



National Policy Roadmap

Draft

LEAPFROGGING TO ENERGY EFFICIENT APPLIANCES AND EQUIPMENT (REFRIGERATORS AND TRANSFORMERS) IN MALAWI

Draft Version

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Renewable Energy and Energy Efficiency (SACREEE)**

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List of Abbreviations

AEC	allowable energy consumption
CO ₂	Carbon Dioxide
CTCN	Climate Technology Centre & Network
DSM	Demand Side Management
DT	distribution transformer
EAC	East African Community
EACREE	East African Centre of Excellence for Renewable Energy and Efficiency
EAD	Environmental Affairs Department
EE	Energy efficiency
EEl	Energy Efficiency Index
EE&C	Energy Efficiency and Conservation
EPCs	Energy Performance Contracts
ESCO	Energy Service Company
ESCOM	Electricity Supply Corporation of Malawi Limited
GCF	Green Climate Fund
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
MAREP	Malawi Rural Electrification Programme
MBS	Malawi Bureau of Standards
MEPS	Minimum Energy Performance Standards
MERA	Malawi Energy Regulator Authority
MoE	Ministry of Energy
MoFNR	Ministry of Forestry and Natural Resources
MRA	Malawi Revenue Authority
MV&E	Monitoring, Verification, and Enforcement
NDB	National Development Bank
NCST	National Commission for Science and Technology
NEP	National Environmental Policy
NETFA	National Electricity Test Facility, South Africa
NRM	National Roadmap
NSO	National Statistical Office
PRS	Product Registration System
PWG	Policy Working Group
SACREEE	SADC Centre for Renewable Energy and Energy Efficiency
SADC	Southern African Development Community



SADCSTAN	SADC Cooperation in Standards
S&L	Standard and Labelling
TC	Technical Committees
TCO	Total Cost of Ownership
U4E	United for Efficiency

1. Background

As part of Malawi's commitment to implement various energy efficiency strategies of the identified appliances and equipment, Ministry of Environment, Forestry, and Tourism (MEFT), through the National Designated Entity (NDE) submitted a request for technical assistance to Climate Technology Centre & Network (CTCN). This allowed Malawi to be part of the eight countries in Southern African Development Community (SADC) embarking on GCF Readiness projects on "Developing a national framework for leapfrogging to energy efficient appliances and equipment (refrigerators and distribution transformers (DT)) through regulatory and financing mechanisms." The project aims to enhance the country programs regarding refrigerators and distribution transformers and strengthen climate finance strategies. In addition, the project will be a key driver for good policy development and governance to inform the adequate measures. The key output of the project includes a National Policy Roadmap (NPR) and enabling environments for the implementation of standards and labels, appropriate financing mechanism to increase the uptake of energy efficient refrigerators and distribution transformers and contribute to capacity building to develop standards and labels for other appliances in future.

1.1 Country Background and International Commitments

As previously mentioned, Malawi is among the eight countries in SADC that have embraced a common approach for the implementation of the Green Climate Fund (GCF) Readiness projects on 'Developing a national framework for leapfrogging to energy efficient refrigerators and distribution transformers.'

Malawi has been experiencing adverse impacts of climate change including frequent occurrence of climate related hazards like severe floods, strong winds, drought episodes, protracted dry spells, and outbreaks of pests and diseases. Malawi, therefore, signed and ratified the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, "to reduce the onset of global warming by reducing greenhouse gas concentrations in the atmosphere to a level that would prevent dangerous anthropogenic interference with the climate system." Malawi is a signatory to the 2015 Paris Agreement, "to strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius".¹

"Malawi submitted its first Intended Nationally Determined Contributions (INDCs) in 2015 covering a period of 25 years to 2040.² Energy, among others, was identified as one of the main sectors contributing to GHG emissions in Malawi with sectoral emissions forecast to increase from 4% in 2015 to 17% in 2040. The policy-based mitigation (on energy utilization) was limited to energy saving cook stoves. The adaptation actions (also on energy utilization) were limited to promoting the use of energy efficient light bulbs. Consultative meetings with key stakeholders established efforts lead by the Malawi Bureau of Standards (MBS) developing specific standards for energy efficient refrigerators; efforts lead by the energy sector to finalize the distribution code and specify minimum energy efficient standard for mandatory compliance to harmonize best practice among the industry stakeholders; and

¹ Malawi Launches its Updated Strategy on Climate Change Learning. Environmental Affairs Department (EAD), February 9, 2021. <http://www.ead.gov.mw/post/malawi-launches-its-updated-strategy-climate-change-learning>.

² Intended Nationally Determined Contribution (INDC). Environmental Affairs Department. Environmental Affairs Department (EAD), December 2, 2020. <http://ead.gov.mw/storage/app/media/Resources/Miscellaneous/MALAWI%20INDC.pdf>.

intentions to have in place regulations on both safety and minimum energy aspects. Further, the Government was yet to advance implementation of the national energy policy actions on energy efficiency.

Malawi stands to be guided by the regional practice set by East African Community (EAC) and SADC. Reference is made to the Technical Note on quality and performance metrics of cooling Products for EAC and SADC, Part I: Refrigerating Appliances. The Note refers to the Montreal Protocol which evolved to address climate change mitigation as well, with the 2016 Kigali Amendment establishing a framework for reducing global hydrofluorocarbon (HFC) use,³ where Malawi is a signatory to both. The note supports the effort of EAC and SADC to establish and improve energy-efficiency standards for room air conditioners (ACs) and refrigerating appliances by providing an overview of global market and policy trends and technical recommendations in a harmonized way across the region.

Since 2020 Malawi has been part of an additional regional effort which is the harmonization of minimum energy performance standards (MEPS) and labels for residential refrigerating appliances and room air conditioners. The countries of the EAC and SADC are working together with the project partners SACREEE, EACREEE and UNEP-U4E to develop harmonized MEPS and labels for refrigerating appliances and ACs. The project is particularly noteworthy in this context as it focusses on the same appliance as the national project for Malawi, namely on energy efficient refrigerating appliances. The regional MEPS for refrigerating appliances have been drafted and are currently undergoing the voting process by Member States (MS), as required by the SADC Cooperation in Standardisation (SADCSTAN). Anteriorly, the project has also conducted a regional market assessment across both regions and developed technical notes that included technical recommendations on the MEPS development.⁴

An amended version of the DT model regulation developed by United for Efficiency (U4E) was recommended for the implementation in all SADC GCF countries after significant PWG and TC consultations. The U4E Model Regulation Guideline 2019, on energy performance requirements for distribution transformers, requires that distribution transformers be reassessed for conformity as follows:

- Comply with minimum energy performance in terms of maximum allowed load and no-load losses
- Should not contain Polychlorinated biphenyls (PCB) contamination or other hazardous materials as defined in the relevant international, regional, and national regulations
- Product and technical information to include free access to websites of manufacturers and to durably mark on or near the rating plate of the distribution transformers
- Certification and registration to test transformer's energy performance in accordance with IEC 60076-1 and its fire performance in accordance with IEC 60076-11, for instance, for dry-type transformers and related reference test standards

³ W.Y. Park et al. 2020. Technical Note on Quality and Performance Metrics of Cooling Products for EAC and SADC. s.l.: UN Environment Program, 2020.

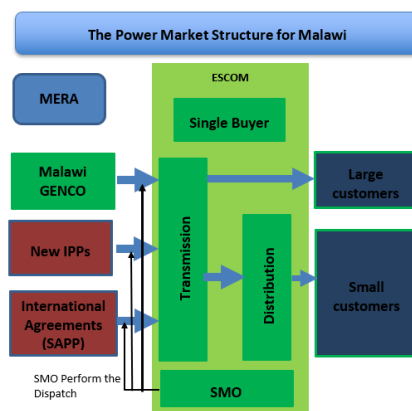
⁴ <https://united4efficiency.org/country-regional-activities/eac-sadc/>

1.2 Electricity Context in Malawi

Malawi is one of the countries with the lowest electricity per capita consumption averaging 84 kilowatt-hours (kWh) per capita as of 2020⁵. As of April 2021, Malawi’s installed generation capacity was at 519.95 Megawatts (MW), of which 75% was hydro-based generation. Diesel generators cover the remaining 25%. The total capacity comprised 441.95 MW of the Electricity Generation Company (EGENCO) of Malawi and 78MW of diesel of Aggreko, an Independent Power Producer (IPP).

Electricity in Malawi is transmitted at 400 kilovolts (kV), 132kV, and 66 kV and distributed at 33kV and 11 kV. Distribution transformers are used to step down the voltage level to 400 V for the 3-phase network and 230 V for the single-phase network.

In January 2017 Malawi’s electricity sector underwent reforms to create a conducive environment for private sector investment. This led to the institutionalization of a new power market structure shown in Figure 1.1.



Source: Malawi Energy Regulatory Authority (MERA), 2022⁶

Figure 1-1: Power Market Structure in Malawi

The reforms unbundled the power utility, the ESCOM, Limited company, creating a separate Electricity Generation Company (EGENCO). ESCOM remained with the mandates of system operation, electricity transmission and distribution. The unbundling separates the generation function with the aim of making it competitive with other IPPs. In 2018, the Government created another company called Power Market Limited (PML), whose primary role was to operate as a single buyer responsible for power purchases, system planning and power trade.

