed. There could potentially be different gender impacts associated with mechanizing each step, depending on who was performing (and profiting from) each task prior to, and then after, mechanization. The mini-grid pilot in Kudembe should seek to restore livelihoods following any economic displacement of female manual groundnut and soybean processors as well as avoid the further "masculinization" of electric equipment use or bulk trading.

After crop farming, fishing is perhaps the next most important agricultural sector, providing 60% of the animal, and 40% of the total protein, intake of the population, and employing 50,000 people directly in the catch and 350,000 people indirectly in other value chain steps and support industries, respectively.[181] It is predominantly men who fish on the lake while women are overrepresented among the small scale processors and traders on the shore (large scale, capital intensive, downstream market segments are also male dominated). The result is frequently a sexualized and exploitative power dynamic known as "sex for fish," where sex is used either to settle payment accounts or to secure supply in a tight market.[182] Any mini-grid intervention which may end up supporting the fishing industry, such as by instituting cold chains, must manage a balanced approach to the gender power dynamics in this sector and try to reduce some

[174] Tyroler, "Gender Considerations for Researchers Working in Groundnuts."
[175] ICRISAT, "Technologies Developed in Malawi Reduce Drudgery and Labor in Groundnut – ICRISAT."
[176] Tyroler, "Gender Considerations for Researchers Working in Groundnuts."
[177] Tyroler.
[178] Chitsike, Kampanje-Phiri, and Sangole, "A Qualitative Evaluation of Gender Aspects of Agricultural Intensification Practices in Central Malawi."
[179] Ussar, "Rapid Gender Assessment of Soybean Farmers under IBCF."
[180] Chitsike, Kampanje-Phiri, and Sangole, "A Qualitative Evaluation of Gender Aspects of Agricultural Intensification Practices in Central Malawi."
[181] Phiri et al., "Value Chain Analysis of Lake Malawi Fish: A Case Study of Oreochromis Spp (Chambo)."
[182] MacPherson et al., "Sex, Power, Marginalisation and HIV amongst Young Fishermen in Malawi."

of the persistent gender inequalities. This could be relevant for Output 2.1 (piloting productive uses) since one of the satellite villages, Dziko, is situated approximately one mile in each direction from beaches/boat launches on the lake.

Finally, many households engage in raising livestock and poultry for consumption and income, as a savings mechanism/safety net, for draught power, and as collateral for loans. Women are more likely to own small animals for cultural reasons or because they are less expensive, and thus have less access to motive and ploughing power and a lower ability to use animals to secure credit.[183] Mini-grid developers and promoters can simultaneously encourage the expansion of small livestock husbandry and poultry businesses, for example with electric incubators where women are already active, and also promote more capital intensive female enterprises involving larger animals, such as through efficient milk chilling. The dry soy cake, which is a waste product from oil expelling, may be sold or used as feed for certain animals.

2.6.2 Unremunerated work

Though now quite dated, a national time use survey showed women spend more total hours working and significantly more time on domestic chores and collecting fuelwood and water (see Table 17 and Table 18). Men, by contrast, devoted relatively more time to non-agricultural enterprise and wage work, likely giving them greater status within the household and deference from others regarding decision-making and investment/expenditure choices.

Table 17: National time use data based on 2004 survey[184]

Table 5.5. Work Time by Gender, Month, and Age According to the Categories of Time Recorded in the Survey, Malawi–National, 2004

	Cooking laundry, and cleaning	Collecting water	Collecting fire-wood	Agricultural work	Running non-ag. business	Helping for non-ag. business	Casual, part-time & ganyu work	Salaried work	Total work (mean)	Total work (median)	Working less than 10 hours	Working more than 70 hours
Adult males (age 15 and over), national												
March 2004	1.6	0.5	0.5	13.9	3.4	0.7	2.5	6.0	29.1	24.5	27.4	8.0
April 2004	1.9	0.6	0.5	13.5	5.4	0.7	2.5	6.3	31.5	30.0	18.0	7.3
May 2004	1.9	0.6	0.3	11.8	4.5	0.8	1.8	6.6	28.3	26.0	24.3	5.4
June 2004	1.9	0.9	0.3	10.9	3.8	0.7	2.5	8.5	29.6	30.0	22.0	4.7
July 2004	2.2	0.9	0.6	10.5	5.4	0.5	3.2	5.7	29.0	27.0	19.7	5.3
August 2004	2.4	0.7	0.3	10.7	5.7	0.4	2.5	6.0	28.6	25.0	21.8	5.4
Sept. 2004	2.7	0.8	0.4	10.8	3.9	0.4	3.0	9.0	31.0	28.0	19.6	7.7
Oct. 2004	2.2	0.6	0.3	13.8	4.1	0.2	3.4	6.4	31.1	30.0	17.7	6.5
Nov. 2004	2.6	0.7	0.4	15.8	3.0	0.2	2.7	8.9	34.4	34.0	12.3	7.6
Dec. 2004	1.8	0.6	0.3	20.6	4.2	0.3	3.2	5.7	36.7	36.0	6.8	6.5
Jan. 2005	2.4	1.0	0.3	18.5	3.4	0.1	2.5	7.6	35.9	35.0	8.8	9.2
Feb. 2005	1.8	0.7	0.3	15.6	3.1	0.2	2.2	6.7	30.6	30.0	16.1	4.5
March 2005	2.4	0.7	0.3	14.2	3.9	0.5	2.6	7.5	32.2	30.0	16.3	7.1
Adult females (age 15 and over), national												
March 2004	14.8	5.3	3.0	12.5	2.2	1.1	1.7	1.4	41.9	38.0	11.8	17.4
April 2004	14.0	5.1	2.1	13.0	2.5	0.6	1.2	1.2	39.8	37.0	11.8	12.9
May 2004	13.6	5.4	2.3	13.2	1.6	0.6	1.0	1.3	39.0	38.0	10.9	10.9
June 2004	15.0	6.1	2.3	11.0	2.3	0.5	1.7	1.5	40.3	38.0	10.7	14.4
July 2004	14.5	6.4	2.4	8.6	2.6	0.3	1.6	1.2	37.7	35.0	11.5	10.9
August 2004	15.3	7.0	2.3	9.6	3.0	0.2	1.0	1.1	39.6	37.0	8.1	11.6
Sept. 2004	15.2	6.9	2.1	11.0	2.5	0.4	0.9	1.2	40.3	38.5	9.6	12.8
Oct. 2004	15.3	6.9	2.1	14.6	2.0	0.3	1.0	1.6	43.7	43.0	7.7	12.1
Nov. 2004	14.6	6.7	2.0	16.4	1.6	0.3	1.3	2.3	45.2	45.0	7.1	14.6
Dec. 2004	13.6	5.9	1.6	20.2	1.6	0.2	1.7	1.0	45.9	45.5	6.3	12.2
Jan. 2005	14.2	7.8	2.0	17.4	1.0	0.5	1.2	1.8	45.9	46.0	7.4	13.1
Feb. 2005	14.1	6.4	1.7	15.1	1.3	0.2	1.6	1.2	41.9	41.5	8.5	11.3
March 2005	14.7	6.8	2.1	13.2	1.5	0.3	1.3	1.6	41.5	40.5	6.9	10.1

[183] Gondwe, "Gender Segmented Markets and Production Systems in Malawi."

[184] Retrieved from: Wodon and Blackden, *Gender, Time Use, and Poverty in Sub-Saharan Africa.*

Table 18: Rural Time use data based on 2004 survey

Table 5.7. Work Time by Gender, Month, and Age According to the Categories of Time Recorded in the Survey, Malawi–Rural, 2004

	Cooking laundry, and cleaning	Collecting water	Collecting fire-wood	Agricultural work	Running non-ag. business	Helping for non-ag. business	Casual, part-time & ganyu work	Salaried work	Total work (mean)	Total work (median)	Working less than 10 hours	Working more than 70 hours
Adult males (age 15 and over), rural												
March 2004	1.5	0.5	0.6	15.6	2.6	0.7	2.6	4.9	29.0	25.0	26.4	8.1
April 2004	1.7	0.6	0.5	15.2	5.9	0.7	2.5	3.6	30.9	29.0	17.2	6.9
May 2004	1.5	0.6	0.4	13.9	3.6	0.5	1.9	4.7	27.0	25.0	24.2	4.8
June 2004	1.6	0.9	0.4	12.6	3.3	0.7	2.6	6.1	28.3	28.0	22.0	4.7
July 2004	2.1	0.8	0.6	11.2	4.9	0.6	2.9	5.1	28.3	26.0	19.1	4.9
August 2004	2.2	0.7	0.3	12.2	4.4	0.3	2.4	4.4	26.9	24.0	22.2	4.6
Sept. 2004	2.4	0.8	0.4	12.8	3.6	0.2	2.7	6.7	29.4	26.0	18.4	7.0
Oct. 2004	1.9	0.6	0.3	15.5	4.0	0.2	3.4	4.5	30.3	30.0	16.5	5.8
Nov. 2004	2.1	0.7	0.4	18.8	2.2	0.2	3.1	6.3	33.9	32.0	10.9	6.8
Dec. 2004	1.3	0.6	0.3	24.7	2.8	0.3	3.1	3.0	36.2	34.5	4.0	5.5
Jan. 2005	1.5	0.9	0.3	19.4	3.4	0.1	2.4	7.1	35.2	34.5	7.4	7.4
Feb. 2005	1.6	0.7	0.3	16.7	3.0	0.2	2.3	5.2	29.9	28.0	15.7	4.3
March 2005	1.9	0.8	0.3	16.3	3.3	0.2	2.8	5.2	30.8	30.0	15.6	5.2
Adult females (age 15 and over), rural												
March 2004	14.7	5.6	3.3	13.6	1.9	1.2	1.8	0.8	43.0	38.5	10.5	18.1
April 2004	14.0	5.4	2.2	14.1	2.4	0.6	1.1	0.9	40.7	38.5	10.8	13.2
May 2004	13.6	5.8	2.6	14.8	1.3	0.3	1.1	0.4	39.9	38.5	8.6	10.4
June 2004	15.1	6.7	2.6	12.4	2.0	0.5	1.9	0.4	41.7	39.5	9.5	14.6
July 2004	14.5	6.7	2.5	9.3	2.4	0.4	1.6	1.2	38.5	35.0	11.1	11.1
August 2004	15.4	7.3	2.5	10.6	2.5	0.2	1.0	0.6	40.2	38.0	7.6	11.3
Sept. 2004	15.4	7.4	2.4	12.4	2.1	0.4	0.8	0.5	41.4	40.0	8.9	13.0
Oct. 2004	15.3	7.4	2.3	15.8	1.7	0.3	1.1	0.7	44.6	44.0	6.9	12.5
Nov. 2004	14.3	7.4	2.3	19.0	1.2	0.3	1.5	1.1	47.2	46.0	5.2	15.0
Dec. 2004	12.6	6.4	1.8	23.3	1.0	0.2	2.0	0.4	47.7	47.0	4.5	12.1
Jan. 2005	13.8	8.2	1.9	18.2	0.9	0.5	1.0	1.7	46.4	47.0	5.5	12.9
Feb. 2005	14.0	6.8	1.8	15.9	1.3	0.3	1.7	1.2	43.1	43.0	7.4	11.6
March 2005	14.0	7.3	2.2	14.8	1.4	0.2	1.5	1.0	42.4	41.0	6.8	10.3

2.6.3 Women in the Micro, Small, and Medium Enterprise (MSME) sector

Women own around two thirds of all MSMEs but are even more overrepresented among micro-enterprises, which account for three quarters of all MSMEs (84% of micro-enterprises are female-owned).[185] Most MSMEs (78%) are located in rural areas, 23% conduct primary agricultural activities, and 42% of owners are younger than 35.[186] Compared to men, more women are "necessity" entrepreneurs (i.e., they are driven less by the desire to build a business and be their own boss and more by a need for extra income coupled with lack of other employment options). The prevalence of micro-businesses in rural areas, led by women, presents an opportunity to grow the load profile of mini-grids. Conversely, the provision of electricity may also present an opportunity to grow and formalize women's businesses. According to the World Bank Enterprise Surveys (2014/15), the top obstacles to enterprise development among female-owned firms (not necessarily restricted to just MSMEs) were access to finance, access to electricity, and corruption.

In 2016/17, 13% of surveyed households reported a member receiving a loan in the prior year for either business or farming (14% for male headed households versus 10% for female headed), with 38% of those

[185] Finscope, "Malawi 2019: Micro, Small and Medium Enterprise Survey."
[186] Finscope.

individuals applying for credit from Village Banks.[187] Many village savings and loan associations (VSLAs) are backed by charitable organizations (e.g., World Vision, Care Malawi, OXFAM and others) and issue very small loan sizes with short tenors, sometimes with a narrow portfolio focus. On the plus side, many are focused on women's financial inclusion and empowerment. Slightly larger Savings and Credit Cooperatives (SACCOs) and formalized Micro Finance Institutions (MFIs), however, are probably better suited for financing electricity connections, appliances, and electricity-enabled business ventures and these are also numerous throughout the country and count many women among their customer bases.

2.7 Gender and energy access

Women's and men's use of energy systems varies according to the work they are responsible for performing as well as their assets, income and other endowments. For example, women's businesses and women individuals in their capacity as domestic managers, are often more reliant on heat energy (for cooking, processing harvests for instance rice parboiling, heating water for domestic use, and space heating) than electricity. On average, households in Malawi spend 1.6 hours per day gathering firewood, and it is largely done by girls and women.[188] Finding a way to promote electric pressure cookers in concert with mini-grid connections would be one way to help make electrification benefits more gender balanced, especially in light of the fact that the surveyed proportion of households using electricity-based cooking decreased from 2010 to 2013, then again to 2016 (see Table 19).

Women and men often exhibit distinct but overlapping preferences when it comes to project design parameters. During the planning of the Bondo micro-hydro scheme in the Mulanje district, gender differences in electrification preferences surfaced. The women's needs were inclined more towards social and community uses such as lights at health clinic and maize milling machine while the men's were more centered around income generation such as refrigeration, opening shops and using electricity for welding; focal group discussions were employed to better understand the needs of the community.[189]

Female-headed households have lower access to electricity in Malawi (7.6% versus 12% of male-headed households) and are less likely to own a mobile phone (34% versus 53% of male headed households).[190] Mobile phone ownership could potentially affect one's ability to pay electricity bills if smart meters require mobile payments or if the local sales agent does not maintain a convenient location or hours, especially since women often face more mobility and time constraints than men. In terms of cooking fuels and lighting sources, there are more similarities between male- and female-headed households than differences. Female-headed households have a slightly higher propensity to use firewood and lower propensity to use charcoal for cooking and are less likely to use electricity for lighting (and more likely to use kerosene, see Table 19 and Table 20).

Table 19 Percentage of households by main source of fuel for cooking[191]

Background characteristics	Solid fuels			Firewood			Charcoal			Crop residue/Saw dust			Electricity			Other		
	2010	2013	2016	2010	2013	2016	2010	2013	2016	2010	2013	2016	2010	2013	2016	2010	2013	2016
Malawi	95.3	95.7	96.6	80.2	76.3	70.1	14.7	18.4	24.3	0.4	1.1	2.2	4.6	4.1	3.1	0.1	0.2	0.3
Place of residence																		
Urban	85.7	86.2	90.1	41.3	34.4	22.0	44.0	51.3	67.5	0.4	0.5	0.6	14.3	13.3	9.9	-	0.5	-
Rural	99.3	99.4	98.9	96.4	92.5	87.5	2.5	5.6	8.6	0.3	1.3	2.8	0.6	0.5	0.7	0.1	0.1	0.4
Sex of household head																		
Male	95.6	95.4	96.2	78.5	74.5	67.7	16.8	19.8	26.6	0.3	1.0	1.9	4.3	4.4	3.5	0.1	0.3	0.3
Female	94.4	96.9	97.6	86.4	82.3	77.3	7.3	13.3	17.3	0.6	1.3	3.0	5.6	3.1	2.2	-	-	0.2

[187] Republic of Malawi, "Integrated Household Survey 2016-2017."
[188] "Atlas of Africa Energy Resources."
[189] Mary Robinson Foundation, "Access to Sustainable Energy - The Gender Dimensions."
[190] Republic of Malawi, "Integrated Household Survey 2016-2017."
[191] National Statistical Office, "Integrated Household Panel Survey 2016."

Table 20 Percentage of households by main source of fuel for lighting[192]

Background characteristics	Battery Dry Cell (Torch)			Electricity			Candles			Firewood			Paraffin			Other		
	2010	2013	2016	2010	2013	2016	2010	2013	2016	2010	2013	2016	2010	2013	2016	2010	2013	2016
Malawi	20.1	59.9	66.6	11.4	14.1	17.2	5.6	9.0	7.5	3.3	3.2	3.9	56.7	11.5	1.9	2.8	2.3	2.9
Place of residence																		
Urban	7.2	19.6	25.9	32.4	40.4	48.7	13.5	23.8	21.1	0.4	1.3	0.6	46.1	14.4	1.9	0.4	0.5	1.6
Rural	25.4	75.5	81.3	2.7	3.9	5.8	2.4	3.2	2.6	4.5	4.0	5.1	61.1	10.4	1.9	3.8	3.0	3.4
Sex of household head																		
Male	21.9	61.1	65.9	11.6	15.1	19.2	6.5	9.8	7.3	2.1	2.2	3.4	55.6	10.0	1.7	2.4	1.8	2.5
Female	13.6	55.8	68.7	10.7	10.7	11.3	2.5	6.3	8.1	7.9	6.6	5.2	60.7	16.6	2.5	4.5	3.9	4.1

Several initiatives exist in Malawi to involve women to a greater extent in extending energy access. The Small and Medium Enterprise Development Institute (SMEDI), for example, supports women in the production of fuel briquettes. Christian Aid sponsors the "Breaking the Barriers" program to promote female energy entrepreneurship. And the Millennium Challenge Corporation supports scholarship and training programs to help women enter and advance in the power sector, supports women as natural resource managers to reducing silting at hydro facilities, and improves organizational efficiency at the utilities through support of gender mainstreaming practices. The thing all of these programs report having in common is their belief that women represent untapped potential for expanding energy access.

2.8 Women and governance

Balanced gender representation in governance is theorized to matter for a number of reasons, including both better reflecting the diverse perspectives and priorities of the populace and creating groups of overall better problem-solvers. Currently, only 16.7% of seats in national parliaments are held by women, but Malawi does have experience electing Joyce Banda vice president in 2009, then having her become only the second African female head of state from 2012-2014, before and during which time she had a hand in advancing much of the gender equality-focused legislation. However, some researchers are careful to note that women's interest and ability while in government to improve the situation of other women is not as simple as a pure numbers game but rather a product of complex societal forces.[193]

On a more local level, women's representation and participation in governance may be an enabler of successful mini-grid development. The Local Government Act and Decentralization Policy in Malawi offers a natural experiment to evaluate the role of representative local governance, the results of which suggest that when leadership reflects the diversity of the population being served, the capacity for collective action is enhanced and public goods are provided more efficiently and effectively.[194]

3. Gender Action Plan

Malawi possesses a generally robust legal framework for gender rights and significant progress has been made in improving women's access to health and educational services and economic opportunities. Women and men still, however, do not operate on totally equal footing due to cultural norms and accumulated historical legacies of discrimination. As such, men could be expected to benefit relatively more from a mini-grid programme unless specifically targeted interventions are included to shed light on women's unique circumstances, constraints and opportunities. In particular, the rice, soybean, groundnut and fish value chains, several of which may represent intervention areas for the programme, when investigated were found to exhibit problematic gender dynamics (e.g., men dominate in mechanized dry milling, fish trading can be sexually exploitative, and increasing commercialization of soybeans and groundnuts leads to women being crowded out of the sector). Furthermore, evidence from Malawi suggests that gender inclusion at the heart of community infrastructure and energy access projects, in addition to being a moral imperative, is also correlated with greater success rates; that is, gender inclusion itself may constitute a de-risking approach.

Based on the results on the gender assessment, the following action plan in

[192] National Statistical Office.