1.2.1 Electricity Demand

The Integrated Resource Plan (IRP) projected an increase in electricity demand from 1,800 GWh in 2015 to 10,600 GWh in 2030 of the base case scenario. However, the demand projections have not been commensurate with actual power generated or sold. During the period 2015-2019, ESCOM generation increased from 1,800 GWh to 2,000 GWh.⁷ Total sales during the same period rose from 1,500 GWh to 1,700 GWh in 2019. This was against an estimated demand of 3,500 GWh in 2019.

⁵ <https://mera.mw/other-tools/>

⁶ Available at: <https://mera.mw/other-tools/>

⁷ ESCOM Generation Statistics, 2015-2019

1.2.2 Access to Electricity

Malawi has one of the lowest accesses to electricity in Sub-Saharan Africa at 11.2%⁸ with access to the national grid and as of 2019, almost doubling since 2010. According to the Third Integrated Household Survey of 2010/2011, it estimated about 6.48% of households had access to electricity. This was against an installed generation capacity of 287 MW. Considering rural and urban dimensions, access to electricity in the urban areas stands at 47% compared to 5% in the rural areas. Error! Bookmark not defined.

1.3 National Policies on Energy, Energy Efficiency, and Conservation

Malawi developed the National Climate Change Management Policy (2016) in order to enhance coordination and implementation of climate change activities; to foster development and transfer of climate related technologies and capacity building. Further, Malawi Government formulated a Strategy on Climate Change Learning in 2013 to address knowledge gaps that are key for formulating informed policies and climate change interventions.

The focus in the energy sector is noted on the fossil fuels, which contributed 11% of total national greenhouse gas emissions in 2017. Malawi's report on National Greenhouse Gas Inventory System (GHG-IS) indicates three major contributors of greenhouse gas emissions. Namely the fossil fuels of diesel, coal, and petrol. Wood fuels is reported to contributing to the energy sector emissions of 38% but is noted that it could be a sustainable and renewable source of energy if responsibly managed and sourced. The energy sector green investment opportunities identified, among others, introducing policies that promote technologies that lower emissions.⁹

The Malawi National Environmental Policy, 2004 (NEP 2004¹⁰) provides economic incentives for Sustainable environmental management to, among others, ensure that individuals and economic entities are given appropriate incentives for sustainable resource use, conservation, and environmental management. The policy strategies include:

- Ensure that the opportunity cost of using natural resources and the economic values of conserving natural resources is reflected in market prices or non-market mechanisms used to allocate or regulate their use and conservation
- Provide tax incentives for production or importation of environmentally friendly products and disincentives for production or importation of products that pollute or have adverse effects on the environment.

Government, through the Ministry of Forestry and Natural Resources, launched the "Malawi's Strategy on Climate Change Learning" to contribute to the National Climate Change Resilience Programme through the strengthening of human resources skills development and institutional arrangements for the advancement of green, low emission and climate resilient development.¹

The Malawi National Energy Policy (NEP) sets out different policy actions including the promotion of Demand Side Management (DSM). DSM require the institution of appliance testing, labelling and standards.¹¹ To this effect, the national power utility is undertaking a

⁸ <https://www.se4all-africa.org/seforall-in-africa/country-data/malawi/>

⁹ Greenhouse Gas Inventory. Environmental Affairs Department (EAD), 2017. <http://www.ead.gov.mw/green-house-gas-inventory>.

¹⁰ National Environmental Policy. Environmental Affairs Department (EAD), 2004.

¹¹ NEP 2018. National Energy Policy. Lilongwe: Ministry of Energy

program replacing the energy consuming incandescent bulbs and the compact fluorescent lamps (CFLs) with light emitting diodes (LEDs).

In line with the international requirements, Government of Malawi embarked on a participatory process to revise its INDCs, which was posted on its website and open to the public for review contributions. The contributions were due for submission by 15th December 2020.¹²

1.4 Key institutions & Recommended Roles

The key institutions that are expected to play a significant role in promotion of energy efficient refrigerators and distribution transformers in Malawi are summarised in Table 1-1Table 1-1.

Table 1-1: Key Institutions in Malawi

Main Organisation	Description /Role
National Commission for Science and Technology (NCST)	<p>NCST is established by the Science and Technology Act No.16 of 2003 with the principal function to advise the government and other stakeholders on all science and technology matters in order to achieve a science and technology led development.</p> <p>NSCT is the National Designated Entity (NDE) for the CTCN.</p>
Environmental Affairs Department (EAD)	<p>EAD is under the Ministry of Natural Resources and Climate Change, which launched the Malawi's Strategy on Climate Change Learning. EAD implements the regulatory framework to check all imports for compliance of Ozone Depletion Substances (ODS).</p> <p>EAD registers and issue permits for importation of cooling appliances and refrigerators. The EAD works with MRA at the borders.</p> <p>EAD is the National Designated Agency (NDA) to the Green Climate Fund (GCF).</p> <p>To execute its responsibilities more effectively and improve delivery of environmental services, EAD will be reformed as a semi-autonomous institution and renamed it as Malawi Environment Protection Authority (MEPA).</p>
Ministry of Energy (MoE)	<p>The Ministry of Energy is mandated to formulate, coordinate, promote and implement energy policies and planning (MEPS and labelling program).</p>
Malawi Energy Regulator Authority (MERA)	<p>The Malawi Energy Regulator Authority (MERA) is mandated to regulate the energy sector of Malawi. MERA is the potential regulator for energy efficient refrigerating appliances and distribution transformers</p>

¹² Malawi Undertakes to Revise Its Nationally Determined Contributions. Environmental Affairs Department. December 2, 2020. <http://www.ead.gov.mw/post/malawi-undertakes-revise-its-nationally-determined-contributions>.

Malawi Revenue Authority (MRA)	<p>MRA is accountable to, and operates, under the general supervision of the Ministry of Finance (MOF). Customs Division, under MRA monitors entry of electrical appliances and works with MBS to carry out compliance checks on imported products under MEPS and labelling program.</p>
Malawi Bureau of Standards (MBS)	<p>MBS has a mandate to develop specific standards to support regulations on both safety and minimum energy aspects in collaboration with stakeholders</p> <p>MBS also worked with MRA at the borders to carry out compliance checks on imported products.</p>
Electricity Supply Corporation of Malawi Limited (ESCOM)	<p>National electricity utility mandated with the systems operation, transmission, and distribution of electricity. Supporting implementation of MEPS and labelling programs and financing mechanisms (e.g., on-bill financing/repayment, bulk procurement with Total Cost of Ownership (TCO), etc.). ESCOM is the main importer of distribution transformers.</p>
National Statistical Office (NSO) of Malawi	<p>The National Statistical Office (NSO) of Malawi is the main government department responsible for the collection and dissemination of official statistics. Data information for refrigeration and distribution transformers can be obtained from NSO</p>
Public Procurement and Disposal of Assets Authority (PPDA)	<p>PPDA is mandated by the Public Procurement Act (PPA) 2017, to regulate, monitor and oversee public procurement and disposal of public assets in Malawi.</p>

2. About the National Policy Roadmap

2.1 Scope

The NPR aims to provide technical guidance to improve Malawi's programming process to leapfrog to energy efficient refrigerators and distribution transformer and further strengthen climate finance strategies. Specifically, the NPR aims to:

- Create an enabling policy and regulatory environment for the adoption of energy efficient refrigerators and distribution transformers in Malawi through the development of mandatory Minimum Energy Performance Standards (MEPS) for domestic refrigerators and distribution transformers and a labelling scheme for domestic refrigerators.
- Enable the development of appropriate financing mechanisms to accelerate deployment of energy efficient domestic refrigerators and distribution transformers.
- Contribute to capacity building to develop standards and labels for other appliances in the future.
- Transform the market to energy-efficient domestic refrigerators and distribution transformers.
- Reduce the strain on the electricity grid and improve the quality of supply.
- Increase disposable income for household and potentially reduce greenhouse gases (GHG) emissions.

The Malawi Energy Regulator Authority (MERA) will act as lead agency for the implementation of this roadmap.

2.1.1 Roadmap Development Process

In order to ensure participation of national stakeholders throughout the development of the NPR, the Policy Working Group and Technical committees for distribution transformers and refrigerating appliances were established and consulted extensively.

Policy Working Group

The objective and mandate of the Policy Working Group (PWG) was to ensure coherence and synergy between the national policy roadmap and the regulatory framework for higher efficiency residential refrigerating appliances and distribution transformers and the national policies on energy efficiency. The role of the Policy Working Group was to assist in the development of the national policy roadmap for refrigerating appliances and distribution transformers which included:

- Minimum Energy Performance Standards (MEPS) and Higher Energy Performance Standards (HEPS)
- Labelling options and decide on labelling scheme
- End-users' awareness campaign
- Public consultations
- Financing mechanisms
- Monitoring, verification, and Enforcement (MV&E) plan

The list of institutions and members represented in the Policy Working Group is found in Annex A.

Technical Committee

The objective and mandate of the technical committees was to support the development of the NPR (led by the PWG) by reviewing MEPS and testing standards to be adopted for distribution transformers and refrigerating appliances. The list of institutions and members represented in the technical committees are found in Annex B for refrigerating appliances and Annex C for distribution transformers.

2.2 Energy Efficiency Implementation Ecosystem

The NPR for leapfrogging to energy efficient refrigerators and distribution transformers comprises of five elements:

1. MEPS
2. Labels
3. Communication - Consumer and Stakeholder Education
4. Monitoring, verification, and Enforcement (MV&E)
5. Financing mechanisms

A holistic interaction between these elements ensures successful creating an enabling policy and regulatory environment and market transformation for refrigerators and distribution transformers including the ability for continuous improvement in the energy performance in Malawi.

3. Refrigerators

Malawi does not have local manufacturers for residential refrigeration appliances; imports drive the refrigerator supply in Malawi’s market. Imports of residential refrigerators to Malawi were increasing on average at 27%, with the annual import value average of 1.7 million US\$, as shown in Table 3-1. The growth was consistently driven by imports from South Africa (70%), followed by China (16%) in 2020.¹³

Table 3-1: Refrigerators Imports and Highest Exporting Countries.

Exporters	2016	2017	2018	2019	2020	Annual Average
Total Imports (US\$'000)	1,581	1,469	1,507	2,016	1,915	1,697
Annual Increase on Quantity (%)						27%
South Africa (US\$'000)	1,025	904	894	1,358	1,367	1,110
South Africa's Market Share (%)	72%	75%	69%	74%	77%	
Annual Increase on Quantity (%)						29%
China (US\$'000)	306	378	378	474	400	387
China's Market Share (%)	12%	14%	20%	18%	16%	
Annual Increase on Quantity (%)						72%

Source: National Statistics Office (NSO)

The supply chain of residential refrigerators in Malawi, either wholesale or retail to consumer, can be categorized in three ways: (1) imported new refrigerator to sell, (2) imported used residential refrigerators and repaired them to sell, and (3) import spare parts. The ownership rate for households’ refrigerators shows that 85.3% owned a single refrigeration appliance, 12.3% owned two refrigeration appliances, and only 2.4% owned three units. Based on the consumer survey, the consumer indicated purchasing new refrigerators (85%), while only 15% bought used refrigerators. On average, 75% of the residential refrigerator were of capacity ranging from 200 to 400 litres, and 95.4% of the refrigerators had annual energy consumption equal to or less than 400kWh, as shown in Table 3-2.

All imports are subject to Malawi Standard compliance requirements, environmental protection regulations, and customs import taxes. MBS carries out compliance checks at the borders on imported products. MBS uses a general standard, MS-IEC 60335-1:2005, on household and similar electrical appliances – safety part 1: General requirements (m) to certify compliance of refrigerators imported in Malawi, which is limited on issues to do with energy efficiency.

¹³ Data based on the National Statistics Office (NSO) from 2016 to 2020.

Table 3-2: Distribution by Energy Consumption and Type of Residential Refrigerators (%)

Energy Consumption	Distribution of Residential Refrigerator (%), by Types		
	Refrigerator	Refrigerator/Freezer	Freezer
<200 kWh	39.9	7.0	3.4
200-<300 kWh	33.3	22.1	58.6
300-<400 kWh	22.2	53.5	25.9
400-<500 kWh	5.6	7.0	6.9
>=500 kWh	0.0	10.5	5.2
Total	100	100	100

(Source: Household Survey, 2021)

Malawi’s market share for residential refrigerators-freezers is at 48% (43% non-inverter and 5% inverter), for freezers, it is 39% (all non-inverter), and for refrigerators only, it is 14% (10% non-inverter and 4% inverter). This indicates that the energy-efficient inverter technology is yet to penetrate the market. 63% of the residential refrigerators on the market are of “A” energy efficiency rating, followed by 11% of the rating “B” and only 6% of the “A+” rating. Between 2010 and 2015, refrigerators mostly used high GWP refrigerants, including R134a, R22, R404A, and R507. Almost all refrigerators sold between 2016 and 2020 used the natural climate-friendly refrigerant R600a except for larger units that used R410A.

The market size for residential refrigerators in Malawi is assumed to be driven by the need to replace the old ones at the end of life and supply new demand. The new demand is assumed to be proportionate to the economic growth at an average of 4.35%. The market projections use the economic model to project growth in refrigeration equipment. The market size is expected to grow from 34,230 units in 2021 to 76,871 in 2040, as shown in Figure 3-1. This corresponds to an increase in refrigerating appliance stock from 289,223 in 2021 to 649,515 in 2040.

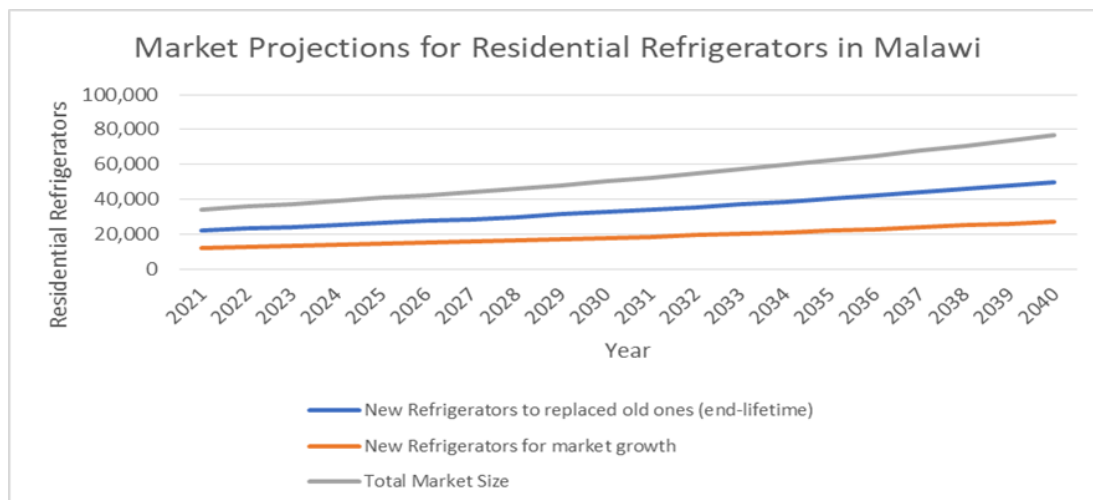


Figure 3-1: Projected number of residential refrigerator-freezers acquired and replaced in Malawi

3.1 Minimum Energy Performance Standards

3.1.1 Current Situation

Since South Africa is considered the major trade partner with 70% of residential refrigerators market share in Malawi, the imported units from South Africa are generally tested according to the South African test standard SANS 62552-2008. The SANS 62552-2008 standards contain both the test method and the labels for South Africa, based on the IEC 62552-2007. The remaining units are imported from China and Europe, which are typically tested according to IEC 62552-2015.

In South Africa, the VC9008 Regulation sets the MEPS rating at the Label Class B ($55 \leq \text{EEI} < 75$) and Class C ($75 \leq \text{EEI} < 90$) for refrigerators-freezer and freezers, respectively. Energy Efficiency Index (EEI) is the energy consumption ratio for an individual product as measured in accordance with the test method over the reference for the product size and category. The official test method for the performance of refrigerators is cited in SANS 62552/IEC 62552 – Household Refrigerating Appliances – Characteristic and Test Methods.¹⁴ The existing MEPS of South Africa is currently under revision; it plans to adopt IEC 62552:2015 which will advance to A+ in 2022 for refrigerators products, and the C label intends to advance to A in 2022 and A+ in 2026 for freezers. Most of the refrigeration appliances available to consumer in South Africa market were rated as Class “A” per the South African regulation. And 70% of imported product into Malawi market were “A” rated appliances; we can consider it to be the baseline energy efficiency level.

The MBS is currently working with the SADC Cooperation in Standards (SADCSTAN) secretariat in collaboration with UNEP-U4E, SACREEE, and EACREEE, SADCSTAN to develop regionally harmonized MEPS for cooling appliances, refrigerating appliances and air conditioners. The project aims to establish MEPS for cooling appliances, including refrigerators.¹⁵

3.1.2 Recommended MEPS

Currently, Malawi does not have a mandatory MEPS, and the technical committee recommended starting with a voluntary MEPS following the SADC harmonised MEPS. The SADC Cooling Project developed a harmonized MEPS for refrigeration appliances based on the IEC 62552-2015, 1,2,3 test standard with progressive maximum allowable energy consumption (AEC_{max}) with an ambient reference temperature of 24°C.

The second version of the ICS 97.040.30 dated 26 July 2022 “Minimum Energy Performance Standards for Foodstuffs Refrigerating Appliances” provides means to set the minimum energy performance standard based on “R” which is the ratio of the maximum annual energy consumption “ AEC_{Max} ” to the annual energy consumption “AEC” calculated based on the daily energy consumption “ E_{daily} ” in accordance with IEC 62552-3: 2015. The current implementation schedule for the proposed MEPS levels is as follows:

- By 2023: Phase 1 of implementation, $R = 1.0$
- By 2026: Phase 2 of 25% more stringent, $R = 1.25$

AEC_{Max} is calculated for the different equipment classes, as shown in Table 3-3.

¹⁴ Overview of the Market on Refrigerating Appliances and Room Air Conditioners in East and Southern Africa
https://united4efficiency.org/wp-content/uploads/2021/04/SADC_EAC_Market-Assessment_Cooling_20210205_Final.pdf

¹⁵ Submission on Malawi Standards dated 1st April 2021.

Table 3-3: Maximum Annual Energy Consumption for a Reference Ambient Temperature of 24°C.

Product Category	AEC _{Max} (kWh/year)
Refrigerators	0.163×AV+102
Refrigerator-Freezers	0.222×AV+161
Freezers	0.206×AV+190

The draft MEPS suggests that R should be greater than or equal to 1.0 for the first phase of MEPS implementation and 1.25 for the second phase and beyond. The minimum R requirement for refrigerating appliances is shown in Table 3-4. In addition, the countries can make additional tiers to support the setting of high energy efficiency targets in accordance with IEC 62552-2015, based on the country’s national circumstances.