[193] O'Neil, Kanyongolo, and Wales, "Representation and Influence in Malawi's Parliament."

[194] McCarthy and Kilic, "The Nexus between Gender, Collective Action for Public Goods, and Agriculture: Evidence from Malawi."

Table 21 has been drafted to provide a "gender lens" over the project, ensuring equitable participation and benefit incidence among women and men across the various program components. It seeks to cultivate gender-relevant data within nascent national mini-grid frameworks, within monitoring systems, de-risking analysis, and opportunity maps to shore up the foundation for more informed decision-making that reflects the realities of the full populace. The other main component of the gender action plan is to ensure equal participation and benefits for community men and women involved in the productive use pilots. This will be achieved through targeted outreach, specialized training, credit and empowerment support, and the exploration, also, of other productive use opportunities beyond rice mills. Finally, activities supporting the industry association will be geared to increase female participation and influence in the sector.

Table 21 Gender Action Plan

Objective	Gender Action	Indicator and Targets	Responsible / Institutions	Timeline	Budget (USD)
Component 1: Policy and Regulation					
Output 1.1 **'Energyscaping' and digitally mapped inventory of MSMEs**	Include some discussion of "hands and feet" (i.e., human) energy infrastructure in 'energyscaping' analysis, aligned with the view that "where there is no infrastructure, women become the infrastructure." Include presence of women's co-ops, trade organizations, and finance providers as an added layer of map. Tag value chains and value chain steps involving MSMEs as "predominantly male," "predominantly female," or "mixed/neutral." Based on user surveys, classify available appliances by gender (predominantly male, female, or mixed) of owners, users, and priorities.[195]	**Baseline:** No local gender analysis aggregated of energy infrastructure and potential demand, including appliances. **Indicators:** • Percentage of digitally mapped data entries (MSMEs, enabling organizations, energy assets, energy needs) or digitally catalogued appliances having some associated (i.e., database relational) gender information **Target:** 20% of digitally mapped data entries can be associated with a gender variable and 50% of catalogued appliances are linked to form of gender information	District Energy Officers (DEOs), Community Energy Malawi, with cooperation from EASE program and ESMAP and potentially MUSCCO and MAMN as apex organizations whose members likely have information on female-led MSMEs		$10,000 budget included fo the gender analyst appointed for the overall project to support activities under this output and ensure mapping gender data tasks is mainstreamed into existing workflows and reflected in mapping data.
Output 1.2 **Mini-grid DREI analysis**	If the opportunity presents itself, investigate whether women MG developers, or gender diverse community institutions, experience an additional risk premium compared to	**Baseline:** Presence/absence of a specific additional risk premium associated with being a female MG sponsor currently unknown.	UNDP, with cooperation from MG sponsors		Included in full task budget

[195] For ideas about a methodological approach, see: Winther et al., "In the Light of What We Cannot See."

Objective	Gender Action	Indicator and Targets	Responsible / Institutions	Timeline	Budget (USD)
	male counterparts and, if so, the degree to which this can/can't be explained by other variables in DREI analysis.	**Indicator:** None **Target:** None			
Output 1.3 **An inclusive national dialogue to identify minigrid delivery models is facilitated, clarifying priority interventions for an integrated approach to off-grid electrification**	Include stakeholders in National Dialogue that promote gender equality, or that are active in issues or sectors or great importance to women. Ensure that the leadership group is representative and gender-balanced.	**Baseline:** 0 **Indicators:** • Number of organizations/agencies included in Dialogue with strong gender inclusion or empowerment focus • Percentage of core working group individuals that are female **Target:** At least three organizations and 40% individuals	MoE, Project Unit		No additional budget
Output 2: Project and Business Model Innovation with Private Sector Engagement					
Output 2.1 **Extension of MG pilots in Mthembanji and Kudembe and their environs with productive use (PUE) applications**	Conduct a community-level gender assessment, communication and mobilization effort. Ensure the participation (ownership, management and benefit capture) of both women and men among the largest planned anchor users (i.e. rice mills and oil pressing machines). Identify and support through credit, training and agency-based empowerment, existing and potential	**Baseline:** No female ownership/management of MG-connected rice processing equipment or oil pressing machines; no deliberate targets set for outreach to support of female-led businesses using electricity; no experience with EPCs **Indicator:**	United Purpose, U. of Strathclyde, with potential women's business development support from SMEDI, Christian Aid, and possibly lesson sharing from TaTEDO (EPC in Tanzania)		$10,000 for the gender assessment/ mobilization (budget reflected against this output, but included under tasks of gender specialist appointed by project) and $250 - $500 for added childcare/ networking support (included in overall task budget for training);

Objective	Gender Action	Indicator and Targets	Responsible / Institutions	Timeline	Budget (USD)
	"second tier" income-generating electricity use applications led by women and men. Add childcare services/supplemental per diem for trainees with young children and organize additional women-only support group events. (TBD) Support the piloting of a limited number of efficient, electric pressure cookers (EPCs) for household or school use, studying in detail both the load implication and the unit economics from users' point of view.	• Number of all-female or gender balanced lessees of rice and oil processing, or other "large," equipment[196] OR accessibility[197] of the equipment or facility(ies) to women. • Percent of male and female micro- and small enterprises connected to and using MG electricity • Presence/absence of demand and affordability feasibility analysis for EPCs in Mthembanji and Kudembe and their environs **Targets:** At least 1/3 of 'large' anchor users are women- (or gender diverse) controlled enterprises OR any improvement over baseline; At least 40% of connected 'second layer' micro-enterprise are female-led; publication of technical/economic/gender	and Agsol (DC rice dehuskers and polisher in Kenya)		e-cooking pilot will be at the discretion of Implementing Partners.

[196] If leased to a single or small number of enterprises rather than fee-for-service based operation, track gender composition of enterprise owners or management.

[197] If used on a fee-for-service basis, availability/accessibility of the equipment and facilities and barriers to adoption can be assessed (e.g., Do women feel comfortable going to the location and interacting with the operator? Is the service available at times when women are also available?). PUE operators can consult with project gender specialist to make their service offering as accessible and inclusive as possible.

Objective	Gender Action	Indicator and Targets	Responsible / Institutions	Timeline	Budget (USD)
		feasibility analysis for MG-powered EPCs in the community.			
Output 2.2 **"One Stop Information Centre"**	Proactively market the "One Stop Information Centre" to potential female developers/sponsors, including those with power sector engineering and logistics experience, e.g., individuals supported under the Millennium Challenge Corporation (MCC) Compact. Informally foster professional networking experiences, person-to-person information exchanges, and mentoring relationships for interested female developers when the occasion arises. Add a gender tracking question to pre-download survey for published "How To" guides.	**Baseline:** No information centre exists yet. **Indicator:** None **Target:** None	REIAMA		
Component 3: Data, Knowledge Management and Monitoring and Evaluation					
Output 3.1 **Quality Assurance and Monitoring Framework (QAF) Operationalized**	Thoroughly mainstream gender into the QAF, in particular devising a way to verify whether or not specific instances of MG electrification narrow the discrepancies in M/F decision-making, assets levels, income, human capital, and social status—and also to what extent men and women are benefiting from participation in the construction, management, and regulation of MGs.	**Baseline:** QAF developed by NREL, SEFA, GEF and others **Indicator:** TBD **Target:** TBD	MoE, MERA, NSO, with support from UNDP regional AMP		No additional budget, gender mainstreamed into full task
Output 3.2 **A Project Digital Strategy is developed and implemented, including linkages to and**	None.				

Objective	Gender Action	Indicator and Targets	Responsible / Institutions	Timeline	Budget (USD)
following guidance from the regional project					
Output 3.3 Minigrids digital platform implemented to manage data from pilots, and to support minigrids scale-up and cost-reduction	None.				
Output 3.4 **Active interface with regional project established, including, but not limited to, via (i) participating in Communities of Practice and (ii) capturing and sharing lessons learnt at national and regional level.**	Research and publication of a briefing note on gender impacts of rural electrification via mini-grids and role of women in MG development and management. Publication of case study on female- and male-owned rice mills and oil pressing machines in PUE pilots.	**Baseline:** No such briefer exists specifically focused on the experience in Malawi. **Indicator:** Publication of briefing note. **Target:** One briefing note.	UNDP, Implementing Partners		$5,000
Output 3.5 **Industry Association Strengthened**	Support female members of REIAMA, if possible, to form a women's chapter/working group, to attend events with government officials and industry partners; raise their public visibility to serve as female role models; leverage their educational and professional networks to attract more women to REIAMA and encourage some who may be working in adjacent businesses (e.g., solar home sales) to enter the MG market.	**Baseline:** TBD **Indicator:** Number of female members of REIAMA; percentage of female members reporting REIAMA is a welcoming and inclusive organization **Target:** Any improvement over baseline	REIAMA, UNDP		$4,000

References

"Atlas of Africa Energy Resources." Nairobi, Kenya: United Nations Environment Programme, 2017.

Chitsike, Talleteh, Jessica Kampanje-Phiri, and Noel Sangole. "A Qualitative Evaluation of Gender Aspects of Agricultural Intensification Practices in Central Malawi." International Institute of Tropical Agriculture, 2017. https://cgspace.cgiar.org/bitstream/handle/10568/87892/AR-ESA_MalawiGender_jun2017.pdf?sequence=1.

Djurfeldt, Agnes Andersson, Ellen Hillbom, Wapulumuka O. Mulwafu, Peter Mvula, and Göran Djurfeldt. "'The Family Farms Together, the Decisions, However Are Made by the Man' —Matrilineal Land Tenure Systems, Welfare and Decision Making in Rural Malawi." *Land Use Policy* 70 (January 2018): 601–10. https://doi.org/10.1016/j.landusepol.2017.10.048.

Duflo, Esther. "Grandmothers and Granddaughters: Old-Age Pensions and Intrahousehold Allocation in South Africa." *The World Bank Economic Review* 17, no. 1 (2003): 1–25.

FAOSTAT. "Malawi," 2017. http://faostat.fao.org/static/syb/syb_130.pdf.

Finscope. "Malawi 2019: Micro, Small and Medium Enterprise Survey," 2019. https://www.genesis-analytics.com/uploads/downloads/Malawi_MSME-Survey-2020-05-22.pdf.

Flanagan, Padraic. "Tribal Chief Defies Death Threats to Save Child Brides in Malawi." inews.co.uk, August 2, 2019. https://inews.co.uk/news/world/malawi-tribal-chief-child-brides-underage-marriage-death-threats-education-321625.

Forsythe, Lora, Mala Nyamanda, Agnes Mbachi Mwangwela, and Ben Bennett. "Beliefs, Taboos and Minor Crop Value Chains: The Case of Bambara Groundnut in Malawi." *Food, Culture & Society* 18, no. 3 (July 3, 2015): 501–17. https://doi.org/10.1080/15528014.2015.1043112.

Gondwe, Anderson. "Gender Segmented Markets and Production Systems in Malawi," 2018, 27.

ICRISAT. "Technologies Developed in Malawi Reduce Drudgery and Labor in Groundnut – ICRISAT." ICRISAT.org, n.d. https://www.icrisat.org/technologies-developed-in-malawi-reduce-drudgery-and-labor-in-groundnut/.

Kilic, Talip, Amparo Palacios-Lopez, and Markus Goldstein. "Caught in a Productivity Trap: A Distributional Perspective on Gender Differences in Malawian Agriculture," Policy Research Working Papers, no. 6381 (March 2013): 51.

MacPherson, Eleanor E., Mackwellings Phiri, John Sadalaki, Victoria Nyongopa, Nicola Desmond, Victor Mwapasa, David G. Lalloo, Janet Seeley, and Sally Theobald. "Sex, Power, Marginalisation and HIV amongst Young Fishermen in Malawi: Exploring Intersecting Inequalities." *Social Science & Medicine* 266 (December 2020): 113429. https://doi.org/10.1016/j.socscimed.2020.113429.

Makwemba, Medson, Blessings Chinsinga, Chrissie Thakwalakwa Kantukule, Alister Munthali, Mekonnen Woldegorgis, Simon Haenni, and Qingyang Lin. "Traditional Practices in Malawi Survey Report," 2019. https://www.unicef.org/malawi/media/1546/file/Traditional%20Practices%20in%20Malawi:%20Survey%20Repo.

Mary Robinson Foundation. "Access to Sustainable Energy - The Gender Dimensions," n.d. https://www.mrfcj.org/pdf/Policy-Brief-Malawi-Access-to-Sustainable-Energy-the-Gender-Dimensions.pdf.

McCarthy, Nancy, and Talip Kilic. "The Nexus between Gender, Collective Action for Public Goods, and Agriculture: Evidence from Malawi," Policy Research Working Papers, no. 6806 (March 2014): 55.

Muricho, Geoffrey, Jourdain Lokossou, Hippolyte Affognon, Benjamin Ahmed, Haile Desmae, Hakeem Ajeigbe, Michael Vabi, Jummai Yila, Essegbemon Akpo, and Christopher Ojiewo. "Estimating and Decomposing Groundnut Gender Yield Gap: Evidence from Rural Farming Households in Northern Nigeria." *Sustainability* 12, no. 21 (October 27, 2020): 8923. https://doi.org/10.3390/su12218923.

National Statistical Office. "Integrated Household Panel Survey 2016," 2017. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwiMlsS6ybbuAhWFLc0KHQtcBREQFjAFegQICxAC&url=https%3A%2F%2Fmicrodata.worldbank.org%2Findex.php%2Fcatalog%2F2936%2Fdownload%2F47122&usg=AOvVaw3Bai9RmNEpbkearlyk2-Jd.

———. "Malawi Demographic and Health Survey: 2015-16," 2017. https://dhsprogram.com/pubs/pdf/FR319/FR319.pdf.

O'Neil, Tam, Ngeyi Kanyongolo, and Joseph Wales. "Representation and Influence in Malawi's Parliament," February 2016, 59.
Parliament of the Republic of Malawi. "Deceased Estates Act," 2011. https://malawilii.org/mw/legislation/act/2011/14.
———. "Gender Equality Act," 2013. https://womenlawyersmalawi.files.wordpress.com/2017/06/gender-equality-act.pdf.
———. "Marriage, Divorce and Family Relations Act," 2015. https://malawilii.org/mw/legislation/act/2015/4.
Phiri, Letson Yoyola, Joseph Dzanja, Tasokwa Kakota, and Mafanizo Hara. "Value Chain Analysis of Lake Malawi Fish: A Case Study of Oreochromis Spp (Chambo)" 4, no. 2 (2013): 12.
Republic of Malawi. "Constitution," 2017. https://www.constituteproject.org/constitution/Malawi_2017.pdf?lang=en.
———. "Customary Land Act," 2016. https://malawilii.org/mw/legislation/act/2016/19.
———. "Integrated Household Survey 2016-2017," 2017. http://www.nsomalawi.mw/images/stories/data_on_line/economics/ihs/IHS4/IHS4%20REPORT.pdf.
Slavchevska, Vanya, Cheryl R. Doss, Ana Paula de la O Campos, and Chiara Brunelli. "Beyond Ownership: Women's and Men's Land Rights in Sub-Saharan Africa." *Oxford Development Studies*, September 23, 2020, 1–21. https://doi.org/10.1080/13600818.2020.1818714.
Tyroler, Carol. "Gender Considerations for Researchers Working in Groundnuts." USAID Feed the Future, May 2018. https://pdf.usaid.gov/pdf_docs/PA00T3SR.pdf.
UN Women, UNDP-UNEP Poverty Environment Initiative, and World Bank. "The Cost of the Gender Gap in Agricultural Productivity in Malawi, Tanzania, and Uganda," October 2015. https://www.unwomen.org/-/media/headquarters/attachments/sections/library/publications/2015/costing%20gender%20gap_launch.pdf?la=en&vs=2608.
Ussar, Maxi. "Rapid Gender Assessment of Soybean Farmers under IBCF." Malawi Oilseeds Sector Transformation, March 2017. https://www.researchgate.net/publication/342956187_Rapid_Gender_Assessment_of_Soybean_farmers_under_IBCF_Rapid_assessment_of_gender_dynamics_of_soybean_contract_farming.
Winther, Tanja, Kirsten Ulsrud, Margaret Matinga, Mini Govindan, Bigsna Gill, Anjali Saini, Deborshi Brahmachari, Debajit Palit, and Rashmi Murali. "In the Light of What We Cannot See: Exploring the Interconnections between Gender and Electricity Access." *Energy Research & Social Science* 60 (February 2020): 101334. https://doi.org/10.1016/j.erss.2019.101334.
Wodon, Quentin, and C. Mark Blackden, eds. *Gender, Time Use, and Poverty in Sub-Saharan Africa*. World Bank Working Papers. The World Bank, 2006. https://doi.org/10.1596/978-0-8213-6561-8.
World Bank. "Malawi Electricity Access Project Project Appraisal Document," 2019. http://documents1.worldbank.org/curated/en/520771561341715792/pdf/Malawi-Electricity-Access-Project.pdf.
———. "Malawi Financial Inclusion and Entrepreneurship Scaling Project Appraisal Document," August 3, 2020. http://documents1.worldbank.org/curated/en/205691596821965142/pdf/Malawi-Financial-Inclusion-and-Entrepreneurship-Scaling-Project.pdf.
———. "World Development Indicators | DataBank." Accessed March 6, 2018. http://databank.worldbank.org/data/reports.aspx?source=2&series=EG.USE.ELEC.KH.PC&country=#.

Annex 12: Procurement Plan

The procurement plan will cover a 12-month period. The National Implementation Agency shall update the procurement plan throughout the duration of the project, at least annually by including contracts previously awarded. All procurement plans, their updates or modifications shall be published on the website of the National Implementation Agency.

General Information

Project Name: National child project under the GEF Africa Minigrids Program	
Country: Malawi	**Implementing Partner:** Ministry Energy (MoE)
Date of First Procurement: 4th Quarter 2021	**Date of this Procurement Plan:** February 2021

A. Process Thresholds, Review and 12 Month Procurement Plan

1. Project Procurement Thresholds

The following UNDP procurement thresholds shall apply to procurement of goods and works:

Procurement method	Contract value	Type of requirement	Method of solicitation	Type of competition
Micro-purchasing	**Below US $5,000**	Goods, services or simple works	Canvassing (by phone, Internet, shopping, etc.)	Limited international or national
Request for quotation	**US $5,000 to $149,999**	Goods, services or simple works	Written request for quotation	Limited international or national
Invitation to bid	**US $150,000 and above**	Goods or works	Advertisement in international media	Open international
Request for proposal	**US $150,000 and above**	Services	Advertisement in international media	Open international
Direct contracting	**Any amount within permissible circumstances**	Services, goods or works	Direct invitation or negotiation	None

2. Prior or Post Review

The following UNDP prior review requirements apply to the various procurement and consultant recruitment methods used for the project.

	Level 1 (Country Level): Contracts, Assets and Procurement Committee	**Level 2 (Regional):** Regional Advisory Committee on Procurement (country offices only)	**Level 3 (HQ):** Advisory Committee on Procurement
Competitive procurement process			

	Level 1 (Country Level): Contracts, Assets and Procurement Committee	Level 2 (Regional): Regional Advisory Committee on Procurement (Country Offices only)	Level 3 (HQ): Advisory Committee on Procurement
Any contract or series of contracts including amendments to be awarded to a vendor *in a calendar year* that in aggregate has a cumulative value:	Above US $50,000 (above US $100,000 for Individual Contracts) and up to the standard delegated procurement authority – Direct Review by CAP Chairperson Above the standard delegated procurement authority and up to any increased delegated procurement authority – by CAP Committee	Above the delegated procurement authority and up to US $2 million (applies per year for Long-Term Agreements)	Country offices: above US $2 million (applies per year for Long-Term Agreements)
Direct contracting			
Any contract or series of contracts, including amendments to be awarded to a vendor *in a calendar year* that in aggregate has a cumulative value:	Above US $50,000 and up to 50 percent of the standard delegated procurement authority – Direct Review by CAP Chairperson Above 50 percent of the standard delegated procurement authority and up to 50 percent of any increased delegated procurement authority – by CAP Committee	Above 50 percent of the delegated procurement authority and up to US $2 million (applies per year for long-term agreements)	Headquarters units: above 50 percent of the delegated procurement authority Country offices: above US $2 million (applies per year for long-term agreements)
Amendment of all contracts			
Any amendment or series of amendments to a contract which, in aggregate, increases the contract value by 20 percent or the delegated procurement authority, whichever is less:	Above US $50,000 and up to the standard delegated procurement authority – Direct Review by CAP Chairperson. Above the standard delegated procurement authority and up to the increased delegated procurement authority - by CAP Committee	Above the delegated procurement authority and up to US $2 million (applies per year for long-term agreements)	Country offices: above US $2 million (applies per year for long-term agreements)
Ex ante review			
Ex ante review refers to the review of the procurement strategy roadmap prior to commencement of the procurement process for complex procurement actions with a value:	N/A	Above US $1 million and up to US $2 million (applies per year for long-term agreements)	Above US $2 million (applies per year for long-term agreements)
Notes:	1. The procurement support unit shall participate when requested in the committee review of ex ante submissions. 2. An ex-ante review is not required if: (a) The business unit has had a previous successful experience in the procurement of similar goods/services/works that was already subject to an ex-ante review; or (b) There is sufficient specific corporate guidance and templates on the procurement of the said goods/services. 3. Irrespective of the above, the procurement authority may submit the cases for ex ante review if significant risks are perceived.		

Table 1: Expected Goods and Non-Consulting Services under the GEF project "National child project under the GEF Africa Minigrids Program", Malawi

No	General Description	Contract Value USD (cumulative)	Procurement Method	Procured by	No of Contracts	Advertisement Date (quarter/year)	Implementation Start date (quarter/year)	Comments	Prior or Post review
1	Catered venue for inception meeting (Output 3.5)	4,000	Request for Quotation	MoE / ACRE PU	1	Q4 / 2021	Q4 / 2021	National	Prior
2	IT services for assess suitability and upgrade online platform to host mapping data (Output 1.1)	13,000	Request for Quotation/ Request for Proposal	MoE / ACRE PU	1	Q4 / 2021	Q4 / 2021		Prior
3	Logistics and coordination of first mapping workgroup meeting (Output 1.1)	2,000	Request for Quotation	MoE / ACRE PU	1	Q4 / 2021	Q4 / 2021	National	Prior
4	GIS modeling and mapping contract including gender sensitive markers (Complete delivery on Output 1.1 with exception of gender analyst and website)	245,000	Request for Proposal	UNCDF	1	Q1 / 2022	Q2 / 2022	International	Prior
5	Travel and per diems for nominee(s) to attend regional Community of Practice event	12,000	Request for Quotation	MoE	1	Q3 / 2022	Q3 / 2022	International	Prior
6	Complete delivery, operation and on-site oversight of PUE overlays including design, development, appliance subsidies, PUE technical, operational and business development training, stakeholder consultation, agriculture field support to farmers, coordination of MFI financing offer, Social and environmental impact monitoring, gender action plan, as well as implementation of measures for refinement to system utilisation, PUE operations and tariffs in response to feedback from techno-economic and business modelling. It also includes securing continuation of minigrid system operations support post 2023 (EASE co-finance until 2023) (four year contract) (Output 2.1).	92,190	Request for Proposal	MoE/UoS	1	Q4 / 2021	Q4 / 2021	National	Prior
7	Subsidy, low interest rate agreement or similar with Micro-Finance Institution (financing solution for pilot community to	7,000	Request for Quotation	MoE/UoS or UP Malawi	1	Q2 / 2022	Q3 / 2022	National	Prior

No	General Description	Contract Value USD (cumulative)	Procurement Method	Procured by	No of Contracts	Advertisement Date (quarter/year)	Implementation Start date (quarter/year)	Comments	Prior or Post review
	purchase electrical equipment/appliances) (Output 2.1)								
8	Small businesses development training for pilot communities provided by SMEDI (government unit), or similar organisation	10,000	Direct Contracting	MoE / ACRE PU / UoS or UP Malawi	1	Q1 / 2022	Q2 / 2022	National	Prior
9	Service provider to develop "How To" guides for the online, One Stop Information Centre. Scope of services to include complete delivery of research, content development, technical writing and graphic design / layout and packaging for publication. First year contract shown, but could be procured once off for 4 years with total budget of $70,000) (Output 2.2)	20,000	Request for Proposal or Individual Consultancy	MoE / ACRE PU	1	Q2 / 2022	Q3 / 2022	National	Prior
10	Contracting services to upgrade existing or develop a new web based open-access online facility for hosting and maintenance of online One Stop Information Centre / "How To" guides (Output 2.2) (Includes $12,500 development in initial 2021/22, thereafter $2,500 for maintenance over 3 years)	20,000	Request for Quotation/ Request for Proposal	MoE / ACRE PU or REIAMA	1	Q2 / 2022	Q3 / 2022	National	Prior
11	Contractual services for development, implementation and maintenance of Quality Assurance and Monitoring Framework with dashboard in compliance with guidance provided from the regional project and establishing data collection instruments (Output 3.5) (Four-year contract, budgeted at $5,000 per year)	20,000	Request for Quotation/ Request for Proposal	MoE / ACRE PU	1	Q2 / 2022	Q2 / 2022	International	Prior
12	Logistics and coordination of annual project steering committee meeting (Output 3.5) (Only year 1 costs indicated)	1,000	Request for Quotation	MoE / ACRE PU	1	Q3 / 2022	Q4 / 2022	National	Prior
13	Professional services for audit of project (PMC) (only year 1 costs indicated)	5,000	Request for Quotation/ Request for Proposal	MoE / ACRE PU	1	Q2 / 2022	Q3 / 2022	National	Prior

No	General Description	Contract Value USD (cumulative)	Procurement Method	Procured by	No of Contracts	Advertisement Date (quarter/year)	Implementation Start date (quarter/year)	Comments	Prior or Post review
14	Contract service provider to develop data protocols and set up central database to automatically collate data from participating projects (pilots plus UNDP supported (Sitolo, MEGA, others) into a central database that meets specifications provided by the regional project including confidentiality of data and standardised reports, tracking of trends.	15,000	Request for Quotation/ Request for Proposal	MoE / ACRE PU	1	Q2 / 2022	Q3 / 2022	National	Prior
15	Establishment of digital platform to meet generic specifications and any further guidance available from the regional project at the time. Total costing of contract includes all hardware, software (budgeted at $10,000) and licensing fees (budgeted at $300 per annum per pilot site) that may be relevant and training / capacity building for use of the platform (3,491). (Once off procurement for 4-year implementation)	18,291	Request for Quotation/ Request for Proposal	MoE / ACRE PU	1	Q1 / 2022	Q2 / 2022	National	Prior

Table 2: Expected Works Contracts under the GEF project "National child project under the GEF Africa Minigrids Program", Malawi

No	General Description	Contract Value USD (cumulative)	Procurement Method	Procured by	No of Contracts	Advertisement Date (quarter/year)	Implementation Start date (quarter/year)	Comments	Prior or Post review
1	Procurement of equipment and construction of complete PUE overlay with all electrical infrastructure for both pilot sites (Output 2.1)	34,111	Request for Quotation	UoS /UP Malawi	1	Q1 / 2022	Q1 / 2022	International	Post
2	Procure electrical appliances / equipment for both pilot sites (Output 2.1)	8,700	Request for Quotation	UoS /UP Malawi	1	Q2 / 2022	Q2 / 2022	International	Post

Table 3: Expected Consulting Services under the GEF project "National child project under the GEF Africa Minigrids Program", Malawi

No	General Description	Contract Value USD (cumulative)	Procurement Method	Procured by	No of Contracts	Advertisement Date (quarter/year)	Implementation Start date (quarter/year)	Comments	Prior or Post review
1	Project / Finance Assistant (UN Volunteer available for first of 4 years of implementation. Contract expected to be renewed annually for 4-year implementation)	15,000	Direct Contracting (UNV)	UNDP	1	Q3 / 2021	Q4 / 2021	UNV	Post
2	Consulting services from Regional Panel of Experts (Output 3.1, 3.2. and 3.4)	65,000	Direct Contracting	MOE / ACRE PU	1	N.A.	Q1 / 2022	International	Post
3	Gender specialist (Support for Output 1.1 and 2.1 and 3.3 over 4 years)	29,000	Request for Quotation	MOE / ACRE PU	1	Q3 / 2021	Q1 / 2022	National	Post
4	SES specialist (Support for Output 2.1 and 3.1) Contract value indicated for full 4 years for a total of 8 weeks at an estimated $2,000 per week.	16,000	Request for Quotation	MOE / ACRE PU	1	Q3 / 2021	Q1 / 2022	National	Post
5	Stakeholder engagement specialist (2.5 weeks of support provided to the program over 4 years at $1,652/week)	4130	Request for Quotation	MOE / ACRE PU	1	Q3 / 2021	Q1 / 2022	National	Post
6	Procurement of an international DREI Consultant from list of qualified service providers	40,000	Request for Quotation	MOE / ACRE PU	1	Q1 / 2022	Q1 / 2022	International	Post

No	General Description	Contract Value USD (cumulative)	Procurement Method	Procured by	No of Contracts	Advertisement Date (quarter/year)	Implementation Start date (quarter/year)	Comments	Prior or Post review
7	Procurement of a national consultant to support the international consultant conducting the DREI study	10,000	Request for Quotation	MOE / ACRE PU	1	Q1 / 2022	Q1 / 2022	National	Post

Annex 13: GHG Emissions Reductions and Project's target contributions to GEF-7 Core Indicators (Malawi)

1. Introduction

A financial model has been developed during the PPG Phase (the AMP Financial Model) the main objective of which is to take a standardized approach at analyzing minigrid pilots which will receive support from national child projects and **provide revised estimations for the projects' target contributions to GEF-7 Core Indicators** to replace those developed during the PFD Phase. Box 9 presents the indicators AMP projects report on.

BOX 9: AMP & GEF-7 Core Indicators

AMP projects contribute to the following GEF-7 Core Indicators:

- **Core indicator 6: Greenhouse Gas Emissions Mitigated** captures the amount of GHG emissions expected to be avoided through the GEF project's investment in renewable energy minigrids. It should be measured above a baseline value. Mitigation benefits include:
  - **Direct emissions reductions** attributable to the investments made during the project's supervised implementation period, totaled over the respective lifetime of the investments. For national child projects under AMP, direct emission mitigation arises from minigrid pilot investments under Component 2.
  - **Indirect emissions reductions** that could result from a broader adoption of the outcomes of a GEF project plus longer-term emission reductions from behavioral change[1] in the post-project period. Broader adoption of a GEF project proceeds through several processes including sustaining, mainstreaming, replication, scaling-up and market change. For national child projects under AMP, direct emission mitigation results from creating a general enabled investment environment for minigrid market development, and subsequent investment flows.
- **Context Sub-indicator 6.4: Increase in installed renewable energy capacity per technology** captures the increase in renewable energy generation or storage capacity and should be disaggregate by type of renewable energy technology (biomass, geothermal, ocean, small hydro, solar photovoltaic, solar thermal, wind power, and storage). All AMP national child projects will be contributing to the increase of solar photovoltaic and/or storage capacity.
- **Core indicator 11: Number of direct beneficiaries disaggregated by gender as co-benefit of GEF investment** captures the total number of direct beneficiaries including the proportion of women beneficiaries. Direct beneficiaries are all individuals receiving targeted support[1] from a given project. For AMP national child projects this refers to the investments in minigrids projects under Component 2. AMP national child projects will be reporting on this indicator disaggregated by customer segment. Box 8 below provides additional details on this.

For the purpose of estimating greenhouse gas (GHG) emissions reductions (ER), assumptions are made in terms of what level of concessionality is applied to the use of GEF INV funds to support minigrid pilots (defined in terms of a percentage of capital expenditure costs (CAPEX) to be covered by GEG INV hereinafter referred to as 'CAPEX subsidy levels.'

The AMP Financial Model takes a different **approach at estimating CAPEX subsidy levels**[198] than the one used at PIF stage. This approach results in a level of subsidy – for greenfield and hybridization pilots - which is a function of the difference in the levelized cost of electricity (LCOE)[199] between the clean energy minigrid and a notional diesel-only minigrid. As such, the model estimates for each of the minigrid pilots, the LCOE of the renewable energy minigrid and of a diesel-only minigrid serving an equivalent market, and the resulting level of subsidy (as a % of CAPEX)

[198] The AMP national child projects provide capital cost subsidies, preset as a share of "reasonable" capital costs or based on lowest-subsidy bids, to provide direct financial support for one or more eligible minigrid operator(s) to: (i) develop minigrid projects, and/or (ii) purchase productive use appliances/electromechanical equipment to be leased to and used by minigrid customers.

[199] The price that would have to be paid for each unit of electricity output (e.g kWh) to cover total costs of electricity supply (including capital investments, operating costs, and financing costs) over the lifetime of the system.

required to make the renewable energy minigrid LCOE equal to that of the diesel-only minigrid. For PUE Overlay pilots, the model takes a simplified approach which does not take into consideration the need for strengthening the existing minigrid system, by adding generation and/or distribution capacity, to accommodate the additional PUE overlay demand. The underlying assumption is that the existing minigrid may be oversized and the PUE Overlay improves its capacity utilization. Hence, only PUE equipment capital costs are considered, and the model assumes the project subsidizes 100% of PUE equipment CAPEX costs. In all cases, LCOEs and subsidy levels are indicative and meant only for the purpose of updating greenhouse gas (GHG) emissions reductions (ER) at the PPG Phase.

At PIF stage, it was assumed that all minigrid pilots would be greenfield minigrid projects and only residential customers of these minigrids were considered as direct beneficiaries of the project. The PPG Phase has provided more nuance as to the types of minigrid pilots that will receive Program support and their respective direct beneficiaries. The former includes the following **three types of minigrid pilots:** (1) Greenfield minigrids, (2) Hybridization of existing or planned diesel minigrids, and (3) A productive use overlay to an existing or planned minigrid; and the latter are described in Box 10 below.

BOX 10: Project (Pilot) beneficiaries

AMP national child projects will be reporting on the number of people who are 'direct beneficiaries' of the project. As per GEF's definition, **direct beneficiaries** are all individuals receiving targeted support from a given project, and **targeted support** is the intentional and direct assistance of a project to individuals or groups of individuals who are aware that they are receiving that support and/or who use the specific resources.

In the context of AMP, **only minigrid customers gaining access to electricity and/or improved electricity services are considered direct beneficiaries of the project**. Those community members who benefit from accessing goods and services enabled by electricity, are considered indirect beneficiaries. The exact definition of direct beneficiaries for each type of pilot is presented below.

Type of pilot	Targeted support provided by the project	Direct beneficiaries
Greenfield	Providing access to clean/reliable/affordable electricity to **new minigrid users** through development of new minigrid sites	**All new minigrid customers**
Hybridization	Providing improved electricity services to **all existing as well as new users of an existing minigrid**, based on a larger share of renewable energy and a clear path for diesel phase-out	**All existing as well as new customers of the hybridized minigrid**
PUE Overlay	Providing improved electricity services to **all existing as well as new users of an existing minigrid** through the addition of productive use equipment for use by Commercial/PUE users, which improves sustainability of the minigrid for all its customers	**All existing as well as new customers of the minigrid to which a PUE Overlay is added**

Box 10: Project (Pilot) beneficiaries (continues)

Project direct beneficiaries are categorized in three different customer segments as show in the table below.

Customer Segment	AMP - Program-level definition	# people per minigrid connection
Residential (households)	All households connected to a minigrid regardless of whether they use electricity in the household for value-adding activities.	5 people (household residents)
Social (community and public institutions)	Churches, community centers, health facilities, educational facilities, street lighting, government buildings, and public buildings.	4 people (employees)
Commercial/PUE (productive users of electricity)	Customers who are engaged in value-adding activities powered/enabled by electricity, who in turn provide goods and services to indirect project beneficiaries. Commercial loads such as lighting, cooking, information and communication, refrigeration, space heating/cooling, and motive power are used for value-adding activities such as restaurants, shops, sewing services, beauty salons, internet-cafes, as well as transformation processes, like rice milling, usually embedded in agricultural supply chains.	3 people (owners, employees)

This annex contains the results and calculations of project contributions to GEF-7 Core Indicators, describes the pilots that will be developed under the project to contribute to these results, and the methodologies used to estimate direct Greenhouse Gas (GHG) emissions reductions (ER) expected at CEO Endorsement Request. To that end, it is structured as follows:

- **Section 2 – Executive Summary** presents a snapshot of project results and contributions to GEF-7 Core indicators and a comparison with same calculations at PFD/PIF stage
- **Section 3 – Minigrid Investment Pilots** describes the type of pilot that the Malawi National Child Project will provide support for
- **Section 4- AMP Financial Model Calculations & Methodology** presents the calculations for the pilot(s) and describes inputs and methodology used

2. Executive Summary - Project Results

The Malawi National Child Project aims to support deployment of 2 minigrid pilots in the country both of which will use the productive use overlay to an existing Solar PV-battery minigrid approach, to increase capacity utilization factor of this existing minigrid, reduce its LCOE and increase optimal usage of existing minigrid asset. Section 3 describes the pilots in more detail.

The following table shows the project's updated target contributions to GEF-7 Core Indicators as estimated at the time of CEO endorsement request submission and compares them with those targets included in the Program Framework Document (PFD) and the Malawi Project Concept[200] approved by the GEF Council in December 2019.

Table 22: Project Results – Expected at PIF and at CEO Endorsement

Project GEF-7 Core Indicators		Expected at PIF	Expected at CEO Endorsement
6	**Greenhouse Gas Emissions Mitigated** (metric tons of CO2e)	2,400 (direct) 2,004,726 (indirect top-down)	1,068 (direct) 2,043,000 (indirect)[201]

[200] All documents approved by the GEF on its December 2019 Council.

[201] 10% of the indirect GHG ER of this an all AMP national child projects have been removed from each project and allocated to the AMP regional

Project GEF-7 Core Indicators		Expected at PIF	Expected at CEO Endorsement
6.4	**Increase in installed renewable energy capacity** per technology (MW)	0.06 (solar PV)	0 (solar PV incremental) 0 (storage incremental)
11	Number of **direct beneficiaries disaggregated by gender** (and customer segment) as co-benefit of GEF investment (number of people, number of connections)	9,644 (of which 51% women)	763 additional persons of which 389 women --- 600 people (residential) 16 people (social) 147 people (commercial/PUE) 763 people (total) 120 connections (residential) 4 connections (social) 49 connections (commercial/PUE) 173 connections (total)

The table below shows these results disaggregated for each individual pilot under the project.

Table 23: Project Results - Malawi National Project under the Africa Minigrids Program (AMP)

Project GEF-7 Core Indicators		Pilot 1	Pilot 2
6	**Greenhouse Gas Emissions Mitigated** (metric tons of CO2e)	756 (direct)	312 (direct)
6.4	**Increase in installed renewable energy capacity** per technology (kW – solar) (kWh - storage)	0 (solar PV) 0 (storage)	0 (solar PV) 0 (storage)
11	Number of **direct beneficiaries disaggregated by gender** (and customer segment) as co-benefit of GEF investment (number of people)	398 people (total) 300 people (residential) 8 people (social) 90 people (commercial/PUE) --------- 60 existing connections (residential) 2 existing connections (social) 7 existing connections (commercial/PUE) 23 new connections (commercial/PUE) ***92*** connections ***(total)***	365 people (total) 300 people (residential) 8 people (social) 57 people (commercial/PUE) ---------- 60 connections (residential) 2 connections (social) 7 existing connections (commercial/PUE) 12 new connections (commercial/PUE) ***81*** connections ***(total)***

child project, in line with the apportioning of the overall program budget and reflected in the PFD allocation of GHG emissions reductions across the different child projects. This reflects the benefits of national child projects accessing the regional child project's support which is expected to contribute and enhance the enabling conditions required for minigrids development across AMP countries.