Table 3-4: Minimum R Requirements for Refrigerating Appliances

Product Category	R Requirement (Phase 1: by 2023)	R Requirement (Phase 1: by 2026)
Refrigerators	1.0	1.25
Refrigerator-Freezer	1.0	1.25
Freezers	1.0	1.25

Source: Proposed Regional Minimum Energy Performance Standards for Refrigerating Appliances, 26 July 2022

Note: $R = AEC_{max}/AEC$.

Furthermore, the draft MEPS should include provisions limiting the GWP of the refrigerant used in the vapor compression cycle, and the foam blowing to 20, and the Ozone Depleting Substances (ODS) to 0. The draft MEPS also reference to the IEC 60335-2-24 to ensure safety when a flammable refrigerant is used.

Testing Standard

Adopting a test standard is considered as a cornerstone of the regulatory environment. The test standard method indicates how appliances’ energy efficiency is evaluated. It is imperative that Test standards and MEPS must not disrupt the market and create more market-entry barriers; hence, coordination and harmonization with major trade partner(s) standards are of prime importance. Regional harmonization with the major trade partner, South Africa, may result most cost-effectively since Malawian consumers are already familiar with the South African Label.

Energy efficiency standards and labels (S&L) are based on energy consumption values obtained from test standards. At the same time, the standard for measuring refrigerator energy consumption is broadly similar across countries. Many countries adopt or refer to IEC 62252 standards; for example, Brazil, China, the European Union (EU) 2009 regulation, South Korea, and South Africa had/have their standards based on IEC 62552:2007, which use an ambient temperature of 25°C.

IEC 62552:2015 for household refrigerators was recently developed to harmonize international residential refrigeration testing and efficiency metrics. This standard enables

manufacturers to derive fair and comparable figures for annual energy consumption (kWh/year) and make suitable calculations for local climate conditions and policy needs based on two tests (one at 16°C and one at 32°C ambient).

IEC 62552: 2015 is favoured because it includes flexibility for adaptation of results to suit local climate and internal storage temperatures but ensures comparability of results between economies. Economies that are recommended to consider basing their policies on IEC 62552: 2015. China, Chinese Taipei, the EU, Indonesia, Japan, Kenya, Malaysia, and Thailand have already moved to, or are planning to, adopt the IEC 62552-2015 that measures energy consumption at both 16°C and 32°C, enabling improved information on the likely field performance of refrigerating appliances.¹⁶

The IEC 62552-3: 2015 is the recommended test standard by the SADC/EAC MEPS that is based on the global U4E tool. It is recommended to establish Malawi's MEPS with the test standard of IEC 62552-3: 2015.

3.1.3 Actions & Timeframe

According to UNEP-U4E¹⁷, the MEPS development process involves several steps as shown in Figure 3-2. The overall responsibility of the NPR implementation and MEPS regulation lies with MERA and MoE to establish a legal framework and guidance on policy and execution for household refrigerators. MoE will also have the function of coordinating and involving relevant Ministries and Agencies in this effort. Other key government agencies that will support the implementation of the National Policy Roadmap within the scope identified by their mandate and relevant policies include the Malawi Bureau of Standard (MBS) and the Malawi Revenue Authority (MRA). MBS has a mandate to develop specific standards to support regulations on minimum energy efficiency and safety in collaboration with MoE and MRA. MBS also worked with MRA at the border to conduct compliance checks on imported products.

It is necessary to obtain high-level political buy-in from relevant government agencies with appropriate authority and mandate in the country, to ensure sufficient political support in developing the NPR and establishing the mandatory MEPS. It will also rely on the extensive participation of all relevant national stakeholders that will be involved in the detailed formulation process. The Policy Working Group (PWG) members have identified that MBS would be the most cognizant government authority to be the custodian of the standard.

The MEPS development process should include consultation with the following stakeholders:

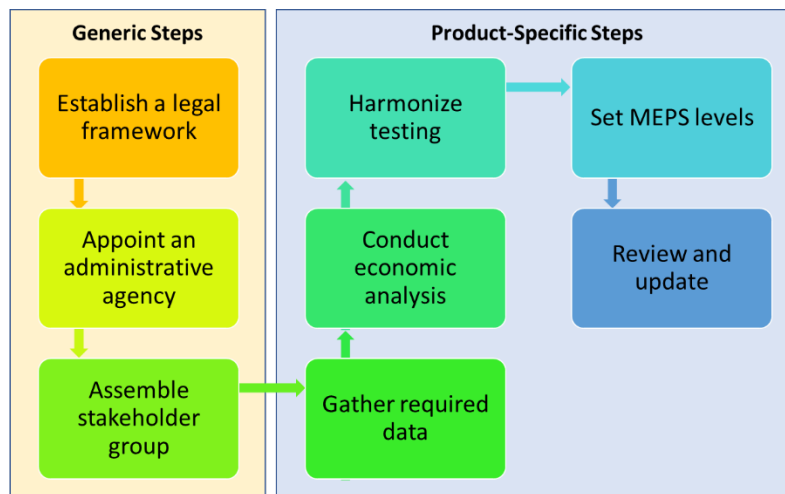
- PWG members
- Trade industry representatives
- Consumer representatives
- Malawi Chamber of Commerce and Industry

In collaboration with the Ministry of Energy, the focal agency (MERA) will play a leading role in developing and implementing the MEPS standards and labelling. MBS will facilitate the

¹⁶ Technical Note on Quality and Performance Metrics of Cooling Product for East African Community (EAC) and Southern African Development Community (SADC), United Nations Environment Programme-United for Efficiency, 2021

¹⁷ UNEP/U4E: Policy guidebook for climate-friendly and energy-efficient refrigerators. Available at: <https://united4efficiency.org/resources/>

identification and engagement of other necessary government agencies and key stakeholders and coordinate their effort and inputs.



Source: UNEP/U4E: Policy guidebook for climate-friendly and energy-efficient refrigerators¹⁸

Figure 3-2: MEPS Development Framework

Table 3-5 lists actions for development of mandatory MEPS. It also includes country-specific activities that will support the future decision for MoE and MBS to harmonize MEPS and testing methods with the SADC harmonised MEPS.¹⁹

Table 3-5: Action Plan for Development of Mandatory MEPS and Harmonization of Testing Methods

Action	Lead Agency & Other Stakeholders	Timeframe
1. Develop an implementation plan on national policy roadmap	MoE, MBS, and International/ national advisor	2023
2. Finalise the draft MEPS for voluntary implementation	MBS	2023
3. Establish/designate the Authority (preferably MERA) to regulate refrigerating appliances	MoE & MERA	2023
4. Develop and implement a capacity building and training program for MERA to effectively regulate the refrigerating products	MoE & International Partners	2024
5. Conduct public consultation on the voluntary MEPS to become mandatory	Regulator (MERA) designated to regulate the refrigerating appliances	2024

¹⁸ Available at: <https://united4efficiency.org/resources/>

¹⁹ Technical Note on Quality and Performance Metrics of Cooling Product for East African Community (EAC) and Southern African Development Community (SADC), United Nations Environment Programme-United for Efficiency, 2021

Action	Lead Agency & Other Stakeholders	Timeframe
6. Develop regulatory mechanisms to enforce mandatory MEPS and testing methods	MoE & MERA	2025
7. Promulgate the mandatory MEPS regulation	MERA/MoE, Cabinet, and Parliament	2025
8. Enforce the mandatory MEPS	MERA/MoE	2026
9. Review and adjust the MEPS level based on the analysis of statistical data collected and the regional harmonisation trend	MBS/MERA/MRA	Every 5 years

3.2 Energy Labelling

3.2.1 Current Situation

Malawi has neither mandatory MEPS regulation nor the local manufacturer of residential refrigeration appliances. As mentioned, around 70% of the refrigerators sold in Malawi are imported from South Africa, and the market is already familiar with the South Africa refrigeration appliance energy label. The South Africa label is shown in Figure 3-3.

The Cost-effective implementation of Mandatory MEPS and Labels may be achieved through regional harmonization (as with the SADC/EAC MEPS) or the adoption of international or major trade partner standards.

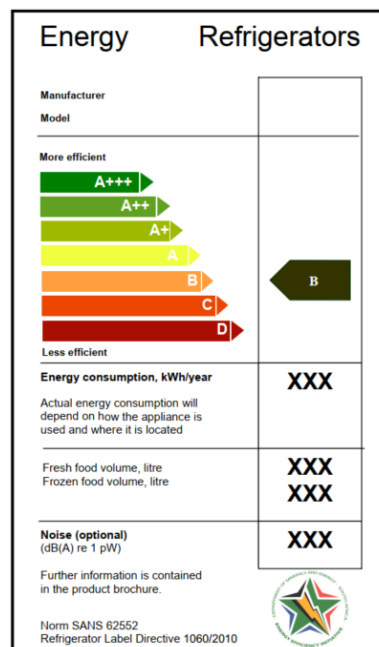


Figure 3-3: South African Residential Refrigerator Energy Efficiency Label

In the South Africa label, Energy Efficiency Index (I) is used to determine the energy label class for refrigerators and freezers, where “I” is the ratio of the annual energy consumption (AEC) to the max allowable annual energy consumption (AEC_{max}) multiplied by 100. Energy efficiency

level in the South African label is designed on 7 levels, with D being the least efficient and A+++ being the most efficient on the market. The annual energy consumption of each refrigerator model is tested according to SANS 62552:2008 test standard and presented in unit kWh/yr. Note that the current MEPS in South Africa is set a level “B” for refrigerators and refrigerator-freezers and level “C” for freezers. The correlation between energy efficiency index and energy efficiency level is shown in Table 3-6.