Indicative Minigrid Systems

Various aspects of these pilots remain to be defined during project implementation (e.g. CAPEX subsidy levels, estimated number of households, social, and/or commercial/PUE customers that will be served by each of these minigrids). Hence, for the purpose of estimating an indicative subsidy requirement and indicative GHG emissions reductions, the financial models for each of these 2 pilots simulate representative, standardized minigrid system profiles (Indicative minigrid systems).

It is important to note that the representative indicative minigrid system profiles simulated by this financial model has been built to oversize the system capacity and CAPEX upfront to have enough electricity generation, storage and distribution capacity to meet demand growth from local communities for up to 10 years. This approach has been adopted to ensure overall GHG ER estimates are easier to make during this modeling stage. However, AMP aims to support developers to optimize their minigrid system designs and hence, this approach of oversizing may not be relevant for actual pilot deployment during implementation stage and does not constitute any recommendation in terms of the appropriate sizing of the pilots' minigrid systems.

The following are the characteristics of the Indicative minigrid system that would take the productive use overlay approach (Pilot 1):

- Pilot 1 will use a Productive Use Overlay approach to optimize an **existing minigrid which is already serving 60 households, 2 social users (1 church, 1 school), and 7 commercial/PUE users (2 barber shops, 3 video shops and 2 commercial refrigerators)** by adding productive users and productive use equipment.
- Based on assumptions for estimated electricity demand from each of these customers over a 20-year period, the financial model estimated a **baseline minigrid system with Solar PV capacity of 12 kWp and battery capacity of 80 kWh to serve these customers.** No diesel genset backup is modelled.
- Since the exact number and power load of PUE equipment to be overlayed on this existing minigrid is currently unknown, for the purpose of LCOE estimation and GHG emission reduction calculation, we estimate **23 PUE equipment** – 20 'smaller' load commercial/PUE users (10 commercial refrigerators, 5 egg incubation units, 1 IT hub/printing, 2 peanut butter machines, 2 restaurants) and 3 'larger' load commercial/PUE users (3 rice/corn mills) will be overlayed on the existing Solar PV-battery minigrid.
- Based on assumptions for estimated electricity demand from each of these existing 60 households, 2 social users, and 7 commercial/PUE users, and the newly proposed 23 PUE overlay customers over a 20-year period, the financial model estimated a **minigrid system with Solar PV capacity 43 kWp and battery capacity of 285 kWh** to serve these customers. No diesel genset backup is modelled.
- This Levelized Cost of Energy (LCOE) of the indicative baseline 12 kWp 80 kWh Solar PV-battery minigrid system is estimated at $6.61/kWh whereas the LCOE of the indicative 43 kWp 285 kWh Solar PV-battery minigrid system with PUE overlay is estimated at of $5.66/kWh, thereby achieving the desired result of reduced LCOE due to improved capacity utilization factor.
- For the purpose of this financial modeling exercise of PUE overlay Pilot 1, no subsidy is envisaged to be provided for increased capex of Solar PV-battery minigrid system due to PUE overlay. However, it's assumed the total cost of 23 PUE equipment deployed, estimated to be **$22,161** will be completely subsidized by the GEF National Child Project resources.

The following are the characteristics of the Indicative minigrid system that would take the productive use overlay approach (Pilot 2):

- Pilot 2 will use a Productive Use Overlay approach to optimize an **existing minigrid which is already serving 60 households and 2 social users (1 church, 1 school), and 7 commercial/PUE users (2 barber shops, 3 video shops and 2 commercial refrigerators)** by adding productive users and productive use equipment.
- Based on assumptions for estimated electricity demand from each of these customers over a 20-year period, the financial model estimated a **baseline minigrid system with Solar PV capacity of 12 kWp and battery capacity of 80 kWh to serve these customers.** No diesel genset backup is modelled.

- Since the exact number and power load of PUE equipment to be overlayed on this existing minigrid is currently unknown, for the purpose of LCOE estimation and GHG emission reduction calculation, we estimate **12 PUE equipment** – 10 'smaller' load commercial/PUE users (2 commercial refrigerators, 5 egg incubation units, 1 IT hub/printing, 1 peanut butter machine, 1 restaurant) and 2 'larger' load commercial/PUE users (2 soya oil pressing machines) will be overlayed on existing Solar PV-battery minigrid.
- Based on assumptions for estimated electricity demand from each of these existing 60 households, 2 social users, and 7 commercial/PUE users, and the 12 newly proposed PUE overlay customers over a 20-year period, the financial model estimated a **minigrid system with Solar PV capacity 25 kWp and battery capacity of 164 kWh** to serve these customers. No diesel genset backup is modelled.
- This Levelized Cost of Energy (LCOE) of the indicative baseline 12 kWp 80 kWh Solar PV-battery minigrid system is estimated at $6.61/kWh whereas the LCOE of the indicative 43 kWp 285 kWh Solar PV-battery minigrid system with PUE overlay is estimated at of $5.96/kWh, thereby achieving the desired result of reduced LCOE due to improved capacity utilization factor.
- For the purpose of this financial modeling exercise of PUE overlay Pilot 1, no subsidy is envisaged to be provided for increased capex of Solar PV-battery minigrid system due to PUE overlay. However, it's assumed the total cost of 12 PUE equipment deployed, estimated to be **$20,650** will be completely subsidized by the GEF National Child Project resources.

The following are the estimated results at CEO ER stage of the 2 proposed minigrid pilots (Pilot 1 and Pilot 2) receiving support from the Malawi National Child Project based on the 2 minigrid system profiles described above:

- The allocated INV budget **of USD 42,811**, and assuming that this entire amount will be used as capital expenditures (CAPEX) subsidies for minigrid investment pilot(s), will be used to provide 100% CAPEX subsidy (US$ 22,161) for the 23 PUE equipment to be overlayed on the existing Solar PV-battery minigrid of Pilot 1 and 100% CAPEX subsidy (US$ 20,650) for the 12 PUE equipment to be overlayed on the existing Solar PV-battery minigrid of Pilot 2.
- The number of direct project beneficiaries (GEF Core indicator 11) from both pilots together is expected to be around **763 people (600 residential, 16 social, 147 commercial/PUE users)**. This is due to the project's support for 173 new minigrid connections (120 residentialo, 4 social, 49 commercial/PUE).
- No increase in renewable energy capacity installed is estimated since GEF National Child Project resources are not being used to support incremental Solar PV-battery capacity deployment.
- The lifetime global environmental benefits that will accrue from the adoption of off-grid solar technologies is estimated at **1,068 tCO2e** (756 tCO2e due to Pilot 1 and 312 tCO2e due to Pilot 2). This is calculated for the 20-year period of the technology's lifetime.
- Indirect emission reductions amounting to **2,043,000 tCO2e** are expected due to investments in minigrids completed during the 10-year influence period following project completion, predominantly through the replication of the sustainable technology value chain.
- The project yields an abatement cost of 199.5 USD/tCO2e (average of 243 USD/tCO2e due to Pilot 1 and 156 USD /tCO2e due to Pilot 2). This abatement cost takes into consideration overall upfront and replacement CAPEX of both pilots, as well as CAPEX for PUE overlay (Pilot 1).

Comparison with respect to PIF Stage – Direct GHG ER

At PIF stage, it was estimated that US$124,779 would be used to provide CAPEX subsidies to cover 75% of the CAPEX needed to develop 1.6 greenfield minigrid sites at an average investment cost of US$3,450 per kW of installed solar capacity. Each of these minigrid sites was assumed to have 30 kW of installed solar capacity and serve a population of 6,000 people per minigrid (200 people per kW of installed capacity). Hence the total increased RE capacity expected from the project was estimated at 50-60 kW and the number of project direct beneficiaries at 9,644 people, resulting in direct GHG ER of 2.4 ktonCO2e over the technology's lifetime of 20 years.

At CEO ER stage, it is estimated that out of the USD 42,811 GEF 'INV' budget under Component 2: (i) USD 22,161 will be used to provide 100% CAPEX subsidy for the 23 PUE equipment to be overlayed on the existing Solar PV-battery minigrid of Pilot 1 and (ii) USD 20,650 will be used to provide 100% CAPEX subsidy for the 12 PUE equipment to be overlayed on the existing Solar PV-battery minigrid of Pilot 2. Assumptions on the number of people served by each minigrid have been revised downward with respect to PIF stage; the number of direct project beneficiaries from both pilots together is expected to be around 763 people (398 people due to Pilot 1 and 365 people due to Pilot 2). This is due to the project's support for **600 residential customers (120 connections; 5 people per houseold), 16 social users (4 connections, 4 people per connection) and 147 commercial/PUE customers (49 connections, 3 people per connection).**

The table below compares key parameters used to determine project's results at PIF and CEO endorsement request stages.

Parameters to estimate project results	**PIF Stage**	**At CEO Endorsement**
Type of pilot	Greenfield minigrid	Pilot 1 – PUE Overlay of existing Minigrid Pilot 2 – PUE Overlay of existing Minigrid
GEF INV used as CAPEX subsidy (USD)	124,779	42,811 (22,161 for Pilot 1, 20,650 for Pilot 2)
Subsidy level	75%	Pilot 1 - 100% for PUE equipment CAPEX Pilot 2 - 100% for PUE equipment CAPEX
# minigrids	1.6	2
Minigrid installed solar PV capacity (kW/minigrid)	30	0 (incremental)
Minigrid battery storage capacity (kWh/minigrid)	Not defined	0 (incremental)
CAPEX per kW of installed solar capacity (USD/kW)	3,450	NA
Number of people per unit of installed solar PV capacity (people per kW)	200	NA
Number of people served by minigrid (people/minigrid)	6,000	Pilot 1 – 398 Pilot 2 – 365 Total Project – 763
Annual RE generation (MWh/year/minigrid)	95	Pilot 1 – 52.5 Pilot 2 – 30.3 Total Project – 82.8
Emission factor of diesel-only minigrid (tCO2/MWh)	0.786	UNFCCC methodology (refer Section IV)
Minigrid annual GHG ER (tCO2/year/minigrid)	74	Pilot 1 – 38 Pilot 2 – 16 Total Project - 54
Project annual GHG ER (tCO2/year)	119.5	Pilot 1 – 38 Pilot 2 – 16 Total Project - 54
Project lifetime GHG ER (tCO2)	2,400	Pilot 1- 756 Pilot 2 – 312

Parameters to estimate project results	PIF Stage	At CEO Endorsement
		Total Project – 1,068

At PIF stage, power generation per minigrid was estimated at 94.61 MWh per year, considering a 40% solar capacity factor (fraction of installed solar PV capacity that can effectively generate electricity) and a 90% availability factor (fraction of time the minigrid system is online and available to generate power during a given year). Based on annual generation, the comparison with a diesel only minigrid (with an emission factor of 0.786 tons CO2e/MWh), yields annual project GHG ER of **119.5 metric tons of CO2e.**

At CEO ER stage, power generation per minigrid is estimated at **52.5 MWh per year for Pilot 1 and 30.3 MWh per year for Pilot 2**. Based on annual generation, the comparison between the existing Solar PV-battery minigrid with and without PUE Overlay (Pilot 1 and Pilot 2), yields annual project GHG ER of **54 metric tons of CO2e (38 tCO2e for Pilot 1 and 16 tCO2e for Pilot 2)**. Hence the total number of direct GHG ER over 20 years for the project is now estimated at **1,068 tons of CO2e (756 tCO2e for Pilot 1 and 312 tCO2e for Pilot 2)**.

Comparison with respect to PIF Stage – Indirect GHG ER

Indirect emissions mitigation at PIF stage was estimated at 2,004,726 tCO2e. This was done using a top-down approach, on the basis that the project contributes to an enabled environment which subsequently attracts investment in renewable energy minigrids adding approximately 75 MW of installed capacity over a 10-year post-project period. Indirect emissions mitigation from these minigrids is calculated over their technology lifetime of 20 years. The methodology assumes that minigrids will electrify either 33%, 25% or 15% (in this case 25%) of the unelectrified population (14,977,252 people). The selection of this minigrid electrification factor was based on several criteria, including (1) current levels of grid coverage; (2) recent and ongoing initiatives for grid extension; (3) geographical size of countries; and (4) spread of off-grid communities in terms of population density. Thereafter the methodology applies a causality factor varying between 20% and 80%, chosen based on the state of the minigrid market development and ongoing baseline initiatives in each country; for this project it was estimated at 60%.

Indirect emissions mitigation at CEO ER stage has been estimated at 2,043,000 tCO2e[202]. This was calculated using a similar methodology as used for the PIF but revising the fossil fuel emissions factor from 0.786 tCO2e/MWh to 0.741 tCO2e and assuming minigrids will electrify 4,048,814 people - 30% of the rural unelectrified population (13,496,048 people). Investments in renewable energy minigrids are expected to add 81 MW of installed capacity after the project implementation period ends. This will reduce 189,235 tCO2e annually resulting in 3,784,700 tCO2e of emissions reduced over 20 years of the technology's lifetime. A causality factor of 60% was used to estimate what percentage of these emissions reductions can be attributed to enabling conditions to which the project has contributed.

Parameters to estimate indirect GHG ER	PIF Stage	At CEO Endorsement
Unelectrified population (million people)	14,977,252	14,873,890
National electrification rate (%)	13%	18%
Unelectrified rural population (people)	NA	13,496,048

[202] 10% of the indirect GHG ER of this an all AMP national child projects have been removed from each project and allocated to the AMP regional child project, in line with the apportioning of the overall program budget and reflected in the PFD allocation of GHG emissions reductions across the different child projects. This reflects the benefits of national child projects accessing the regional child project's support which is expected to contribute and enhance the enabling conditions required for minigrids development across AMP countries.

Parameters to estimate indirect GHG ER	PIF Stage	At CEO Endorsement
Minigrids Total Electrification factor (% of total unelectrified population)	25%	27%
Minigrids Rural Electrification factor (% of unelectrified rural population)	NA	30%
Number of people to be electrified by minigrids (people)	3,744,313	4,048,814
Average minigrid market size (# households/minigrid)	100	100
Average minigrid system size (kW per minigrid)	10	10
Number of people per unit of installed solar PV capacity (people per kW)	50	50
Installed RE capacity over post-project 10-year period (MW)	75	67.5
Causality factor (attribution to AMP) (%)	60%	60%

3. Malawi - Minigrid Investment Pilots

The Malawi National Child Project will support the following two minigrid investment pilots:

- **Pilot 1 will use a Productive Use Overlay approach**
  - Pilot 1 for Malawi will be an existing minigrid system (already consisting of 60 households and 2 social users (1 church, 1 school), and 7 commercial/PUE users (2 barber shops, 3 video shops and 2 commercial refrigerators) upon which the project will add a PUE Overlay.
  - It is to be noted that the minigrid system upon which the project will add a PUE Overlay, is already installed and is significantly oversized. The 12kWp, 80kWh solar PV-battery system was developed solely for residential and community use. As a public sector pilot project, it was intended to assess system performance for rural electrification.
  - Therefore, the model does not consider investments in additional solar or battery installed capacity and will focus instead on improving the utilization of the existing 12kWp, 80kWh solar PV-battery system. The project will only invest the capex required for PUE equipment, which will be financed entirely from the project budget.
  - Pilot 1 is estimated to overlay 23 PUE equipment – 20 'smaller' load commercial/PUE users (10 commercial refrigerators, 5 egg incubation units, 1 IT hub/printing, 2 peanut butter machines, 2 restaurants) and 3 'larger' load commercial/PUE users (3 rice/corn mills) on existing Solar PV-battery minigrid.

- **Pilot 2 will use a Productive Use Overlay approach**
  - Pilot 2 for Malawi will be an existing minigrid system (already consisting of 60 households and 2 social users (1 church, 1 school), and 7 'smaller' load commercial/PUE users (2 barber shops, 3 video shops and 2 commercial refrigerators) upon which the project will add a PUE Overlay.
  - It is to be noted that the minigrid system upon which the project will add a PUE Overlay, is already installed and is significantly oversized. The 12kWp, 80kWh solar PV-battery system was developed solely for residential and community use. As a public sector pilot project, it was intended to assess system performance for rural electrification.
  - Therefore, the model does not consider investments in additional solar or battery installed capacity and will focus instead on improving the utilization of the existing 12kWp, 80kWh solar PV-battery system. The project will only invest the capex required for PUE equipment, which will be financed entirely from the project budget.

- Pilot 2 is estimated to overlay 12 PUE equipment – 10 'smaller' load commercial/PUE users (2 commercial refrigerators, 5 egg incubation units, 1 IT hub/printing, 1 peanut butter machine, 1 restaurant) and 2 'larger' load commercial/PUE users (2 soya oil pressing machines) on existing Solar PV-battery minigrid.

The allocated GEF project INV budget of **USD 42,811** will be used as capital expenditures (CAPEX) subsidies for minigrid investment pilot(s), to provide (i) 100% CAPEX subsidy (US$ 22,161) for the 23 PUE equipment to be overlayed on the existing Solar PV-battery minigrid of Pilot 1 and (ii) 100% CAPEX subsidy (US$ 20,650) for the 12 PUE equipment to be overlayed on the existing Solar PV-battery minigrid of Pilot.

The table below provides a brief description of each pilot, the allocated budget and the expected increase in renewable energy (RE) capacity.

Table 24: Malawi National Child Project – Minigrid investment pilots

Pilot Summary			
Pilot # / name	**Pilot 1. Mthembanji PUE Add On**	**Pilot 2. Kudembe PUE Add On**	**Combined**
Type of Pilot	Productive use overlay to an existing MG	Productive use overlay to an existing MG	
Objective:	Pilot extension project to demonstrate productive use as anchor load in Mthembanji Village in Dedza	Pilot extension project to demonstrate productive use as anchor load in Kudembe Village in Dedza	
Technology:	Solar PV + Battery	Solar PV + Battery	
Total number of minigrids	1	1	
Budget Allocated (USD) (estimated CAPEX subsidy):	22,161	20,650	42,811
Use of GEF INV funds	Provide CAPEX subsidies for 100% of the cost of PUE equipment	Provide CAPEX subsidies for 100% of the cost of PUE equipment	
System Sizing & Increase in RE Capacity			
Pilot #	**Pilot 1**	**Pilot 2**	**Combined**
Solar PV Capacity (kWp)	12 (existing) 43 (required)	12 (existing) 25 (required)	24 (existing) 68 (required)
	0 (Incremental)	**0 (Incremental)**	**0 (incremental)**
Battery Capacity (kWh)	80 (existing) 285 (required)	80 (existing) 164 (required)	160 (existing) 449 (required)
	0 (Incremental)	**0 (incremental)**	**0 (incremental)**

The following table shows the number of new user connections by customer segment and the resulting number of direct beneficiaries for each pilot and the project.

Table 25: Malawi National Child Project – New minigrid connections and direct beneficiaries

Existing and new minigrid connections					
Pilot # / name	Pilot 1: Mthembanji PUE Add-On		Pilot 2: [illegible]		Combined/Project
Customer segment	**Existing users**	**New users**	**Existing users**	**New users**	**New users**
Residential	60	0	60	0	**0**
Social	1 (church) 2 (school) *2 (total)*	0	1 (church) 2 (school) *2 (total)*	0	**0**
Commercial/PUE (Smaller loads)	2 (Barber Shops) 3 (Video Shops) 2 (Commercial Refrigerators) *7 (total)*	10 (Commercial Refrigerators) 5 (Egg Incubation Units) 1 (IT Hub/Printing) 2 (Peanut Butter Machines) 2 (Restaurants) *20 (total)*	2 (Barber Shops) 3 (Video Shops) 2 (commercial refrigerators) *7 (total)*	2 (Commercial Refrigerators) 5 (Egg Incubation Units) 1 (IT Hub/Printing) 1 (Peanut Butter Machines) 1 (Restaurants) *10 (total)*	12 (Commercial Refrigerators) 10 (Egg Incubation Units) 2 (IT Hub/Printing) 3 (Peanut Butter Machines) 3 (Restaurants) *30 (total)*
Commercial/PUE (Larger loads)	0	3 (Rice/Corn Mills) *3 (total)*	0	2 (Soya Oil Pressing Machines) *2 (total)*	**3 (Rice/Corn Mill)** **2 (Soya Oil Pressing Machines)** ***5 (total)***
Total connections	**69**	**23**	**69**	**12**	**173**
	92		**81**		
Pilot direct beneficiaries	**329**	**69**	**329**	**36**	**763**
	398		**365**		

4. AMP Financial Model Calculations & Methodology

Solar PV Minigrid system sizing. The AMP financial model uses customized demand metrics and typical average load profiles of various customer types to estimate optimized Solar PV-battery system size configuration using the formulas described in Box 1 below.