Table 3-6: Correlation between Energy Efficiency Index and Energy Efficiency Level

Energy Efficiency Index, <i>I</i>	Energy Efficiency Level
$I < 22$	A+++
$22 \leq I < 33$	A++
$33 \leq I < 42$	A+
$42 \leq I < 55$	A
$55 \leq I < 75$	B
$75 \leq I < 95$	C
$95 \leq I$	D

3.2.1 Recommended Energy Labelling

Energy efficiency rating and labelling have been key contributors to the market transformation of household appliances towards more energy-efficient models. Labelling is an effective tool to inform the consumer about the energy consumption of the electrical good. Labels provide a mechanism for customers to understand the relative performance of the appliance or equipment against other technologies on the market. The label's design is critical in its ability to convey the message clearly and simply to consumers to help them with their purchase decision. It is critical that consumers can understand the information provided on the label in a way that encourages them to purchase the most efficient refrigerator.

In general, designing comparative labels and energy labels requires a lengthy and costly step-by-step approach to ensure that the correct information is displayed, the messages are clearly understandable, and that consumers widely accept the label. The design of such labels should consider international alignment opportunities or further consider aligning with regional harmonization with the major trade partner.²⁰ Such alignment would bring significant benefits, including:

- Avoiding or reducing the cost of developing a new label.
- Reducing compliance cost for manufacturers and importers.
- Facilitating market verification and enforcement.

A phased step approach was recommended by the TC and PWG for establishing and implementing the labelling program as follows:

- **Phase 1**, accept South Africa as is with an optional Malawi/SADC specific label

²⁰ UNEP/U4E: Energy labelling guidance for lighting and appliances. Available at: <https://united4efficiency.org/resources/>

For the short-term, adopting the South Africa label with relevant modifications to ensure local and regional context is recommended. This would require proper discussion with the South African authorities to investigate legal issues related to the direct use of their label.

- **Phase 2**, adopt Malawi/SADC Specific Label

It is essential to ensure that Malawi's labelling requirement is harmonized regionally and between SADC countries (including Malawi) and South Africa for the medium to long term. The SADC/EAC MEPS document suggests the use of 4 levels for energy efficiency levels²¹ corresponding to the value of the energy consumption index, $R = AEC_{max}/AEC$, as follows:

- Low; corresponding to MEPS in 2023 ($1.0 \leq R < 1.25$).
- Intermediate 1; corresponding to MEPS in 2024 ($1.25 \leq R < 1.50$).
- Intermediate 2 ($1.50 \leq R < 1.75$).
- High ($1.75 \leq R$).

Table 3-7: Labelling Requirements for Refrigerating Appliances

Category	Low	Intermediate 1	Intermediate 2	High
Refrigerators	$1.00 \leq R < 1.25$	$1.25 \leq R < 1.50$	$1.50 \leq R < 1.75$	$1.75 \leq R$
Refrigerator-Freezers	$1.00 \leq R < 1.25$	$1.25 \leq R < 1.50$	$1.50 \leq R < 1.75$	$1.75 \leq R$
Freezers	$1.00 \leq R < 1.25$	$1.25 \leq R < 1.50$	$1.50 \leq R < 1.75$	$1.75 \leq R$

Source: Proposed Regional Minimum Energy Performance Standards for Refrigerating Appliances, 26 July 2022

While the lower energy efficiency index (I) refers to higher energy efficiency under the South African label, the higher energy consumption index (R) refers to higher energy efficiency under the SADC/EAC MEPS. The label should indicate the current MEPS level (if it is more stringent than South Africa), including relevant seal for Malawian authorities such as MME, NSI, ECB, and MEFT, as shown in Figure 3-4. In addition, it should include the country of origin and refrigerant data as stated in the SADC/EAC MEPS.

²¹ Additional levels of energy labelling requirement could also be incorporated in the future.

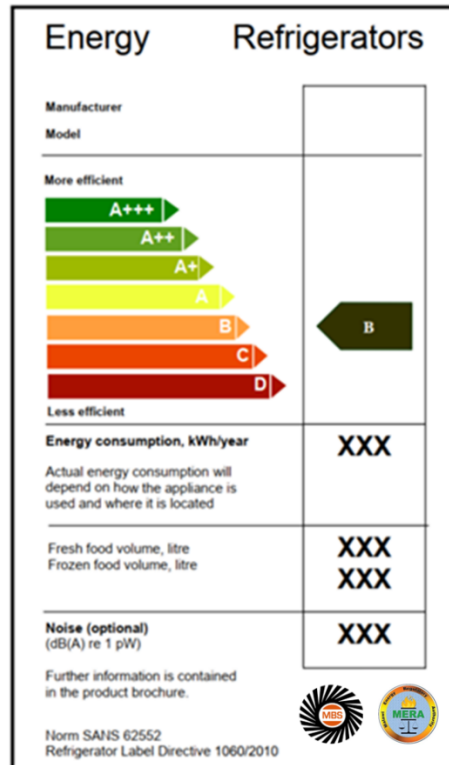


Figure 3-4: Malawi Specific Label carrying the Proper Seal of the Malawian Authorities.

The design of the label is required the following information on the energy label:

- Model name / serial number.
- Type of unit [refrigerator, refrigerator-freezer, or freezer].
- Country where the product was manufactured.
- Volume of the different compartments and an indication of whether they are frost-free.
- Rated performance grade (Low Efficiency, Intermediate, and High Efficiency).
- Yearly energy consumption in kWh at ambient temperature in °C or °F.
- Reference ambient temperature[s] used in performance rating.
- Refrigerant and foam-blowing designation in accordance with ISO 817 or ASHRAE 34, including ODP and GWP.

3.2.2 Actions & Measures

The focal agency (MERA) will play a leading role in developing and implementing the MEPS standards and labelling. MERA will facilitate the identification and engagement of other necessary government agencies and key stakeholders, and coordinate for their effort and inputs.

Table 3-8 lists a matrix of the course of action for establishing and implementing the labelling program. It also includes future actions and measures supporting the MEPS and Labelling program.

Table 3-8: Action Plan for Establishing and Implementing Energy Labelling Program

Action	Lead Agency & Other Stakeholders	Timeframe
1. Phase 1- Conduct consultation workshops to discuss with the South African authorities and adopt the South Africa label with relevant modification on the labels.	MoE/MBS/MERA	2023 to 2024
2. Conduct market assessment to determine the initial impact of voluntary implementation	MERA/MBS/MRA	2024 to 2025
3. Phase 2-Develop a uniform energy performance labelling for all residential refrigerators sold in Malawi. (In coordination with the mandatory MEPS regulation)	MERA/MoE/MBS	2025
4. Develop a labelling regulation on requiring all residential refrigerators imported to and sold in Malawi be compliant with the mandatory labelling requirement	MoE/MERA/MBS/MRA	2025

3.3 Communication Program

3.3.1 Current Situation

Consumer awareness about energy efficiency standards for refrigerators in Malawi is relatively low; almost 98% of consumers are unaware of the energy efficiency performance when purchasing the appliance, and only 2.4% are aware of MEPS and labels for refrigerators.

Considering that energy-efficient refrigerators could cost more than ordinary standard efficiency refrigerators, this poses a major challenge to scaling up the adoption of energy efficiency and climate-friendly residential refrigerators into the market. Based on the survey, consumers’ response to the importance of energy efficiency as a factor impacting the purchase of refrigerators was equally between strongly disagree and somewhat agree. On the other hand, the importance of low unit price is 50% strongly agreed, and 25% somewhat agreed. This indicates that most consumers focus mainly on the unit price rather than the energy efficiency performance of the appliance.

3.3.2 Recommended Communication Plan

Consumer and stakeholder awareness and education are important to the energy-efficient market transformation ecosystem. All stakeholders need to understand the value of MEPS and their roles in energy efficiency market transformation, which is an important pillar of the ecosystem. It is essential to ensure that the consumer and the technology provider throughout the supply chain are well educated about energy efficiency's value. The service provider can better advise and convince consumers to opt for higher efficiency products to ensure that consumers understand the labels and purchase the most efficient products. It is also vital to ensure that government officials understand the value of energy efficiency and how to create the appropriate supporting policies.

Proper consumer and stakeholder education may involve capacity-building activities, awareness campaigns, communication plans, etc. Awareness-raising communication campaigns must accompany any labelling program to ensure consumers understand the labels and purchase the most efficient products. Such campaigns must target not only end-users but also strategic intermediaries (salespersons, retailers, importers) with active support from the media.

This can be facilitated by:

- Government and institutions who support regulatory and legislative work and oversee policy implementation
- Retailers and distributors who facilitate education of end-users through advertising and training of salespersons
- Media that engage end-users in communication and awareness campaigns
- Power utilities: develop and maintain incentive schemes
- End-users who should receive clear information and messaging to help make informed decisions

Awareness and training activities should be directed to consumer and retail personnel on the benefits of efficient refrigerators, with information exchange workshops on promotion campaigns in small cities and rural towns. More skilled and knowledgeable retail staff or other professionals that give advice options can be complemented by more extensive point-of-sale information in terms of information posters or signage.

ANNEX K – Awareness Raising and Education Campaigns further outlines international best practices.

3.3.3 Actions & Timeframe

Table 3-9 lists key actions for implementing communication plan and consumer awareness and communication campaigns.

Table 3-9: Action plan for Establishing Communication Plan and Consumer Awareness Campaign

Action	Lead Agency & Other Stakeholders	Timeframe
1. Design awareness campaigns and capacity building programs on new MEPS and labelling regulations	MoE/MERA	2023
2. Conduct a training program for MERA, MoE and relevant government agencies staff on evaluation and revision of the MEPS and labelling requirements	International Advisor	2025
3. Conduct a training program for ESCOM on managing and maintaining on-bill financing scheme	MoE, MERA, International Advisor	2024
4. Conduct a training program for in-store salespersons on understanding energy label and educating customers on the label usage and value	MoE	2025
5. Implement awareness campaigns for retailers/wholesalers/ distributors on MEPS and labelling regulations to manage inventories	MoE, MERA	2025

<p>6. Conduct regular public awareness and educational campaigns for consumers, and develop communication tools (incl. website, brochures, media reports, TV, and radio broadcasts, etc.)</p>	<p>MoE, MERA, and Consumers Association of Malawi</p>	<p>Every year</p>
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3.4 Financing Mechanisms

3.4.1 Current Situation

Achieving energy efficiency improvements will require a significant increase in investments in energy efficiency. Considering that energy-efficient refrigerators could cost more than conventional products, the preference for purchasing residential refrigerators could be greatly impacted by customers’ financial capacity, who are likely to be inclined towards the less costly refrigerators. The high consumer preference for lower prices poses a significant challenge. This is also compounded by the consumers’ poor perspective on Malawi bank loan terms and conditions.

Based on the survey, consumers’ response to the importance of energy efficiency as a factor impacting the purchase of refrigerators was equally between strongly disagree and somewhat agree. On the other hand, the importance of low unit price is 50% strongly agreed, and 25% somewhat agreed. This indicates that most consumers focus mainly on the unit price rather than the energy efficiency performance of the appliance. Further, consumers have also indicated of high preference for access to financing; 41% were willing to pay more for a 10% reduction in energy consumption, while 34% were willing for a 20 to 40% reduction

It is imperative to implement financial mechanisms that facilitate end-users in the residential sector access to energy-efficient and climate-friendly residential refrigerators and provide incentives along the demand and supply chain to overcome financial and technical barriers.

3.4.2 Recommended Financing Mechanism

To scale up the adoption of energy-efficient and climate-friendly residential refrigerators, effective targeted finance strategies and financial mechanisms will be required to review, develop, and implement. The appropriate supporting policies on financial tools that overcome vital market barriers and facilitate financing flow will help address the untapped market potential.

On the demand side, simple-to-access financial mechanisms with competitive conditions will help to motivate households to acquire high-efficient appliances that can generate substantial energy savings. Credit is vital to facilitate that end-user disburse an amount equivalent to or lower than what implies to purchase a second-hand system. On the supply side, the financing mechanisms will aim to engage and motivate providers to sell energy-efficient and climate-friendly appliances by increasing their sales volume by providing credit facilities to their clients.

The effective targeted finance strategies and financial mechanism options intend to:

- Set up green credit facilities between partner local financial institutions (e.g., banking institutions, National Development Bank (NDB), microfinance institutions, etc.) and participating EE technology providers (e.g., local retailers, local distributors, international manufacturers) with support from international financial institutions

- such as Multilateral Development Banks (MDB) or green funds to ease access to concessional finance and help overcome the higher upfront cost barrier for end-users.
- Structure low-risk repayment mechanisms between key local stakeholders such as partner financial institutions, the power utilities (the Electrical Supply Cooperation Malawi (ESCOM), or the employer institutions, as well as participating EE technology providers.
 - Address market barriers, align with the specific country context, and leverage local opportunities to maximize both options' technical and commercial feasibility (e.g., targeting salaried employees or prepaid metering customers, building on experience with consumer finance products, etc.)

Financing Mechanism Option

Two financing schemes are recommended to implement financial mechanisms that facilitate end-users in the residential sector – Option 1: On-bill financing scheme, and Option 2: Green on-wage financing scheme.

Option 1: On-bill financing scheme- is an innovative approach to financing energy efficiency that has proven effective for smaller investments and increasing energy-efficient equipment uptake. The model enables energy utility customers to acquire energy-efficient equipment, such as domestic refrigerators, and to pay for the equipment over time through their monthly utility bills.

The mechanism allows these households to repay green loans or credits obtained from partner financial institutions and participating vendors through the utility's post-paid or pre-paid metering systems. Operationalizing the On-bill financing mechanism requires significant support from the partner power utility (ESCOM).

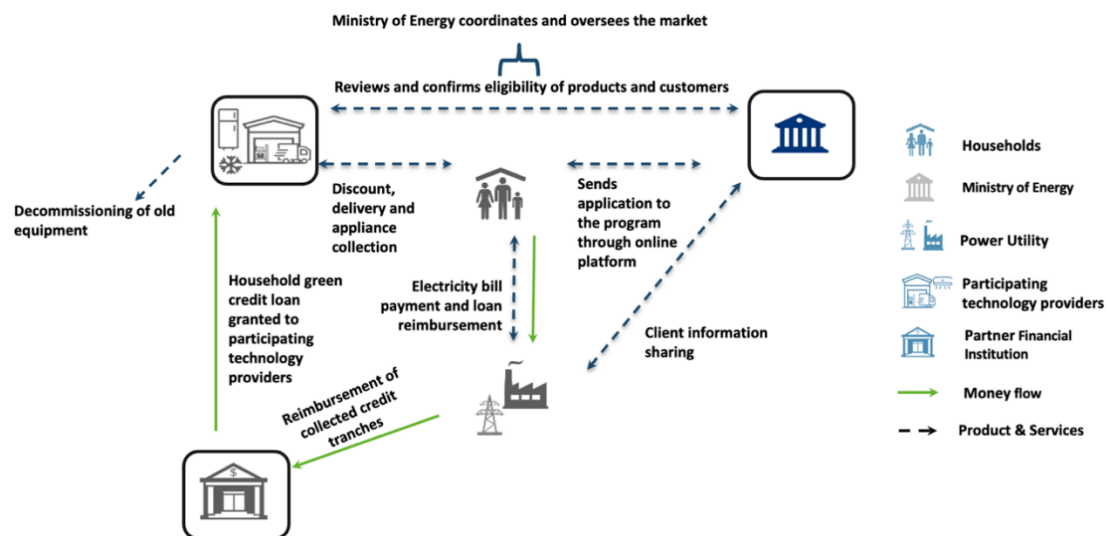


Figure 3-5: Recommended On-Bill Financing Scheme

On-bill financing can be supported by capitalizing new on-bill loan funds, through credit enhancement for existing on-bill funds, such as loan guarantees, and by positive lists. The success of the model depends mainly on the interest and engagement of the utility, which in many cases is, in part or whole, government owned. The government can support the model by capitalizing on new on-bill loan funds and providing credit enhancement for existing on-bill funds, such as loan guarantees. Governments and development agencies can play important roles by providing technical support in setting up the model or providing green credit lines.

Option 2: Green on-wage financing scheme-an innovative mechanism that offers flexible and straightforward repayment terms for energy efficiency products through salary deductions.

Green on-wage financing is a consumer finance product designed to meet the short- and medium-term financing needs of salaried employees of public and private institutions that are profiled or have a business relationship with local financial institutions.

Green on-wage financing can be supported by bulk rebates negotiations, or green credit lines from international financiers to local financial institutions, to help offer the best loan features to end-consumers (e.g., low interest financing for longer tenor periods) and a viable green lending strategy. Parties agree on a rebate loan payment on a minimum percentage set on the product selling price by the technology providers that sell to qualified customers or salaried employees. Local financial institutions use the rebate from technology providers to cover the financier’s cost of funding to offer short- and medium-term unsecured consumer loans with 0 % interest rate. Green on-wage financing can be complementary to on-bill financing, which would target both salaried and unsalaried customers from the energy utilities allowing loan repayments through electricity bills instead.

Green on-wage financing can be complementary with on-bill financing which would target both salaried and unsalaried customers from the energy utilities allowing loan repayments through electricity bills instead.