Box 1: System Sizing Formulas

The Solar PV capacity configuration was estimated using the formula below:

$$\textbf{Solar PV Capacity for a Solar PV Battery system (kW)} = \text{Daily electricity consumption in Year 3 (kWh)} \times \textit{Seasonal Multiplier}\ (1.28) \div \left(1 - \textit{Losses Factor}\ (8\%)\right) \div \textit{Daily peak sun hours}\ (\textit{hours}) \times (1 + \textit{Solar PV Oversizing Factor})$$

Solar PV capacity is a function of:

- Electricity demand parameters – namely, the expected daily average electricity consumption in Year 3 (kWh/year)
- Weather parameters – namely the average Solar Irradiation (daily average number of hours of peak sun at a solar radiation of 1 kW/m2) received by the proposed minigrid pilot location (or a provincial/national average if an exact minigrid pilot location has not been defined), a Seasonal multiplier to account for solar irradiation variations throughout the year, and a generation and distributions losses factor.
- Technical parameters – an overall system oversizing factor (58%) to account for Solar PV output degradation as PV modules become older, and the capacity needed to charge the batteries.

The battery capacity configuration was estimated using the formula below:

$$\textbf{Battery Capacity for a Solar PV} - \textbf{Battery system(kWh)} = \text{Average daily electricity consumption in Year 3 (kWh)} \times \textit{Night time fraction}\ (\%) \times \textit{Night time demand to be met by battery}\ (\%) \div (\textit{Usable Energy}\ (60\%)) \times (1 + \textit{Battery Oversizing Factor})$$

Battery capacity configuration is based on the expectation that a percentage of the minigrid night-time electricity consumption in Year 3 (100% if Solar PV-battery; 70% if Solar PV-Battery Diesel) will be met by battery and the assumption that only 60% of installed battery capacity can be utilized to supply customer demand due to limitations of typical battery discharge depth. Night-time electricity consumption is estimated as 80% of the average daily electricity demand. An overall oversizing factor (140%) is applied to account for increased night-time electricity demand and battery capacity degradation over the years assuming a 13 year battery lifetime.

Power generation. Electricity generated from Solar PV minigrids in the first year of installation is derived from the following formula: (Solar PV Capacity Installed in kW) x (Capacity Utilization Factor) x 365 days x 24 hours. After the first year of installation, an annual 1% degradation factor is applied to the amount of kWh generated by each Solar PV installation. Electricity generated is used to supply demand and to charge batteries; any remaining electricity is considered excess electricity.

Only renewable electricity generated to meet consumer demand is used for the purpose of estimating GHG emissions reductions. Hence, annual renewable electricity generation (excluding excess electricity) is estimated using the following formula: (Annual electricity consumption of residential and non-residential consumers in year y (MWh)) / (1 – Loss factor) x Renewable energy fraction of total power generation (100%).

Loss of electricity due to the use of battery. Electricity losses due to the use of battery have been built into the system, since battery capacity is estimated based on the assumption that only 60% of battery capacity is usable to

supply customer demand. These battery capacity/electricity loss assumptions are in addition to generation and distribution system losses (8%) built into the models due to inverter losses and transmission and distribution losses.

Findings/highlights/conclusions for Malawi Pilot 1.

- **Existing minigrid significantly oversized.** The existing minigrid system upon which the project will add a PUE overlay is oversized enough, but additional investments are needed to increase installed capacity (solar, storage) to accommodate PUE overlay. Nevertheless, additional investments in Solar PV-battery capacity to accommodate PUE overlay are not planned to be supported by the project budget.
- **PUE overlay will improve LCOE.** The proposed PUE overlay over this existing minigrid system will improve its capacity utilization factor and therefore also decrease the estimated Levelized Cost of Energy (LCOE) of this minigrid system from $6.61/kWh without PUE overlay to $5.66/kWh with PUE overlay.
- **Subsidy of up to 100% of upfront capex of 23 PUE equipment proposed to be overlayed, estimated to be a total of US$ 22,161, is proposed.** The financial modeling exercise of the existing Solar PV-battery minigrid considers 100% PUE equipment CAPEX to be subsidized with GEF project budget but not the increased Solar PV-battery minigrid CAPEX due to increased system capacity to accommodate PUE overlay.
- **PUE overlay will increase annual and lifetime carbon emission savings.** The proposed PUE overlay over this existing minigrid system will improve its capacity utilization factor and therefore also increase the lifetime carbon emission savings from this minigrid system. The financial modeling exercise of the existing Solar PV-battery minigrid system estimated an annual carbon emission reduction of 36 tCO2e without PUE overlay and 74 tCO2e with PUE overlay, thereby achieving an effective GHG emission reduction of 38 tCO2e per annum. The modeling exercise also estimated a lifetime (20-year) carbon emission reduction of 718 tCO2e without PUE overlay and 1,474 tCO2e with PUE overlay, thereby achieving an effective GHG emission reduction of 756 tCO2e over a 20-year lifetime.
- **PUE overlay will decrease lifetime carbon abatement costs.** The proposed PUE overlay over this existing minigrid system will increase its capital efficiency by decreasing the lifetime carbon abatement costs (lifetime capex divided by lifetime carbon emission savings) from $386 without PUE to $629 with PUE overlay.

Methodology and calculations – Pilot 1

Step 1 – Defining Indicative minigrid system characteristics.

- The model simulates a Solar PV-battery MG system, both with and without the addition of a productive use of electricity (PUE) overlay, for a custom sized minigrid demand/market.
- Customized demand metrics and typical average load profiles of various customer types are provided to the model as inputs, and an optimized Solar PV-battery-diesel system size configuration is computed by the model (proposed to be deployed under this GEF project) using the formulas described in Box 1.
- In this case, financial model estimated a baseline minigrid system (without PUE overlay) of Solar PV capacity of 12 kWp and battery capacity of 80 kWh to serve these customers. Based on assumptions for estimated electricity demand from each of these existing 60 households and 2 social users (1 church, 1 school), and 7 'smaller' load commercial/PUE users (2 barber shops, 3 video shops and 2 commercial refrigerators) and the newly proposed PUE overlay customers over a 20-year period, the financial model estimated a minigrid system with Solar PV capacity 43 kWp and battery capacity of 285 kWh to serve these customers. No diesel genset backup is modelled in both with and without PUE overlay systems.

Step 2 – Estimating LCOE and subsidy levels.

- The model uses a combination of generic and country-specific inputs to estimate the all-in costs for the minigrid including capital expenditures (CAPEX), operational and maintenance costs (OPEX) and financing costs.

- The model calculates the Levelized Cost of Electricity (LCOE) for the proposed PUE overlay of existing minigrid system, that is the price that would have to be charged for the electricity to be able to recover all costs (CAPEX, OPEX and financing costs) over a 20-year period timeframe.
- Several assumptions/input values are included in the model for Capex, Opex, Capacity Utilization Factor (CUF), cost of capital and electricity demand from existing customers, to estimate all-in costs.
- With the proposed incremental CAPEX investments (under this GEF project) to add 23 more PUE equipment – 20 'smaller' load commercial/PUE users (10 commercial refrigerators, 5 egg incubation units, 1 IT hub/printing, 2 peanut butter machines, 2 restaurants) and 3 'larger' load commercial/PUE users (3 rice/corn mills), and using the same CAPEX, OPEX and financing costs as earlier, LCOE is recalculated with PUE overlay.
- The model compares the LCOEs of the existing Solar PV-battery minigrid in with and without PUE overlay scenarios; CAPEX subsidy of 100% of the cost of PUE equipment is envisaged with GEF project resources.

The PUE overlay proposed to be implemented under this project with GEF INV will result in increased capacity utilization of existing solar PV minigrid and hence, reduce its LCOE, as shown in the figure below.

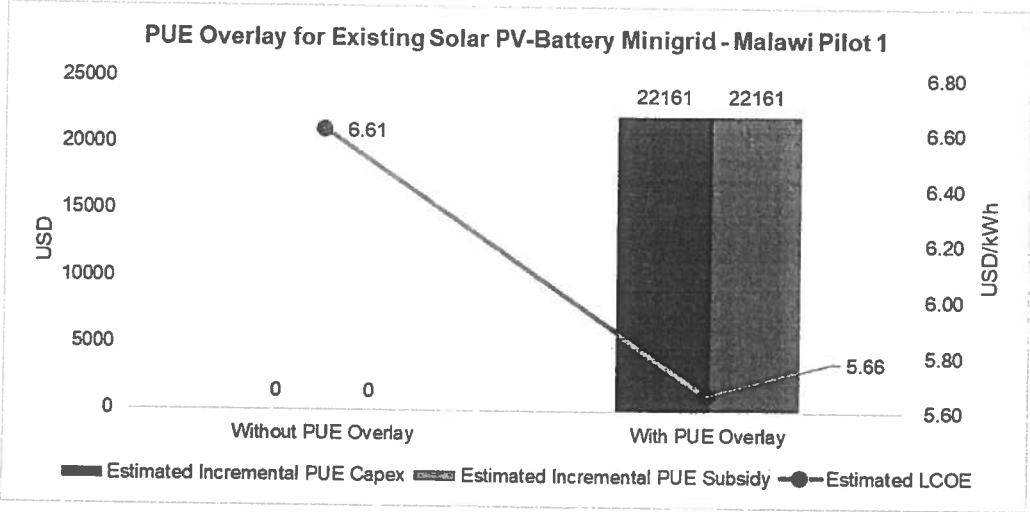


Figure 11: Subsidy Level and LCOE with and without PUE Overlay for Existing Minigrid – Malawi Pilot 1

Step 3 – Estimating GHG ER for indicative minigrid system.

- The model estimates environmental benefits for the Solar PV-battery minigrid system by comparing the GHG emitted between the Program scenario (with PUE overlay of existing Solar PV-Battery minigrid system) and baseline scenario (without PUE overlay of existing Solar PV-Battery minigrid system).
- Estimation of GHG emissions avoided is based on estimating CO2 emissions reduction using emission factors for various consumer types as per **AMS-III.BB: Electrification of Communities through grid extension or construction of new minigrids.** [203] This methodology is applicable to project activities involving electrification of a community of consumers (each consumer with a single electrical connection to a grid)

[203] https://cdm.unfccc.int/methodologies/DB/TI8KFU0GX1JBYZLOIJ6OMCSVYXCZUJ

through either: (a) Extension of an existing grid (national, regional or minigrid); or (b) Construction of new minigrid . No leakage or project activity emissions were considered.

- To that end, the model calculates emissions reductions as a function of incremental electricity generated from the PUE overlay added to the Solar PV- Battery minigrid over a 20-year period and a baseline emission factor which for residential consumers is chosen based on their average annual electricity consumption (a combination of 6.8, 1.3 and 1.0 tCO2e/MWh) and for non-residential users is 1.0 tCO2e/MWh.
- Annual electricity generated from the Solar PV Battery minigrid is derived from the following formula: (Annual electricity consumption of residential and non-residential consumers in year y (MWh)) / (1 – Loss factor)

The Figure below shows the GHG emission reductions due to deployment of PUE overlay of existing Solar PV-Battery Minigrid (Pilot 1) system. The direct GHG emissions reductions from PUE overlay of existing Solar PV-battery minigrid system estimated an annual carbon emission reduction of 36 tCO2e without PUE overlay and 74 tCO2e with PUE overlay, thereby achieving an effective GHG emission reduction of 38 tCO2e per annum. Also, estimated a lifetime (20-year) carbon emission reduction of 718 tCO2e without PUE overlay and 1,474 tCO2e with PUE overlay, thereby achieving an effective GHG emission reduction of 756 tCO2e over a 20-year lifetime. The project yields a GEF abatement cost of $386 without PUE to $629 with PUE overlay.

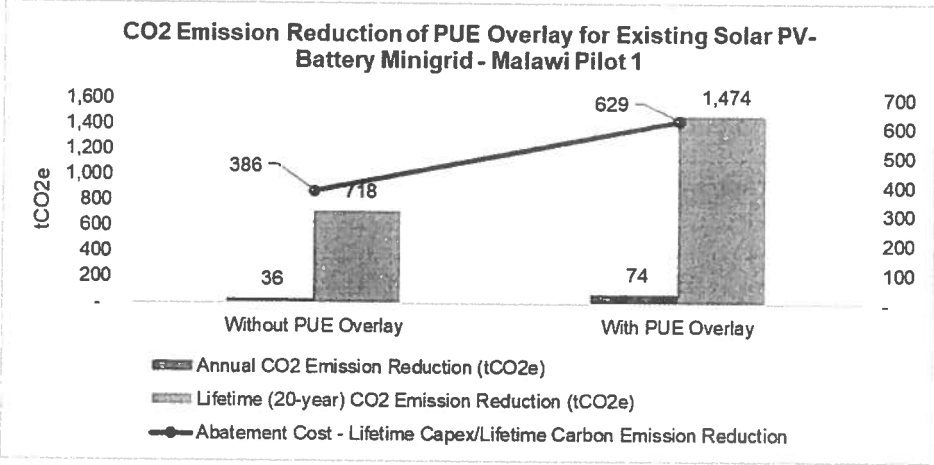


Figure 12: Annual and Lifetime CO2 Emission Reduction (tCO2e) with and without PUE Overlay for Existing Solar PV Minigrid – Malawi Pilot 1

Findings/highlights/conclusions for Malawi Pilot 2.

- **Existing minigrid significantly oversized.** The existing minigrid system upon which the project will add a PUE overlay is oversized enough, but additional investments are needed to increase installed capacity (solar, storage) to accommodate PUE overlay. Nevertheless, additional investments in Solar PV-battery capacity to accommodate PUE overlay are not planned to be supported by the project budget.
- **PUE overlay will improve LCOE.** The proposed PUE overlay over this existing minigrid system will improve its capacity utilization factor and therefore also decrease the estimated Levelized Cost of Energy (LCOE) of this minigrid system from $6.61/kWh without PUE overlay to $5.96/kWh with PUE overlay.

- **Subsidy of up to 100% of upfront capex of 12 PUE equipment proposed to be overlayed, estimated to be a total of US$ 20,650, is proposed.** The financial modeling exercise of the existing Solar PV-battery minigrid considers 100% PUE equipment CAPEX to be subsidized with GEF project budget but not the increased Solar PV-battery minigrid CAPEX due to increased system capacity to accommodate PUE overlay.
- **PUE overlay will increase annual and lifetime carbon emission savings.** The proposed PUE overlay over this existing minigrid system will improve its capacity utilization factor and therefore also increase the lifetime carbon emission savings from this minigrid system. The financial modeling exercise of the existing Solar PV-battery minigrid system estimated an annual carbon emission reduction of 36 tCO2e without PUE overlay and 52 tCO2e with PUE overlay, thereby achieving an effective GHG emission reduction of 16 tCO2e per annum. The modeling exercise also estimated a lifetime (20-year) carbon emission reduction of 718 tCO2e without PUE overlay and 1,031 tCO2e with PUE overlay, thereby achieving an effective GHG emission reduction of 312 tCO2e over a 20-year lifetime.
- **PUE overlay will decrease lifetime carbon abatement costs.** The proposed PUE overlay over this existing minigrid system will increase its capital efficiency by decreasing the lifetime carbon abatement costs (lifetime capex divided by lifetime carbon emission savings) from $386 without PUE to $542 with PUE overlay.

Methodology and calculations – Pilot 2

Step 1 – Defining Indicative minigrid system characteristics.

- The model simulates a Solar PV-battery MG system, both with and without the addition of a productive use of electricity (PUE) overlay, for a custom sized minigrid demand/market.
- Customized demand metrics and typical average load profiles of various customer types are provided to the model as inputs, and an optimized Solar PV-battery-diesel system size configuration is computed by the model (proposed to be deployed under this GEF project) using the formulas described in Box 1.
- In this case, financial model estimated a baseline minigrid system (without PUE overlay) of Solar PV capacity of 12 kWp and battery capacity of 80 kWh to serve these customers. Based on assumptions for estimated electricity demand from each of these existing 60 households and 2 social users (1 church, 1 school), and 7 'smaller' load commercial/PUE users (2 barber shops, 3 video shops and 2 commercial refrigerators) and the newly proposed PUE overlay customers over a 20-year period, the financial model estimated a minigrid system with Solar PV capacity 25 kWp and battery capacity of 164 kWh to serve these customers. No diesel genset backup is modelled in both with and without PUE overlay systems.

Step 2 – Estimating LCOE and subsidy levels.

- The model uses a combination of generic and country-specific inputs to estimate the all-in costs for the minigrid including capital expenditures (CAPEX), operational and maintenance costs (OPEX) and financing costs.
- The model calculates the Levelized Cost of Electricity (LCOE) for the proposed PUE overlay of existing minigrid system, that is the price that would have to be charged for the electricity to be able to recover all costs (CAPEX, OPEX and financing costs) over a 20-year period timeframe.
- Several assumptions/input values are included in the model for Capex, Opex, Capacity Utilization Factor (CUF), cost of capital and electricity demand from existing customers, to estimate all-in costs.
- With the proposed incremental CAPEX investments (under this GEF project) to add 12 PUE equipment – 10 'smaller' load commercial/PUE users (2 commercial refrigerators, 5 egg incubation units, 1 IT hub/printing, 1 peanut butter machine, 1 restaurant) and 2 'larger' load commercial/PUE users (2 soya oil pressing machines), and using the same CAPEX, OPEX and financing costs as earlier, LCOE is recalculated with PUE overlay.
- The model compares the LCOEs of the existing Solar PV-battery minigrid in with and without PUE overlay scenarios; CAPEX subsidy of 100% of the cost of PUE equipment is envisaged with GEF project resources.

The PUE overlay proposed to be implemented under this project with GEF INV will result in increased capacity utilization of existing solar PV minigrid and hence reduce its LCOE, as shown in the figure below.

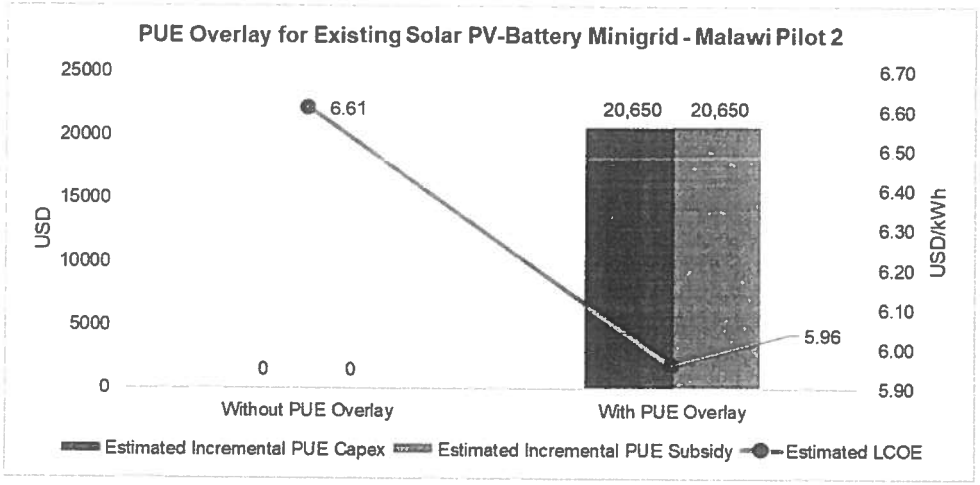


Figure 13: Level and and PUE Existing Malawi Subsidy LCOE with without Overlay for Minigrid – Pilot 2

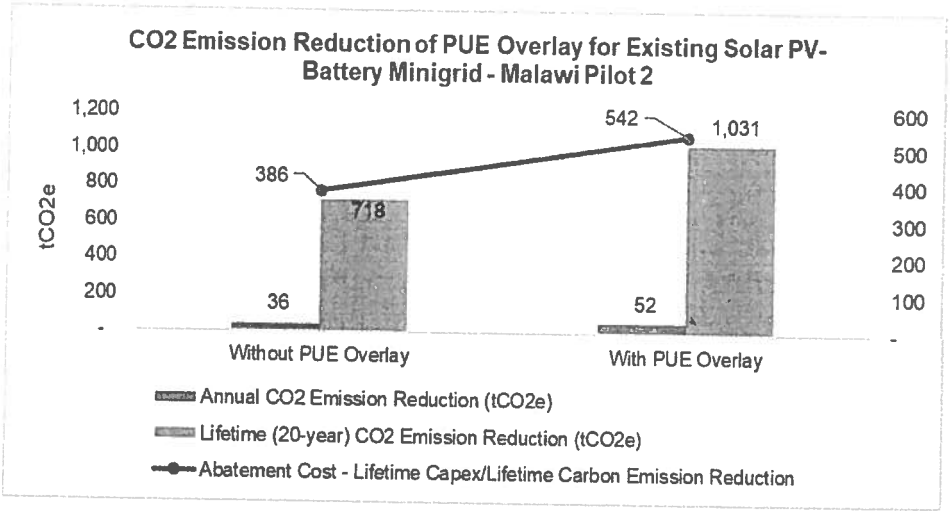
Step 3 – Estimating GHG ER for indicative minigrid system.

- The model estimates environmental benefits for the Solar PV-battery minigrid system by comparing the GHG emitted between the Program scenario (with PUE overlay of existing Solar PV-Battery minigrid system) and baseline scenario (without PUE overlay of existing Solar PV-Battery minigrid system).
- Estimation of GHG emissions avoided is based on estimating CO2 emissions reduction using emission factors for various consumer types as per **AMS-III.BB: Electrification of Communities through grid extension or construction of new minigrids.** [204] This methodology is applicable to project activities involving electrification of a community of consumers (each consumer with a single electrical connection to a grid) through either: (a) Extension of an existing grid (national, regional or minigrid); or (b) Construction of new minigrid . No leakage or project activity emissions were considered.
- To that end, the model calculates emissions reductions as a function of incremental electricity generated from the PUE overlay added to the Solar PV- Battery minigrid over a 20-year period and a baseline emission factor which for residential consumers is chosen based on their average annual electricity consumption (a combination of 6.8, 1.3 and 1.0 tCO2e/MWh) and for non-residential users is 1.0 tCO2e/MWh.
- Annual electricity generated from the Solar PV Battery minigrid is derived from the following formula: (Annual electricity consumption of residential and non-residential consumers in year y (MWh)) / (1 – Loss factor)

[204] https://cdm.unfccc.int/methodologies/DB/TI8KFU0GX1JBYZLOIJ6OMCSVYXCZUJ

The Figure below shows the GHG emission reductions due to deployment of PUE overlay of existing Solar PV-Battery Minigrid (Pilot 2) system. The direct GHG emissions reductions from PUE overlay of existing Solar PV-battery minigrid system estimated an annual carbon emission reduction of 36 tCO2e without PUE overlay and 52 tCO2e with PUE overlay, thereby achieving an effective GHG emission reduction of 16 tCO2e per annum. Also, estimated a lifetime (20-year) carbon emission reduction of 718 tCO2e without PUE overlay and 1,031 tCO2e with PUE overlay, thereby achieving an effective GHG emission reduction of 312 tCO2e over a 20-year lifetime. The project yields a GEF abatement cost of $386 without PUE to $542 with PUE overlay.

Figure 14: Annual and Lifetime CO2 Emission Reduction (tCO2e) with and without PUE Overlay for Existing Solar PV Minigrid – Malawi Pilot 2



Inputs and assumptions.

Key inputs are summarized in the tables below:

- The following are the **inputs used to determine system sizing** (load profile of the customers, day-night usage split, capacity utilization factor and system oversizing requirement to compensate for yield degradation and internal electricity losses).

Input	Units	Values – Pilot 1	Values – Pilot 2
Average daily consumption by customer segment/type			
Residential	kWh / day	0.285	0.285
Social (Church)	kWh / day	0.1-0.78	0.1-0.78
Commercial	kWh / day	0.09-2.4	0.09-2.4
Productive users	kWh / day	0.9-9.0	0.9-6.0
Day/Night consumption Split			
Day Time Electricity Consumption	%	20%	20%
Night Time Electricity Consumption	%	80%	80%
Connection of customers to the minigrid			
% of total demand - Year 1	%	75%	75%
% of total demand - Year 2	%	85%	85%

Input	Units	Values – Pilot 1	Values – Pilot 2
% of total demand - Year 3	%	100%	100%
Technical Inputs			
Solar Irradiation (kWh/m2)	kWh/m2	1646	1646
Solar Capacity Utilization Factor %	%	26%	26%
Seasonal Multiplier	-	1.28	1.28
Usable Battery Energy %	%	60%	60%
Battery Oversizing %	%	140%	67%
Diesel Generators Power Factor	-	0.8	0.8

- **OPEX.** The following are the inputs used to estimate the operational and maintenance costs (OPEX) for the minigrid systems analyzed.

Input	Units	Values – Both Pilots
RE Minigrid Operations & Maintenance (OPEX)		
Annual Insurance Costs as % of Minigrid Capex	% upfront CAPEX	2%
Annual O&M Costs as % of Minigrid Capex	% upfront CAPEX	3%
Number of kWh per Liter of Fuel	kWh / Liter of diesel	3.50
Fuel Cost Per Liter	US$ / Liter of diesel	1.07

- **CAPEX.** The following are the inputs used to estimate the Capital expenditures (CAPEX) for the minigrid systems analyzed.

Malawi Pilot 1.

Input	Units	Values – Pilot 1 (Existing Minigrid)
Minigrid CAPEX (Existing Minigrid – this CAPEX is not incrementally invested by this GEF project, only estimated for computation of LCOE)		
Solar PV + BoS + Inverter CAPEX (Energy Generation)	USD	NA (No project INV)
Battery CAPEX per kWh (Energy Storage)	USD	NA (No project INV)
Distribution Line CAPEX (Energy Distribution)	USD	NA (No project INV)
Site Development Costs	USD	NA (No project INV)
Other Costs - Transport, Installation, Soft Costs, Duties etc.	USD	NA (No project INV)
Total Minigrid CAPEX	**USD**	NA (No project INV)
Incremental PUE Overlay CAPEX (this CAPEX is proposed to be incrementally invested by this GEF project) for 8 PUE	**USD**	**22,161**

Malawi Pilot 2.

Input	Units	Values – Pilot 2 (Existing Minigrid)
Minigrid CAPEX (Existing Minigrid – this CAPEX is not incrementally invested by this GEF project, only estimated for computation of LCOE)		
Solar PV + BoS + Inverter CAPEX (Energy Generation)	USD	NA (No project INV)
Battery CAPEX per kWh (Energy Storage)	USD	NA (No project INV)
Distribution Line CAPEX (Energy Distribution)	USD	NA (No project INV)
Site Development Costs	USD	NA (No project INV)
Other Costs - Transport, Installation, Soft Costs, Duties etc.	USD	NA (No project INV)
Total Minigrid CAPEX	**USD**	NA (No project INV)
Incremental PUE Overlay CAPEX (this CAPEX is proposed to be incrementally invested by this GEF project) for 8 PUE	**USD**	**20,650**

- **Unit Costs.** The following are the unit costs in terms of CAPEX per kWp of solar PV, CAPEX for kWh of battery, CAPEX per km of distribution lines etc. used to estimate the Capital expenditures (CAPEX) for the minigrid systems analyzed.

Input	Units	Values – Pilot 1 (Existing Minigrid)	Values – Pilot 2 (Existing Minigrid)
Minigrid Unit Costs			
Solar PV CAPEX per kWp	USD	NA (No project INV)	NA (No project INV)
Battery CAPEX per kWh	USD	NA (No project INV)	NA (No project INV)
Diesel Genset (Notional Baseline System) CAPEX per kW	USD	NA (No project INV)	NA (No project INV)
Distribution Line CAPEX per kWp	USD	NA (No project INV)	NA (No project INV)
Blended Transport + Installation Costs per kWp	USD	NA (No project INV)	NA (No project INV)

- **Capital Structure.** The following are the inputs used to estimate the Weighted Average Cost of Capital (WACC) for the minigrid investments analyzed. The capital structure reflects a pre-derisking scenario in which debt is not readily available to finance minigrid investments and instead, minigrid investors have to finance projects with 100% Equity.

Input	Units	Values – Both Pilots
RE Minigrid Financial structure and costs		
Equity %	%	100%
Debt %	%	0%
Cost of Equity %	%	25%
Loan Tenor (Years)	Years	8

Interest Rate %	% annual	20%
Weighted Average Cost of Capital (WACC)	% annual	25%

- **GHG Emission factors**. The model simulates a Solar battery Hybrid MG system, with or without the addition of a productive use of electricity (PUE) overlay, for three standard minigrid market sizes or for a custom sized minigrid market. Based on standard or customized demand metrics and typical average load profile of the customers, system size configuration is arrived at for each type of minigrid system.
- Estimation of GHG emissions avoided is based on UNFCCC methodology **AMS-III.BB: Electrification of Communities through grid extension or construction of new minigrids.**[205]
- It is assumed that all consumers (Type I (household) and Type 2 (non-household) will have metered connections for simplicity reasons.
- Since both minigrid pilots supported under this project are off-grid where baseline energy is supplied by diesel or fuel oil or a similar fossil fuel, emission factor of baseline fossil fuel based energy generation is used.
- The main GHG emission reduction computation formula (as provided in the UNFCCC methodology) is:

$$BE_{T1M,y} = \sum_{j=1}^{M_y} EC_{T1M,j,y} \times EF_{CO2,T1M} \qquad \text{Equation (6)}$$

Where:

$BE_{T1M,y}$ = Baseline emissions for Type I-M consumers in year y (t CO_2)

$EC_{T1M,j,y}$ = Annual electricity consumption of Type I-M consumer j in year y (MWh)

3. If $EC_{T1M,j,y}$ is greater than 0.250 MWh/y but less than or equal to 0.500 MWh/y, then:
   (a) For the portion up to and including 0.055 MWh/y use a default value of 6.8 (t CO_2/MWh);
   (b) For the portion greater than 0.055 MWh/y and less than 0.25 MWh/y use a default value of 1.3 (t CO_2/MWh); and
   (c) For the portion greater than 0.25 MWh/y use a default value of 1.0 (t CO_2/MWh);
4. If $EC_{T1M,j,y}$ is greater than 0.500 MWh/y then use a default value of 1.0 (t CO_2/MWh) for the entire portion (i.e. default values of 1.3 (t CO_2/MWh) or 6.8 (t CO_2/MWh) are not eligible for any of the portions)

M_y = Number of Type I-M consumers in year y

j = Type I-M consumer (j = 1, 2, 3, ...)

Baseline emissions of Type I-M consumers, BET1M,y are calculated as:

[205] https://cdm.unfccc.int/methodologies/DB/TI8KFU0GX1JBYZLOIJ6OMCSVYXCZUJ

Emission Factor (for CO2 Emission Reduction Computation)	Value
Emission factor Residential (<55 kWh Annual Consumption)	6.82
Emission factor Residential (55-250 kWh Annual Consumption)	1.30
Emission factor Residential (>250 kWh Annual Consumption)	1.00
Emission factor Commercial	1.00
Emission factor Industrial	1.00
Emission factor Social	1.00

This formula is summarized in the table below:

GHG emission reduction estimation at PIF stage was made based on Capacity Utilization Factor (CUF), wherein amount of electricity units generated from the minigrid (using CUF of installed capacity) was multiplied with emission factors to arrive at GHG emission reduction estimates. The methodology used here is comparable to the one used during PIF stage, but it is more detailed due to the use of different emission factors for different types of customers (as required by the UNFCCC methodology).

Annex 14: Additional agreements.

The following co-financing commitments were received from the Ministry of Energy (MoE), UNDP Country Office, University of Strathclyde/ Scottish Government Rural Energy Access through Social Enterprise and Decentralisation (EASE) and United Nations Capital Development Fund (UNCDF).

Ministry of Energy (MoE) co-finance commitment

Telephone : (265) 1 7789 488
Fax : (265) 1 788 689

All correspondence to be addressed to:
The Secretary for Energy

MINISTRY OF ENERGY
PRIVATE BAG 350
CAPITAL HILL
LILONGWE 3
MALAWI

Ref. No.: MoE/ALT/14

10th June, 2021

Mr. Shigeki Komatsubara
Resident Representative,
United Nations Development Programme,
P.O Box 30135,
LILONGWE 3.

Dear Sir,

CO-FINANCING COMMITMENT LETTER FOR THE NATIONAL CHILD PROJECT UNDER THE AFRICA MINI-GRIDS PROGRAM - MALAWI

In my capacity as the Principal Secretary, I am pleased to express my full support and endorsement of the UNDP-supported, GEF-financed "National child project in Malawi", which is part of the Africa mini-grids program. The project is aligned with, and supportive of, the government's national priorities and commitments towards the sustainable development goals.

The Ministry of Energy will support the GEF-funded project through in-kind co-financing of USD906,903 throughout the duration of the project. The co-financing will focus primarily on Component 4 on Project Management Unit.

The Ministry of Energy would like to thank the Global Environment Facility for its support to this important initiative and looks forward to the commencement of the project and our continued collaboration.

Yours faithfully,

Patrick C.R. Mafuleka
SECRETARY FOR ENERGY

MINISTRY OF ENERGY

Government contribution to the Africa Minigrids Program

Description	Quantity	Days	Frequency	Unit cost	Year 1	Year 2	Year 3	Year 4	Total (MK)
Office Rentals	1	1	12	2,000,000	24,000,000	26,400,000	29,040,000	31,944,000	111,384,000.00
Office Equipment	1	1	1	7,000,000	7,000,000	-	-	-	7,000,000.00
Motor vehicle running expenses	2	1	4	1,200,000	9,600,000	10,560,000	11,616,000	12,777,600	44,553,600.00
Salaries for officers working on the project	5	1	12	8,904,867	106,858,404	117,544,244	129,298,669	142,228,536	495,929,852.96
Cleaning Services	1	1	12	250,000	3,000,000	3,300,000	3,630,000	3,993,000	13,923,000
Electricity	1	1	12	50,000	600,000	660,000	726,000	798,600	2,784,600
Water	1	1	12	50,000	600,000	660,000	726,000	798,600	2,784,600
Telephone charges	1	1	12	500,000	6,000,000	6,600,000	7,260,000	7,986,000	27,846,000
Total					157,658,404	173,424,244	190,766,669	209,843,336	731,692,653

Exchange rate (Malawi Kwacha to USD)	807
Total Budget in USD	906,682

Salaries breakdown:

Description	Quantity	Days	Frequency	Unit cost	Year 1	Year 2	Year 3	Year 4	Total
Project Cordinator (Deputy Director	1	1	12	2,460,353	29,524,236	32,476,660	35,724,326	39,296,758	137,021,979
Assistant Project Cordinator (Chief Energy Officer)	1	1	12	1,949,297	23,391,564	25,730,720	28,303,792	31,134,172	108,560,249
Energy Officer	1	1	12	1,949,297	23,391,564	25,730,720	28,303,792	31,134,172	108,560,249
Accountant	1	1	12	1,949,297	23,391,564	25,730,720	28,303,792	31,134,172	108,560,249
Administrative Assistant	1	1	12	596,623	7,159,476	7,875,424	8,662,966	9,529,263	33,227,128
Total					106,858,404	117,544,244	129,298,669	142,228,536	495,929,852.96

Ref:MWI10/121078 **23rd April, 2021**

Dear Mr Kurukulasuriya,

Re: Co-Financing Commitment Letter for the Africa Mini-Grids Program - Malawi

In my capacity as the Resident Representative, I am pleased to express my full support and endorsement of the UNDP-supported, GEF-financed Africa Mini-grids Program in Malawi – which is part of the regional UNDP initiative that has 11 participant countries. The project is aligned with, and supportive of, the government's national priorities and commitments towards the sustainable development goals.

UNDP Malawi Country Office will support the GEF-funded project through USD 1,000,000 cash (One Million) throughout the duration of the project.

UNDP would like to thank the Global Environment Facility for its support to this important initiative and looks forward to the commencement of the project and our continued collaboration.

Sincerely,

Shigeki Komatsubara

Shigeki Komatsubara
Resident Representative

Pradeep Kurukulasuriya
Executive Coordinator
UNDP-Global Environmental Finance
United Nations Development Programme
304 East 45th Street, FF-9th Floor
New York, NY 10017
United States

Plot No 7, Area 40, P.O. Box 30135, Lilongwe 3, Malawi, registry.mw@undp.org; www.mw.undp.org
Telephone: (265) 1-773 500/074/190/287/532/797; 774 081/404; Fax: (265) 1-773 637

University of Strathclyde Engineering

Department of Electronic & Electrical Engineering
University of Strathclyde
Royal College Building
204 George Street
Glasgow G1 1XW

19th April 2021

Shigeki Komatsubara
Resident Representative
UNDP Malawi, Area 40, Plot 7
P.O. Box 30135, Lilongwe 3
Malawi

Dear Shigeki,

Re: Co-financing commitment letter for the National child project under the Africa mini-grids program - Malawi

In my capacity as Principal Investigator of the Scottish Government funded Rural Energy Access through Social Enterprise and Decentralisation (EASE) project, I am pleased to express my full support and endorsement of the UNDP-supported, GEF-financed "National child project in Malawi", which is part of the Africa mini-grids program (AMP). The project is aligned with, and supportive of, the government's national priorities and commitments towards the sustainable development goals.

The University of Strathclyde will support the AMP project through mini-grid pilots, technical advisory services and research conducted through EASE which we regard as complimentary and synergistic to the AMP goals. Additionally, EASE has already invested in the pilot mini-grid where productive use of energy piloting activities in Output 2.1 will take place. The grant co-financing of $793,492 (USD) will be spent throughout the duration of the AMP project and will focus primarily on Component 2: Project and Business Model Innovation with Private Sector Engagement.

The University of Strathclyde would like to thank the Global Environment Facility for its support to this important initiative and looks forward to the commencement of the project and our continued collaboration.

Yours sincerely,

Professor Stuart Galloway
Principal Investigator, EASE

E: stuart.galloway@strath.ac.uk
T: +44(0) 548 5856

Mr. Oliver Waissbein
Principal Technical Advisor, Energy
United Nations Development Programme
304 East 45th Street
New York, NY 10017, USA

10 May 2021

Re: Co-financing for the UNDP-supported, GEF-funded National Projects in Eswatini and Malawi under the Africa Mini-Grids Program

Dear Mr. Waissbein,

We write to you in connection with the above-named Projects and wish to inform you that UNCDF is pleased to act as a co-financing partner to the Projects.

UNCDF, in partnership with UNDP, conducted a SADC regional market scoping study related to clean energy contributions to real economy growth, as part of a wider financial inclusion diagnostic also known as MAP. Eswatini and Malawi were included in the study, along with three other countries. The Scoping study served as the basis for a clean energy country report developed for all five countries respectively. The country studies include desktop research based on the scoping study, as well as extensive demand side analytics, leveraging the FinScope data sets for each country. The country reports describe the landscape of energy and clean energy provision at country level, and highlight opportunities and barriers to energy and clean energy usage. The research is intended to inform programmatic interventions at country level, inform further research into specific opportunities (like mini-grids), as well as to catalyse investment related to opportunities highlighted.