- Certified appliance models supplied by participating technology providers and registered on a positive list
- Partner financial institutions in repayment agreements with profiled employers
- Partner financial institutions in finance agreements with participating technology providers

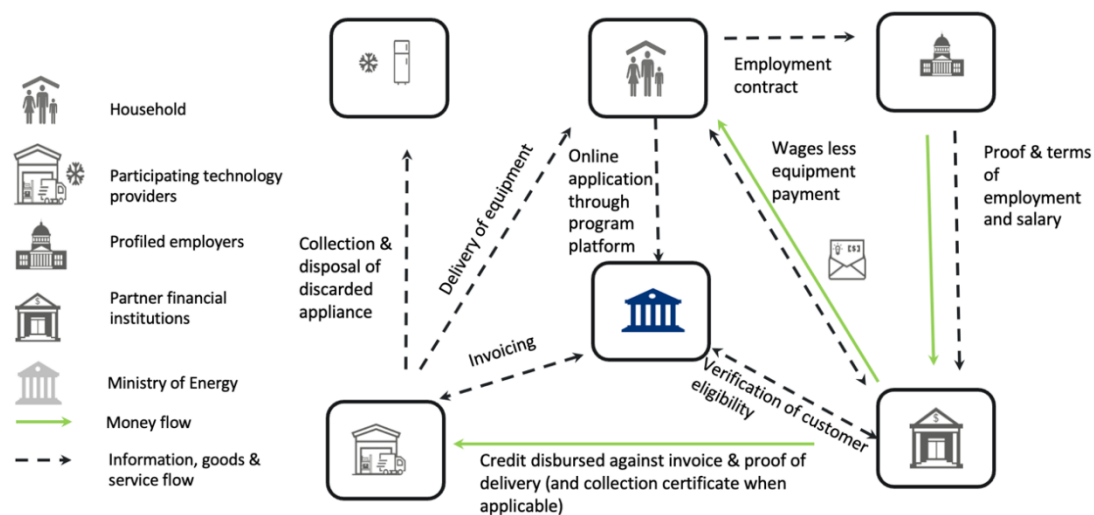


Figure 3-6: Recommended On-Wage Green Financing Scheme

Remark: Details of explanation on On-bill financing scheme and Green on-wage financing scheme can be found in ANNEX F – Financing Mechanisms for Refrigerators.

Involvement of key national stakeholders

To develop the financing strategies and financing scheme, MoE should consult and seek the potential partnership of interested financial institutions including local financial banking or international funds, the relevant public and private agencies, and the participating EE technology providers. The following public and private stakeholders are important and must be closely involved.

- Ministry of Energy (MoE) acting as the lead compliance entity/program manager
- Other relevant government institutions (e.g., Malawi Energy Regulatory Authority (MERA), Environmental Affairs Department (EAD), Malawi Environment Protection Authority (MEPA), Ministry of Finance (MOF), etc.)
- Partner financial institutions (e.g., banking institutions, microfinance institution, NDB, MDB, green funds, etc.)

- Power Utility (ESCOM)
- Partner technology providers of energy-efficient residential refrigerator (e.g., local retailers, local distributors, etc.)

3.4.3 Actions & Timeframe

Table 3-10 lists key actions for developing and implementing a supporting financial mechanism for energy-efficient residential refrigerators (See ANNEX F – Financing Mechanisms for Refrigerators details of the recommended implementation plan).

Table 3-10: Action Plan for Establishing and Implementing Financial Mechanisms for Refrigerators

Action	Lead Agency & Other Stakeholders	Timeframe
1. Finalize finance strategies and detailed implementation plan	MoE leads, with support from MERA, EAD, MEPA, MOF, etc.	2023
2. Engage potential donors and prepare technical assistance project proposals to turn the financial mechanism concepts (On-bill financing and/or Green on-wage financing) into programs	MoE	2023
3. Develop and implement the On-bill financing mechanism program and/or the Green on-wage financing mechanism program	MoE leads, with support from MERA, EAD, MEPA (take-back scheme), MOF, and technical assistance projects supported by international donors and experts.	2024
4. Design and implement marketing campaigns to promote the financing mechanisms	MoE and ESCOM/financial institutions and technology providers	2024 onward

3.5 Monitoring Verification and Enforcement

3.5.1 Current Situation

Although Malawi has not established a legislative and administrative framework to address non-compliance with MEPS and labelling requirements for electrical appliances, however, Malawi has a legal framework to certify compliance and inspect non-compliance with the electrical safety regulations. The current compliance and inspection activities are being carried out by the Malawi Bureau of Standards (MBS).

Rather than redesign a legal and administrative functions for MV&E implementation of the appliance MEPS and labelling programs, MoE and MBS will consider applying the existing regulatory framework for product safety legislation for electrical and electronic household

products such as refrigerators, whether can be adapted and expanded to include additional EE regulations and standard enforcement as well as structure an MV&E scheme.

3.5.2 Recommended MV&E Component

The goal of monitoring, verification, and enforcement (MV&E) is to establish a national system and administrative functions to stimulate MV&E actions in order to accelerate a market transformation to higher energy efficiency refrigerators. MV&E includes multiple components covering the establishment of a legal and administrative framework, enforcement procedures, a plan for monitoring and market surveillance and verification testing, a plan for communicating information and the results of compliance activities to stakeholders, and evaluation plan of program outcomes.

Table 3-11 provides a summary of MV&E components for the full implementation of MV&E actions for refrigerators in Malawi.

Table 3-11: Components of MV&E for Refrigerators

MV&E Component
<p>Establishment and operation of a national MV&E system</p> <p>The following aspects to be considered:</p> <ul style="list-style-type: none"> • Mandatory or voluntary participation • Legislative powers and program administration • Budget and financial considerations for compliance activities • Identification of key institutions for undertaking specific actions (certification, monitoring & market surveillance) under the legislation
<p>Establishment of a national registry system for refrigerators</p> <p>The following aspects to be considered:</p> <ul style="list-style-type: none"> • Procedure and process of registration to ensure that the applicant provides all the information to assess whether a product meets the requirements • Identification of information that the applicant must provide • Identification of stakeholder engagement in certifying and managing product registry system
<p>Establishment of communication program to promote compliance activities</p> <p>The following aspects to be considered:</p> <ul style="list-style-type: none"> • Main stakeholders involved in the supply chain • Key messages – compliance requirements, the risk of detection and sanctions
<p>Establishment of market surveillance program for refrigerators</p> <p>The following aspects to be considered:</p> <ul style="list-style-type: none"> • Approaches to checking markets for non-compliance (e.g., risk-based, and random sampling) • Procedures for applying penalties for non-compliance cases
<p>Establishment of verification testing program for refrigerators</p>

The following aspects to be considered:

- Criteria for selecting test laboratories for testing a product
- Clear guidance on procurement and transport of samples to the test laboratory for verification testing
- Setting up MRAs with other countries or for regional level product testing laboratories to save cost

Establishment of evaluation program for mandatory MEPS and labelling program for refrigerators

The following aspects to be considered:

- MEPS registration & certification process and compliance

A detailed description of MV&E can be found in *ANNEX J - Monitoring, Verification, and Enforcement (MV&E)*.

3.5.2 Actions & Timeframe

Key actions specific to establishment and implementation of the MV&E framework such as development of a national MV&E system and administrative functions, a product registration system, market surveillance and verification testing programs for refrigerators, communication and evaluation programs are listed in Table 3-12.

Table 3-12: Key Actions specific to MV&E framework for Refrigerators

Action	Lead Agency & Other Stakeholders	Timeframe
Establishment and operation of a national MV&E system for refrigerators		
Develop a regulatory & enforcement mechanism - to address managing of compliance activities and clearly specify roles and responsibilities of related enforcement authorities on all related MV&E activities including liability measures with penalty structure for cases where non-compliance has been established	MoE (lead), MBS, MERA, MRA/MoF	Draft by end of 2023 and full enforcement by 2024
Develop administrative procedures/ operational manual for enforcing regulations on MEPS and labelling program	MoE (lead), MERA, MBS, Customs	2023
Assess and conduct capacity building on national MV&E mechanism for responsible staff (customs and other related-MV&E officials)	MoE/MERA	2023
Establishment of a national registry system for refrigerators		
Develop a procedure and process of product registration system (PRS) for refrigerators	MoE/MERA	2024

Action	Lead Agency & Other Stakeholders	Timeframe
Review U4E's prototype PRS software and consider whether to use it (in whole or part) as the basis for developing a national PRS		
Train responsible officers in charge of management and maintenance of PRS	MoE/MERA	2023
Develop procedures for customs personnel to monitor compliance of imported refrigerators with the import regulations for refrigerator products, listed under mandatory MEPS and labelling requirements	MoE (lead), MERA/MRA/MoF, Customs	Draft by end of 2023 and full enforcement by 2024
Develop national regulations on mandatory registration of refrigerators	MoE	Draft by end of 2023 and full enforcement by 2024
Establishment of communication program to promote compliance activities for refrigerators		
Design communication plan for all the main stakeholders involved	MoE/MERA	2023
Develop information materials for custom officials and consumers	MoE/MERA	2023
Train importers on mandatory registration of regulated refrigerator products and their legal obligations	MoE/MERA	2023
Develop and publish annual reports to maintain market transparency and declare non-compliance cases	MoE, /MERA/MBS	2023
Establishment of market surveillance program for refrigerators		
Establish a methodology for identification of products selected and purchase for verification processes, allocate staff for verification (Market Surveillance) and implement	MoE, /MERA MBS	Draft by the end of 2023 and full operation on annual basis by 2024
Train responsible officers in charge of market surveillance	MoE/MERA, NSO	2023
Implement pilot market surveillance program and evaluate the results for full application deployment	MoE/MERA, NSO	2024 and full operation on annual basis by 2025
Establishment of verification testing program for refrigerators		
Develop procedures for verification testing and test laboratory selection (outsourcing lab testing and/or using shared test results from	MoE MERA and MBS	2024

Action	Lead Agency & Other Stakeholders	Timeframe
neighbouring countries or other entities) to verify EE of selected products		
Implement pilot verification testing program and evaluate the results for full application deployment	MoE MERA and MBS	2024 and full operation on annual basis by 2025
Establishment of evaluation program for mandatory MEPS and labelling program for refrigerators		
Plan and implement the evaluation program on MEPS registration & certification process, compliance and impact	MoE/MERA	2025 and on an annual basis for the following years

4. Distribution Transformers

The distribution transformer market in Malawi has only few players. Most of DTs in Malawi are imported with few local manufacturers supplying small size DTs as well as providing repairing services. The Electricity Supply Corporation of Malawi (ESCOM) Limited - the national power utility company licensed to transmit and distribute electricity in all the regions in Malawi - and the Malawi Rural Electrification Program (MAREP) - operating under the Ministry of Energy to increase access to electricity through grid extension and mini grids development – are the two major importers in Malawi.