UNCDF is pleased to confirm the above research initiatives as co-financing towards the above programme on clean energy in Eswatini and Malawi. The details of this co-financing support are as follows:

Country	Co-financing amount (USD)	Type
Eswatini	910,000	*Other – Research was provided to the Ministry of Finance*
Malawi	644,000	*Other - – Research was provided to the Ministry of Finance*
Total	1,554,000	

We believe that the proposed Projects provide an important platform to advance renewable energy mini-grids in Eswatini and Malawi. We look forward to the commencement of the Project and to explore ways in how we can possibly continue our collaboration, at country or regional level.

Yours sincerely,

Mike McCaffrey
Regional Digital Hub Lead for East and Southern Africa
UNCDF

Annex 15: GEF Core indicators

Core Indicator 6	Greenhouse gas emission mitigated				(Metric tons of CO_2e)
		Expected metric tons of CO_2e (6.1+6.2)			
		PIF stage	Endorsement	MTR	TE
	Expected CO_2e (direct)	2,400	1,068		*1,068*
	Expected CO_2e (indirect)	2,004,726	2,043,000		*2,043,000*
Indicator 6.2	Emissions avoided Outside AFOLU				
		Expected metric tons of CO_2e			
		Expected		Achieved	
		PIF stage	Endorsement	MTR	TE
	Expected CO_2e (direct)	2,400	1,068		
	Expected CO_2e (indirect)	2,004,726	2,043,000		
	Anticipated start year of accounting	2021	2021		
	Duration of accounting	20	20		
Indicator 6.4	Increase in installed renewable energy capacity per technology				
	Technology	Capacity (MW)			
		Expected		Achieved	
		PIF stage	Endorsement	MTR	TE
	Solar PV Battery Minigrid	0.06	0		
Core Indicator 11	**Number of direct beneficiaries disaggregated by gender as co-benefit of GEF investment**				***(Number)***
		Number			
		Expected		Achieved	
		PIF stage	Endorsement	MTR	TE
	Female	8,294	389		
	Male	7,969	374		
	Total	16,263	763		

Annex 16: GEF 7 Taxonomy

Level 1	Level 2	Level 3	Level 4
☒ Influencing models			
	☐ Transform policy and regulatory environments		
	☒ Strengthen institutional capacity and decision-making		
	☒ Convene multi-stakeholder alliances		
	☒ Demonstrate innovative approaches		
	☐ Deploy innovative financial instruments		
☒ Stakeholders			
	☐ Indigenous Peoples		
	☒ Private Sector		
		☐ Capital providers	
		☐ Financial intermediaries and market facilitators	
		☐ Large corporations	
		☒ SMEs	
		☒ Individuals/Entrepreneurs	
		☐ Non-Grant Pilot	
		☐ Project Reflow	
	☒ Beneficiaries		
	☒ Local Communities		
	☒ Civil Society		
		☐ Community Based Organization	
		☒ Non-Governmental Organization	
		☒ Academia	
		☒ Trade Unions and Workers Unions	
	☒ Type of Engagement		
		☒ Information Dissemination	
		☒ Partnership	
		☒ Consultation	
		☒ Participation	
	☒ Communications		
		☒ Awareness Raising	
		☒ Education	
		☐ Public Campaigns	
		☐ Behavior Change	
☒ Capacity, Knowledge and Research			
	☐ Enabling Activities		
	☒ Capacity Development		
	☒ Knowledge Generation and Exchange		
	☐ Targeted Research		
	☐ Learning		
		☐ Theory of Change	
		☐ Adaptive Management	
		☐ Indicators to Measure Change	
	☒ Innovation		

	☒ Knowledge and Learning		
		☒Knowledge Management	
		☒Innovation	
		☒Capacity Development	
		☒Learning	
	☒ Stakeholder Engagement Plan		
☒Gender Equality			
	☒Gender Mainstreaming		
		☒Beneficiaries	
		☐Women groups	
		☒Sex-disaggregated indicators	
		☒Gender-sensitive indicators	
	☒Gender results areas		
		☐Access and control over natural resources	
		☒Participation and leadership	
		☒Access to benefits and services	
		☒Capacity development	
		☒Awareness raising	
		☐Knowledge generation	
☐Focal Areas/Theme			
	☒Climate Change		
		☒Climate Change Adaptation	
			☐Climate Finance
			☐Least Developed Countries
			☐Small Island Developing States
			☐Disaster Risk Management
			☐Sea-level rise
			☐Climate Resilience
			☐Climate information
			☐Ecosystem-based Adaptation
			☐Adaptation Tech Transfer
			☐ National Adaptation Programme of Action
			☐National Adaptation Plan
			☐Mainstreaming Adaptation
			☐Private Sector
			☐Innovation
			☐Complementarity
			☐Community-based Adaptation
			☐Livelihoods
		☒Climate Change Mitigation	
			☐ Agriculture, Forestry, and other Land Use
			☐Energy Efficiency
			☐ Sustainable Urban Systems and Transport
			☐Technology Transfer
			☒Renewable Energy
			☐Financing
			☐Enabling Activities
		☐Technology Transfer	
			☐ Poznan Strategic Programme on Technology Transfer
			☐Climate Technology Centre & Network (CTCN)
			☐Endogenous technology
			☐Technology Needs Assessment
			☐Adaptation Tech Transfer

		☐ United Nations Framework on Climate Change	☐ Nationally Determined Contribution
	☒ Rio Markers		
		☐ Paris Agreement	
		☒ Sustainable Development Goals	
		☐ Climate Change Mitigation 0	
		☐ Climate Change Mitigation 1	
		☒ Climate Change Mitigation 2	
		☐ Climate Change Adaptation 0	
		☐ Climate Change Adaptation 1	
		☐ Climate Change Adaptation 2	

Annex 17: Climate risk screening

Infrastructure development, including energy infrastructure, throughout Africa will be particularly vulnerable to increased climate variability. This, in turn threatens economic growth, development, and social welfare benefits of infrastructure expansion. Accordingly, the African Development Bank has prioritized climate risk management and adaptation with an emphasis on building resources and capacity to inform 'best practice' project designs. [206]

At a country level, consideration of resilience planning and resilience enhancing policies will increasingly be important for infrastructure and energy projects. In terms of the AMP, it is anticipated that the DREI analysis might contribute to identifying climate related risks that will benefit from national / policy intervention[207].

For the country, Renewable Energy minigrids contribute greater resiliency to the overall energy system through contributing spatial diversity, bringing generation closer to consumption areas, diversification of the generation mix, locational flexibility, reduced water requirements and modular and rapid deployment. The communities where RE minigrids are deployed benefit from reduced vulnerabilities related to broader grid outages, back-up capacity inherent to battery storage, reduced reliance on fuel availability, having local economies energized with lower cost, localised energy solutions that are insulated against price escalations/volatilities of fossil fuels[208].

However, as already experienced by minigrids, the "resilience benefits of mini-grids are only as strong as the resilience of the mini-grids themselves[209]." Climate vulnerabilities are experienced at three levels: generation, distribution and demand. Climate hazards and risks in these areas include:

- **Generation**. Reduced efficiency of solar PV due to higher temperatures and dust. Increased air temperatures lower solar PV efficiency and energy output. Dry conditions increase dust events. More intense storms (frequency, duration and impact) and extreme precipitation threatens generation infrastructure
- **Distribution**. Increased temperatures reduce the efficiency of distribution networks. More intense storms and severe convection threatens distribution infrastructure. Increased wildfire activity can directly damage distribution infrastructure.
- **Demand.** Increased temperatures increase energy demand for cooling and could potentially stress system capacities, decreased precipitation and increasing dry days will increase irrigation and potable water demand, changing weather patterns will however also impact crop production, rural economies and reduce demand for electricity, declining habitability of areas (desertification, changing water level) might prompt relocations/migration of communities, leaving infrastructure redundant.

PUEs embedded in agricultural value chains are especially vulnerable to (i) the risks of extreme weather on the agricultural production, (ii) lower demand for PUE employed for agricultural beneficiation as well as (iii) the wider economic impact of crop failures in the community and resulting (in)ability to pay for electricity (increased end-user credit risk).

These risks are aggravated by the logistical challenges facing remote rurally located communities with limited access to technical support, spare parts, maintenance capacity to address mini-grid issues/disruptions. At the moment "environmental" and "force majeure risks" have been thought[210] to have relatively low probability, while experience have shown the impact of such risks could range from low to medium. These risks are expected to increase to 2050.

---

[206] Veit, Sebastian. (2010). Climate Risk Management for the Energy Sector in Africa: The Role of the African Development Bank. 10.1007/978-90-481-3692-6_8.

[207] Policy considerations may include grid interconnection processes, tailored government financing mechanisms, overarching policy/regulatory goals for resilient design and operation of infrastructure systems, safety, reliability, and robustness standards, rate structures or incentive programs cognizant.

[208] Sherry Stout. James Elsworth. NREL. 2020. Renewable Energy and Resilience. ccreee.org/event/climate-vulnerability- modelling/

[209] Mason Fried. 2020. Case Study: Climate Resilience Assessment of Mini-Grids in Ghana, Integrated Resource and Resilience Planning (IRRP) Project.

[210] David Manetsgruber, Bernard Wagemann, Bozhil Kondev, Katrin Dziergwa. Risk management for Mini-grids: A new approach to guide mini-grid deployment. Alliance for Rural Electrification. Available at: www.ruralelec.org

In Malawi, preliminary findings of climate analyses done for 8 irrigation sites in 5 districts in the country[211], showed that both temperature and rainfall are predicted to increase over the coming decades. This will likely lead to an increase in the occurrence of floods, prolonged dry periods and strong winds.

In response to these anticipated risks and hazards, resiliency measures to mitigate risks from climate change on the minigrid pilot developments in Malawi have been considered in 5 areas:

Table 26: Climate risk minigrid system mitigation measures

Mitigation area	Checklist of potential resiliency measures considered
Resilience planning	- Proactive planning for climate risks, - Site selection with consideration of weather hazards, - Sizing of systems to limit risk exposure, and - Storm water drainage.
Structural measures	- Site- specific, hazard-based structural design - Structural design, reinforcements, fastener and material selection strengthened or weatherproofed against anticipated climate risks. - Natural ventilation, fans or heat pumps to maintain airflow around battery banks and other critical infrastructure. - Lighting protection.
Reliability measures	- Replacement parts kept, where feasible, to address unexpected failures.
Operations and community coordination	- Necessary tools and capacity to ensure mini- grid systems are well maintained and operate as intended - Enhanced panel cleaning and maintenance of all equipment vulnerable to dust - Pre-storm checklists to limit or avoid damage from flooding, hazardous objects, loose connections, etc. - Post-storm checklists to check for damage or increased vulnerabilities - Community skilled for critical on-site maintenance - Site maintenance and preparation to protect against wildfires (fire breaks, volunteer fire crew training, firefighting equipment)
Productive uses of energy	- Introduction of PUEs that also contributes to mitigation of climate risks e.g. introducing solar powered pumps and irrigation[212].

The majority of these measures have been included in planning and development at the two pilot sites. Among these are the following:

Resilience planning. The shipping containers for housing the system are raised off the ground and seated on concrete plinths to facilitate storm water drainage and prevent flooding.

The smaller sizing and modular approach taken for the two pilot sites provide agility in an uncertain, climate vulnerable environment. The panel mounting structures allow for modular and expandable PV arrays, and containers[213] have space for increased battery storage and inverters to accommodate capacity expansion in response to changing demand.

[211] Contributing to climate resilience in Malawi, April 2021. https://www.smec.com/newsroom/current-news/contributing-climate-resilience-malawi.

[212] Where irrigation systems can support vulnerable smallholder farmers to sustainably enhance their production levels to such a degree that they can provide for their household nutritional demands and deliver produce to viable markets.

[213] The current electrical system is closed off covering about a third of the footprint of the container, with the extra space used for storage/a base for the site agents.

Containerization of the generation system also allows for systems to be transported and deployed in other areas if the population relocated due to climate impacts or if there is damage to the distribution system for example.

Structural measures. Procurement documentation for the development of the pilot systems required EPC contractors to ensure mounting systems will withstand adverse weather effects. Specific specifications were included for grounding and lighting protection as well as resilience of the structural elements, specifically calling for:

- a bolt hardware locking solution.
- through-bolting of modules as opposed to top-down or T clamps, or if top clamping is required, use clamps that hold modules individually or independently.
- all hardware sized based on 25 years (or project life) of corrosion.
- self-tapping screws not to be used.
- all equipment to have appropriate IP (dust and moisture ingress protection) rating, based on its location.

Cooling of critical infrastructure is addressed by fitting the plant rooms with air conditioning to keep batteries cool. Lithium-ion batteries were also selected due to their increased ability to deal with high temperatures over lead acid.

Reliability measures. Adequately addressing reliability presented a challenge with the costs of keeping back up batteries on site to prohibitive. Similarly, any generation components will need to be shipped into Malawi. This has been recognised as a risk of loss of service until equipment or components arrive.

Operations and community coordination. All the operations and community coordination measures have been incorporated, with trained site technicians and more qualified maintenance contractors available from Lilongwe (2 hours away). Measures have been introduced to deal with local fires in the generation hub. These measures do not currently extend to wildfires as the risk of wildfires is low in the area due to low forest cover.

Consideration is being given to introduce a course/module as part of ongoing community engagement and capacity building to share information on climate risks generally and how the microgrid links to these.

Annex 18: Principle for allocation of GEF investment (INV) funding

The following principles set direction and provides guidance for implementation. A departure from these principles during implementation will typically involve a decision of the project's board.

(i) **Clear categorization of pilot (greenfield, productive use overlay, hybrid); initial guidance on delivery model of pilot.**

- The program as a whole has defined three generic categories of pilot:
  1. greenfield solar-battery minigrids (which often will include productive use
  2. Productive use overlays (on an existing solar-battery minigrid)
  3. Hybridization of an existing diesel minigrid (with new solar-battery equipment)
- While the final delivery model of the pilot does not need to be identified at the design stage, if the project is able to provide initial guidance on the direction of exploration of the delivery model for the pilots during implementation, this is encouraged.

(ii) **Private sector involvement in pilots.**

- Each pilot will have a de facto delivery model it is demonstrating. The delivery model does not need to be finalized at the design stage, and can wait until implementation.
- However, in selecting the delivery model during implementation, a key principle should be stated that the delivery model for pilots should seek to incorporate private sector involvement to the degree possible. This will be on a spectrum from private sector for Engineering, Procurement and Construction (EPC), to private sector for Operations and Maintenance (O&M), to private sector for a build own operate model (BOO). While recognizing the importance of national context, market maturity and other factors, the AMP program is taking a normative position that private sector engagement in the minigrid sector is conducive to scaling-up minigrids.

(iii) **Use of digital platforms for tendering**

- The use of digital platforms for tendering the pilots is a central element of the AMP. By using digital platforms for pilots, capacity of key stakeholders will be developed, which can then set the foundation for later using digital platforms for sector-wide large scale tenders.

(iv) **Productive use: third party ownership model; limited technical assistance**

- Productive use is key to the program's theory of change, where the economics of mini-grids can improve in a virtuous cycle of higher loads resulting in lower LCOEs.
- **Third Party Ownership Models for GEF INV.** Pilots that provide financial support for the purchase of productive use equipment (GEF INV) should note that the project will only provide its support via a third-party ownership model, as opposed to a self-ownership model. Third party ownership models involve the minigrid asset owner purchasing the productive use equipment, and then effectively leasing it back to the end-user, as part of an energy as a service offer. This third-party ownership model is necessary to justify the use of climate finance, as the funding can be presented holistically as part of the overall system design required for an economic minigrid.
- **Limited TA.** Projects may also provide TA building capacity for productive uses associated with the pilot investment. While this is not a principle, please note that the amount of GEF budget to technical assistance programs for general productive use should be limited and moderated. This is due to the related issue that climate finance should be directed to activities that specifically reduce emission reductions.

(v) **Clear methodological basis for additionality for calculating the level of GEF INV/financial support.**

- It is very important to put in place protections for the efficient and appropriate use of GEF donor funding to the pilots. As such, project documents should state a clear methodological basis - to be applied during implementation - for which the level of GEF INV/financial support for its selected pilots will be determined. Examples of the methodology on additionality can be: to ensure LCOE parity with a reference tariff (specify which); based on willingness/ability to pay (which may be determined by a study during implementation). Such methodological assessments will be part of an overall package of financial due diligence/assessments that will be performed during the tender process to select pilot sites/developers.

(vi) **Digital data: obligation to report; inclusion of digital equipment.**

- Please convey that, in return for benefiting from GEF INV support as a pilot, the asset owner of the minigrid pilot will be obliged to share digital data from the minigrid's performance with the AMP national project (refer Box 5 in Section IV, Output 2.1)

- Relatedly, the project should specify the necessary digital hardware and software for minigrid pilots in order to be able to honor this requirement. This can typically be included as part the evaluation criteria and/or required specifications in the digital platform tender for the pilots. Depending on the circumstances, it is possible the project may specifically subsidize this. Table 27 provides a generic set of specifications for a minigrid digital hardware and software, with indicative pricing (if applicable).

Table 27: Minimum requirements and costs references for hardware/software for data-sharing

Offering	Details	Indicative Price
1.1 Hardware requirements per site	• Inverter monitoring (monitoring & control) • Distribution monitoring • Optional current transformers for energy meter if more than 10 kW (single phase) or 30 kW (three-phase) • 24V power supply (50€) • Various data cables and installation material • Optional: 24V backup battery (50€) • Optional: Cabinet for the complete monitoring system • Industrial internet router • Industrial or high quality Ethernet Switches	US$ 2,000 per site
1.2 Hardware requirements per connection	• Smart meter	US$ 300 per connection

Annex 19: COVID-19 related considerations and opportunities

By increasing the commercial viability of RE minigrids and thus encouraging access to long term, affordable and clean energy, AMP projects are well aligned with government efforts to respond to the pandemic and national priorities for long-term green and equitable recovery. The COVID-19 crisis has highlighted the importance of reliable and affordable access to electricity for enabling essential health service delivery, and underpinning the ability of communities to abide by social-distancing measures and overcome the disruption to economic activity. Also, over the medium to long term, access to reliable, affordable, clean energy will be crucial to support economic recovery. Not only are investments in off-grid renewable energy important levers to create jobs and generate financial savings but increasing energy access for the most vulnerable population creates opportunities for local economic development that enhance resilience to shocks and crises. Over the long term, access to reliable, clean energy reduces pressure on ecosystems and may contribute to reducing the likelihood and spread of zoonotic diseases.

The multidimensional COVID-19 crisis creates opportunities for the project to mitigate country- and project-level impacts, to contribute toward green recovery and building back better, and also to leverage global responses to COVID-19 to deliver global environmental benefits and/or climate adaptation and resilience benefits. The following opportunities as relevant for AMP have been identified for inclusion in each projects as relevant:

- **Leveraging economic recovery and stimulus plans**. Governments across the continent have been structuring and implementing stimulus and economic recovery plans, social programs and even policy reforms during the crisis. These offer a good opportunity to accelerate the energy transition and step-up climate ambition. Putting people back to work will be an important part of stimulus plans and clean energy is an important source for new job creation and has great potential to spur local economic activity. This creates opportunities for AMP as increased funding availability and public support for renewable energy projects could be leveraged to augment AMP's results. Also, increased support to energy consumers could address widening affordability gaps which pose risks for project implementation.
- **Promoting the inclusion of electric cooking into minigrid operators service offer**. With more attention paid to respiratory health issues as a result of the health crisis, an opportunity arises to address air pollution and make the case for accelerated decarbonization of the electricity matrix, clean transport, and clean cooking and heating technologies. AMP national child projects could provide a way to develop a broad array of energy services as part of a social protection program for the crisis response, particularly focused on provision of clean cooking e-technologies from minigrid operators, which are particularly important to reducing health-related vulnerabilities to COVID-19. Households switching to minigrid-powered electric cooking save money compared with traditional methods. Electric cooking also presents minigrid developers with a valuable opportunity to increase their load factor and boost their revenue.
- **Minigrid site selection with COVID-19 considerations.** AMP projects could also seek to help policymakers and regulators integrate elements from government strategies to respond and recover from the pandemic into energy sector planning. For instance, rural electrification strategies and plans could prioritize areas based on the presence of essential health facilities, key economic activities, particularly vulnerable populations, or other factors to concentrate efforts where COVID-19 impacts are highest. AMP national child projects can help enhance coordination between the energy and health sectors to ensure national electrification plans and minigrid sector planning consider the energy needs of the health sector.
- **Health facilities as beneficiaries of specific minigrid investment pilots.** AMP projects provide support to a number of specific minigrid investment pilots across AMP countries. Projects could use digital mapping tools to proactively identify minigrid sites that can benefit health facilities in addition to households, commercial, and productive users.
- **Improved business case for minigrids providing energy for health facilities.** With its focus on minigrid cost-reduction, AMP could potentially add value in reducing the cost and increasing the commercial viability of minigrids providing energy for healthcare facilities in several ways including supporting governments: (i) to improve data collection on energy access in the health sector and conducting comprehensive community energy needs assessments of health facilities that consider both electricity and thermal energy needs; and

(ii) to utilize specialized digital tools to assist minigrid operators in targeting health care providers and designing appropriate minigrid systems for rural health clinics.

- **Communities of Practice focused on COVID-19 impacts.** If there was enough interest among several countries AMP could specifically create a specific Community of Practice (CoP) to focus on impacts, risks and opportunities around minigrids and the global pandemic. This would allow AMP countries to document and exchange experiences and knowledge on how off-grid lighting and electrification can alleviate some of the disadvantages and challenges experienced by households, productive users, health facilities and communities without access to electricity in facing the different stages of the COVID-19 pandemic and bolster recovery efforts.

Annex 20: Budget per component and output

Component 1: Policy and Regulation

Atlas Activity (GEF Component)	Atlas Implementing Agent (Responsible Party, IP or UNDP)	Atlas Fund ID	Donor Name	Atlas Budgetary Account Code	ATLAS Budget Account Description	Amount Year 2021 (USD)	Amount Year 2022 (USD)	Amount Year 2023 (USD)	Amount Year 2024 (USD)	Amount Year 2025 (USD)	Total (USD)
Output 1.1 Geospatial, techno-economic modelling of least-cost off-grid renewable electricity technologies (minigrids, grid expansion, solar home systems).											
COMPONENT 1: Policy and Regulation	**UNCDF**	**62000**	**GEF**	71300	Local Consultants	-	7 500	-	-		7 500
				72100	Contractual Services-Companies	15 000	50 500	-	-		65 500
					sub-total GEF	**15 000**	**58 000**	**-**	**-**		**73 000**
		4000	**UNDP**	71300	Local Consultants	-	-	2 500	-		2 500
				72100	Contractual Services-Companies	-	142 000	52 500	-		194 500
					sub-total UNDP	**-**	**142 000**	**55 000**	**-**		**197 000**
					Total Output 1.1	**15 000**	**200 000**	**55 000**	**-**		**270 000**
Output 1.2 Minigrid DREI techno-economic analyses carried out to propose most cost-effective basket of policy and financial derisking instruments											
COMPONENT 1: Policy and Regulation	**IP**	**4000**	**UNDP**	71200	International Consultants	-	40 000	-	5 000		45 000
				71300	Local Consultants	-	10 000	-	3 500		13 500
				75700	Training, Workshops and Confer	-	5 000	5 000	-		10 000
				71600	Travel	-	7 500	-	2 500		10 000
					sub-total UNDP	**-**	**62 500**	**5 000**	**11 000**		**78 500**
					Total Output 1.2	**-**	**62 500**	**5 000**	**11 000**		**78 500**

Output 1.3 An inclusive national dialogue to identify minigrid delivery models is facilitated, clarifying priority interventions for an integrated approach to off-grid electrification

COMPONENT 1: Policy and Regulation	**IP**	**62000**	**GEF**	72100	Contractual Services-Companies	-	-	-	-	7 000	7 000
					sub-total GEF	**-**	**-**	**-**	**-**	**7 000**	**7 000**
		4000	**UNDP**	72100	Contractual Services-Companies	-	-	-	-	**20 000**	92 100
				75700	Training, Workshops and Confer	-	-	-	**5 000**	-	80 700
					sub-total UNDP	**-**	**-**	**-**	**5 000**	**20 000**	**172 800**
					Total Output 1.3	**-**	**-**	**-**	**5 000**	**27 000**	**179 800**

Component 2: Business Model Innovation with Private Sector Engagement

Atlas Activity (GEF Component)	Atlas Implementing Agent (Responsible Party, IP or UNDP)	Atlas Fund ID	Donor Name	Atlas Budgetary Account Code	ATLAS Budget Account Description	Amount Year 2021 (USD)	Amount Year 2022 (USD)	Amount Year 2023 (USD)	Amount Year 2024 (USD)	Amount Year 2025 (USD)	Total (USD)

Output 2.1 Extension of two minigrid pilots with productive use overlays to identify a business model suitable to small minigrid operations.

COMPONENT 2: Project and Business Model Innovation with Private Sector Engagement	**UoS**	**62000**	**GEF**	72100	Contractual Services-Companies	-	23 412	35 118	16 832	16 828	92 190
				72200	Equipment and Furniture	-	34 110	8 700			42 810
					sub-total GEF	**-**	**57 522**	**43 818**	**16 832**	**16 828**	**135 000**
		4000	**UNDP**	71200	International Consultants	-	10 000	40 000	30 000	30 000	110 000
				72100	Contractual Services-Companies	-	5 000	4 000	15 433	13 437	37 870
				75700	Training, Workshops and Confer	-	2 000	5 000	1 500	1 500	10 000
					sub-total UNDP	**-**	**17 000**	**49 000**	**46 933**	**44 937**	**157 870**
					Total Output 2.1	**-**	**74 522**	**92 818**	**63 765**	**61 765**	**292 870**

Output 2.2 One Stop Information Centre

COMPONENT 2: Project and Business Model Innovation with Private Sector Engagement	**MoE**	**62000**	**GEF**	72100	Contractual Services-Companies	-	20 000	4 834			24 834
					sub-total GEF	**-**	**20 000**	**4 834**	**-**		**24 834**
		4000	**UNDP**	72100	Contractual Services-Companies	-	12 500	17 666	22 500	12 500	65 166
					sub-total UNDP		**12 500**	**17 666**	**22 500**	**12 500**	**65 166**
					Total Output 2.2	**-**	**32 500**	**22 500**	**22 500**	**12 500**	**90 000**

Component 3: Digital, Knowledge Management and Monitoring and Evaluation

Atlas Activity (GEF Component)	Atlas Implementing Agent (Responsible Party, IP or UNDP)	Atlas Fund ID	Donor Name	Atlas Budgetary Account Code	ATLAS Budget Account Description	Amount Year 2021 (USD)	Amount Year 2022 (USD)	Amount Year 2023 (USD)	Amount Year 2024 (USD)	Amount Year 2025 (USD)	Total (USD)
Output 3.1. A Quality Assurance and Monitoring Framework for measuring, reporting and verification of the sustainable development impacts of all minigrids pilots supported, including GHG emission reductions, is adopted and operationalized based on standardized guidance from the regional project											
COMPONENT 3: Digital, Knowledge Management and Monitoring and Evaluation	**MoE**	**4000**	**UNDP**	71200	International Consultants	-	2 000	2 000	2 000	2 000	8 000
				71300	Local Consultants	-	8 375	5 750	5 750	5 750	25 625
				72100	Contractual Services-Companies	4 000	12 000	3 500	3 500	3 500	26 500
				75700	Training, Workshops and Confer		3 000				3 000
					sub-total UNDP	**4 000**	**25 375**	**11 250**	**11 250**	**11 250**	**63 125**
					Total Output 3.1	**4 000**	**25 375**	**11 250**	**11 250**	**11 250**	**63 125**
Output 3.2. A Project Digital Strategy is developed and implemented, including linkages to and following guidance from the regional project and Output 3.3. Minigrids digital platform implemented to manage data from pilots, and to support minigrids scale-up and cost-reduction											
COMPONENT 3: Digital, Knowledge	**MoE**	**62000**	**GEF**	71200	International Consultants	-	5 000	-	-		5 000

Management and Monitoring and Evaluation				72100	Contractual Services-Companies	-	33 291				33 291
					sub-total GEF	**-**	**38 291**	**-**	**-**	**-**	**38 291**
					Total Output 3.2 and 3.3	**-**	**38 291**	**-**	**-**	**-**	**38 291**

Output 3.4. Active interface with regional project established, including, but not limited to, via (i) participating in Communities of Practice and (ii) capturing and sharing lessons learnt at national and regional level.

COMPONENT 3: Digital, Knowledge Management and Monitoring and Evaluation	**MoE**	**62000**	**GEF**	71200	International Consultants	-	-	-	5 000	-	5 000
				71300	Local Consultants	-	3 000	3 000	3 000	3 000	12 000
				72100	Contractual Services-Companies	-	15 000	11 000	11 000	11 000	48 000
					sub-total GEF	**-**	**18 000**	**14 000**	**19 000**	**14 000**	**65 000**
		4000	**UNDP**	74200	Audio Visual&Print Prod Costs	-	1 000	1 000	1 000	1 000	4 000
				71600	Travel	-	12 000	12 000	12 000	12 000	48 000
				75700	Training, Workshops and Confer	-	6 000	6 000	6 000	6 000	24 000
					sub-total UNDP	**-**	**19 000**	**19 000**	**19 000**	**19 000**	**76 000**
					Total Output 3.4	**-**	**37 000**	**33 000**	**38 000**	**33 000**	**141 000**

Output 3.5. Industry association strengthened to advocate for and actively engage Government on behalf of private sector minigrid developers and operators.

COMPONENT 3: Digital, Knowledge Management and Monitoring and Evaluation	**MoE**	**62000**	**GEF**	72100	Contractual Services-Companies	-	17 000	2 000	8 000	2 000	29 000
					sub-total GEF	**-**	**17 000**	**2 000**	**8 000**	**2 000**	**29 000**
		4000	**UNDP**	71200	International Consultants	-	5 000	5 000	5 000	5 000	20 000
				71300	Local Consultants	-	6 000	6 000	6 000	6 000	24 000
				72800	Information Technology Equipmt	-	2 339	-	-	-	2 339
				71600	Travel		1 500	1 500	1 500	1 500	6 000

				75700	Training, Workshops and Confer		3 000	3 000	3 000	3 000	12 000
					sub-total UNDP	**-**	**17 839**	**15 500**	**15 500**	**15 500**	**64 339**
					Total Output 3.5	**-**	**34 839**	**17 500**	**23 500**	**17 500**	**93 339**

Output 3.6. M&E and Reporting, including (i) Conducting inception workshop and preparing report, (ii) Ongoing M&E, (iii) Mid Term Evaluation and (iv) Terminal Evaluation.

COMPONENT 3: Digital, Knowledge Management and Monitoring and Evaluation	**MoE**	**4000**	**UNDP**	71200	International Consultants	-	3 000	33 000	3 000	45 000	84 000
				71600	Travel	-	-	4 000	-	4 000	8 000
				75700	Training, Workshops and Confer	3 000	1 000	1 000	1 000	1 000	7 000
					sub-total UNDP	**3 000**	**4 000**	**38 000**	**4 000**	**50 000**	**99 000**
					Total Output 3.6	**3 000**	**4 000**	**38 000**	**4 000**	**50 000**	**99 000**

Annex 21: Overview of pilot project O&M and ESMP provisions

The minigrids deployed follow a detailed technical and business design developed from extensive learning from existing initiatives and techno-economic modelling utilising existing smart meter data. Business modelling has taken into account total operational costs including staff, preventative and corrective maintenance, as well as wider social enterprise business costs. These expenditures are balanced with income from electricity sales, and tariffs are set at a level to ensure sufficient income is maintained to ensure financial sustainability over the minigrids designed 20-year lifetime. Business models and financial planning are continually updated based on analysis of data collection through smart meters and business cash flow accounting, to include demand growth, income from sales and system performance.

A maintenance contract is in place with the local electrical engineering contractor responsible for installing the systems, which includes quarterly site visits for preventative maintenance of the generation and distribution grids. The maintenance contract for the minigrids also includes a call out fee to deal with any required corrective maintenance. Remote monitoring of the generation system highlights any potential technical issues real time and allows call outs to be arranged where necessary. Additionally, site agents employed at the minigrid sites provide updates on system performance or issues with the distribution grid or customer connections. Any issues are alerted to the UP staff who arrange repairs if necessary.

The batteries have a 10-year warrantee, as do the SMA inverters and smart meters. PV modules have an estimated lifetime of 25 years. The financial modelling is designed so that there are sufficient funds in reserve to cover these costs at the end of 20 years, as well as ongoing income to pay for operational costs outlined above.

The Environmental and Social Management Plan (ESMP) for the first pilot site includes scheduled replacement and responsible disposal of batteries. The same approach will apply for Kudembe (second pilot site) and reflected in the Kudembe ESMP once finalised.

Link to the ESMP: https://strathcloud.sharefile.eu/d-s789d5530f0a440099896dac052d7a75c

A battery return scheme by Tesvolt is operational in the country that accepts old batteries for recycling at end of life. The technical designs have estimated a 10-year battery life, after which it will be returned to Tesvolt under the return scheme offered to the project. Under the ESMP, agreements are in place to ensure that the supplier engaged for replacement of batteries partakes in the recycling scheme offered by Tesvolt.

Tesvolt have an established recycling operation to deal with their end-of-life lithium ion batteries. The business modelling includes transport fees to get the batteries back to Germany for recycling. Inverters, Solar modules and other electrical equipment will be disposed of using local recycling facilities. Where these are not operational, the project will work with REIAMA (RE industry association of Malawi), the Government of Malawi and other RE industry players to pursue suitable facilities or solutions for recycling.

Annex 22: Diesel generation and use of generators in Malawi

An IFC study, *The Dirty Footprint of the Broken Grid, September 2019*, assessed the prevalence of backup generators in developing countries. It includes off-grid diesel and petrol and small as well as larger size generators. It found that Malawi has a relatively small market (by number of units and energy generated) of diesel generators in use. Backup generator fuel consumption was less than 100 million liters per year and installed capacity fall between 100 and 1000MW.

A 2019 market assessment of solar minigrids in Malawi by the University of Strathclyde[214] included techno-economic modelling of hybrid systems comparing costs of solar and diesel minigrids. The study found that solar is generally cheaper than diesel only systems: "In every location within the inclusion zone the Cost of Energy for a solar microgrid was less than a diesel mini-grid in the same location, with improvement of solar microgrid COE over diesel microgrid COE ranging from 0.03 $/kWh to 1.19 $/kWh".

The study found that although some areas close to diesel pumps with high populations can achieve lower costs through using diesel solar hybrid systems, the key finding was that for the majority of Malawi, solar PV only systems are the most economic option.

Generally, throughout Africa, the cost of diesel generation is exacerbated by the cost of fuel transportation to remote rural areas and fuel supply is unreliable, particularly during rainy seasons. In comparison, RE minigrids with battery storage offer a more reliable and cost-effective option.

This was echoed by the monitoring and evaluation baseline done at the two pilot sites, preceding the development of the pilot projects to which the AMP will contribute the PUE overlay. Community members were specifically asked which energy sources they already used. None of the participants in the survey was currently using diesel generators. Additionally, the questions regarding income levels revealed a low ability and willingness to pay, suggesting diesel generators are too expensive for most community members.

The solar PV systems at the two pilot sites incorporate battery storage to help meet peak demands in early mornings and evenings. Currently, at the pilot sites that has started operation, less than 21% of capacity is being utilized. The PUE overlays are designed to utilize electricity during the day to even out the demand profiles, and help bring down the cost per kWh.

The historic trend and available RE capacity suggest there is no risk of the pilot beneficiaries reverting to diesel generation, the project being sabotaged by diesel generators or of current employment opportunities being impacted.

Capacity building within the target communities has already been carried out and United Purpose will continue to carry out training courses on utilising the minigrid for PUE. As well as covering how the minigrid works and how to utilise energy from the minigrid to foster local economic development, the training will also cover the environmental benefits of utilising solar power, and the negative impacts of using environmentally harmful energy generation technologies such as diesel power.

More generally, the project will work with the government of Malawi and industry representative such as REIAMA to promote solar minigrids also as a viable and profitable means of income generation and business opportunity. The focus of such engagement will be on promoting job creation and highlighting the job opportunities in the renewable energy sector available to those currently working with diesel generators.

[214] Eales, A. Alsop, A. Frame, D. Strachan, S. Galloway, S. Hapres, Journal of Sustainabilty Research. 2020. Assessing the Market for Solar Photovoltaic (PV) Microgrids in Malawi. University of Strathclyde. Published: 07 January 2020. Available at: J Sustain Res. 2020;2(1):e200008. https://doi.org/10.20900/jsr20200008

Annex 22: Diesel generation and use of generators in Malawi

An IFC study, *The Dirty Footprint of the Broken Grid, September 2019*, assessed the prevalence of backup generators in developing countries. It includes off-grid, diesel and petrol and small as well as larger size generators. It found that Malawi has a relatively small market (by number of units and energy generated) of diesel generators in use. Backup generator fuel consumption was less than 100 million liters per year and installed capacity fall between 100 and 1000MW.

A 2019 market assessment of solar minigrids in Malawi by the University of Strathclyde[214] included techno-economic modelling of hybrid systems comparing costs of solar and diesel minigrids. The study found that solar is generally cheaper than diesel only systems: "In every location within the inclusion zone the Cost of Energy for a solar microgrid was less than a diesel mini-grid in the same location, with improvement of solar microgrid COE over diesel microgrid COE ranging from 0.03 $/kWh to 1.19 $/kWh".

The study found that although some areas close to diesel pumps with high populations can achieve lower costs through using diesel solar hybrid systems, the key finding was that for the majority of Malawi, solar PV only systems are the most economic option.

Generally, throughout Africa, the cost of diesel generation is exacerbated by the cost of fuel transportation to remote rural areas and fuel supply is unreliable, particularly during rainy seasons. In comparison, RE minigrids with battery storage offer a more reliable and cost-effective option.

This was echoed by the monitoring and evaluation baseline done at the two pilot sites, preceding the development of the pilot projects to which the AMP will contribute the PUE overlay. Community members were specifically asked which energy sources they already used. None of the participants in the survey was currently using diesel generators. Additionally, the questions regarding income levels revealed a low ability and willingness to pay, suggesting diesel generators are too expensive for most community members.

The solar PV systems at the two pilot sites incorporate battery storage to help meet peak demands in early mornings and evenings. Currently, at the pilot sites that has started operation, less than 21% of capacity is being utilized. The PUE overlays are designed to utilize electricity during the day to even out the demand profiles, and help bring down the cost per kWh.

The historic trend and available RE capacity suggest there is no risk of the pilot beneficiaries reverting to diesel generation, the project being sabotaged by diesel generators or of current employment opportunities being impacted.

Capacity building within the target communities has already been carried out and United Purpose will continue to carry out training courses on utilising the minigrid for PUE. As well as covering how the minigrid works and how to utilise energy from the minigrid to foster local economic development, the training will also cover the environmental benefits of utilising solar power, and the negative impacts of using environmentally harmful energy generation technologies such as diesel power.

More generally, the project will work with the government of Malawi and industry representative such as REIAMA to promote solar minigrids also as a viable and profitable means of income generation and business opportunity. The focus of such engagement will be on promoting job creation and highlighting the job opportunities in the renewable energy sector available to those currently working with diesel generators.

---

[214] Eales, A. Alsop, A. Frame, D. Strachan, S. Galloway, S. Hapres, Journal of Sustainabilty Research. 2020. Assessing the Market for Solar Photovoltaic (PV) Microgrids in Malawi. University of Strathclyde. Published: 07 January 2020. Available at: J Sustain Res. 2020;2(1):e200008. https://doi.org/10.20900/jsr20200008