A total of 3,393 DTs are currently installed in Malawi and 3,374 of which owned and operated by ESCOM. ESCOM's DTs range from 100 kVA to 1000 kVA with a total installed capacity of around 647 MVA. According to the MAREP plan for Phase 9 of rural electrification programme in 2021, 364 new transformers will be installed. Both Cold Rolled Grain Oriented (CRGO) and the amorphous transformers are considered as energy efficient types and are available on the Malawian market.

The market size for new DTs is estimated based on the need to replace the old ones at the end of their life span; to replace due to theft; and to meet the growth in demand for electricity. The power utility did not report any thefts of transformers. The Integrated Resource Plan (IRP) by the ministry of energy made three forecasts for demand growth. Namely: Base, High and Low Scenarios. The actual demand growth in 2020 of 339 MW was closer to the Low Scenario, although much lower than the forecast.

The Base scenario load forecast was updated to use the actual recorded maximum demand of 443, 335, and 339 MW in 2018, 2019, and 2020, respectively. Demand forecast growth rate was 17.5% through to 2020 and 10 % per annum from 2020 to 2030. The 2018 to 2021 forecasts were updated with actual recorded maximum demand figures. As such, the maximum demand will reach 1,873 MW by 2030 and 4,620 MW by 2040; and energy sent out was estimated at 9,659 GWh in 2030 and 18,842 GWh in 2036. The energy was extrapolated to 26,662 GWh in 2040. The 2018 to 2021 forecasts were replaced with actual recorded maximum demand figures.

System Losses (technical and non-technical) were relatively high at 21.8% of sent-out energy. The business-as-usual approach (BAU) was adopted in this case, despite various measures that were expected to reduce the losses gradually reaching the assumed levels of 18% by 2020 and 15% by 2030 in the base scenario. The scenario assumed that DTs will be replaced after a lifespan of 8 years. Energy demand under the Baseline and Low forecasts scenarios are shown in Figure 4-1.

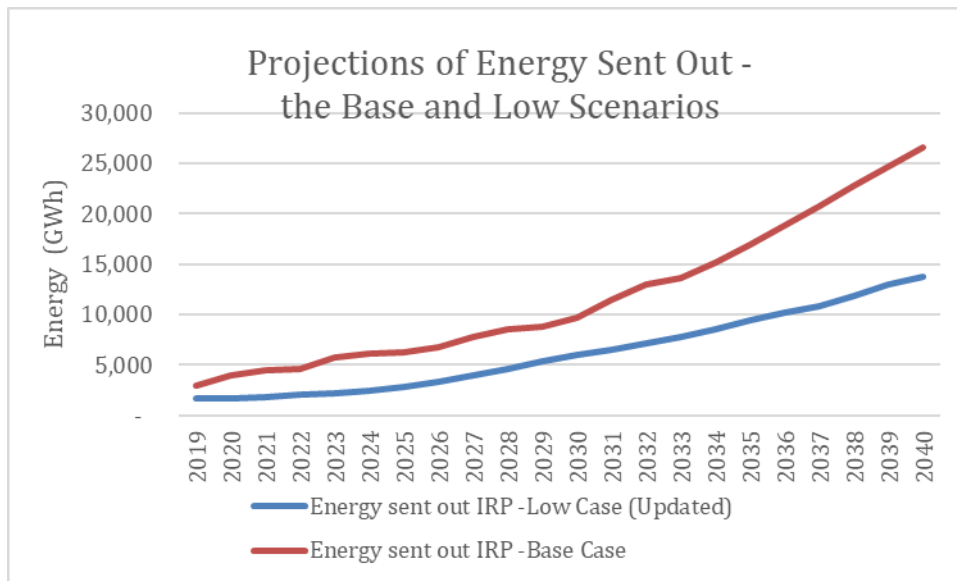


Figure 4-1: Energy Sent Out Projections - the Base and Low Scenarios

As such, the market size of DTs under the Base scenario is projected to increase from 80 MVA in 2021; to 500 MVA in 2030; and 2,000 MVA in 2040 estimated at a market value of USD 3 million in 2021 increasing to USD 17 million in 2030; and USD 64 million 2040. On the other hand, Low scenario suggest the market size for new DTs to increase from 7 MVA in 2021; to 100 MVA in 2030; and 300 MVA in 2040 estimated at a market value of USD 0.2 million in 2021 increasing to USD 3 million in 2030; and USD 9 million 2040.

4.1 Minimum Energy Performance Standards

4.1.1 Current Situation

ESCOM’s procurement specification for DTs reflects both aspects of safety and energy efficiency, among other major areas. The procurement specification references several IEC standards to maintain low to medium pollution levels and the labelling as per the IEC 60076-1 nameplate specifications. The procurement specification only allows for cold-rolled grain-oriented steel (CRGO) or amorphous core transformers but does not include the IEC TS 60076-20, the internationally adopted standard on energy efficiency for power transformers. ESCOM specifications does not refer to all relevant standards in the MBS’s catalogue and some standards were not found in MBS catalogue.

Regarding energy efficiency, the specifications require routine tests by the manufacturer to include No Load Losses (NLL) and Load Losses (LL) compliant with IEC 60076-1 standard on Power Transformers – Part 1: General. Bidders are asked to provide test certificates which indicate, among other parameters, the NLL and LL. The power utility has calculated the A and B factors for capitalization of losses as shown in Table 4-1

Table 4-1: A and B Factors for Different Transformer Types

Rating (kVA)	33kV Transformers		11kV Transformers	
	A Factor (\$/kW)	B Factor (\$/kW)	A Factor (\$/kW)	B Factor (\$/kW)
50	7,600	2,100	7,600	2,100
100	7,600	2,500	7,600	2,500
200	7,600	2,500	7,600	2,500
315	7,600	2,500	7,600	2,500
500	7,600	3,000	7,600	3,000
800	7,600	3,400	7,600	3,400
1000	7,600	3,400	7,600	3,400

4.1.2 Recommended MEPS

Many countries and regions have adopted all, parts, or modified versions of the “IEC 60076 series - Power transformers”²² to best fit their local or regional requirements. In South Africa, SANS 60076 Parts 1 and 20 and SANS 780:2021 are used. SANS 780:2021 includes provisions for both performance testing and MEPS. As discussed earlier, DTs are mainly procured in Malawi through ESCOM and MAREP. The current electric power transmission and distribution losses represent 21.8% of output in Malawi. This is more than twice the losses in South Africa. As such, improving the DT energy efficiency policy and regulation is of paramount importance for Malawi.

IEC 60076-20 provides methods for efficiency and efficiency index calculation with two levels of recommendations

- Level 1 is for basic energy performance
- Level 2 is for high energy performance

This standard may specify the energy performance by:

- Minimum PEI (Peak Efficiency Index)
- Maximum load losses and maximum no-load losses
- Minimum Efficiency Index at a load factor of 50%

The energy loss in DTs is highly dependent on the usage pattern as shown in Figure 4-2. however, not all energy performance indices may be able to capture this accurately. Using the 50% load method could not differentiate between the performance of 3 different designs as shown on the right of Figure 4-2. however, considering the Load and No-Load losses can capture the difference in performance under both the realistic and worst-case DT loading scenarios.

²² <https://webstore.iec.ch/publication/588>

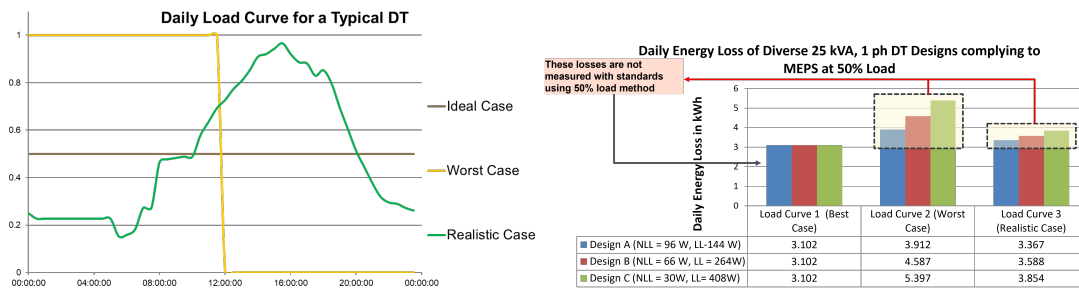


Figure 4-2: Energy loss in DTs based on usage pattern.

The performance based on Load/No-Load losses, one of the approved performance indices in IEC 60076-20, are the most appropriate and representative of typical use cases. It is also recommended by the U4E regional model regulation and is already adopted by SANS 780:2021. Considering this, it is recommended for ESCOM to adopt the maximum LL/NLL for the procurement specifications and as the criteria for factory-acceptance testing. Considering that South Africa is the major trade partner of Malawi, adopting the maximum LL/NLL approach results in least market disturbance as distribution transformers. Regional coordination through the U4E regional model regulation would also rely on it.

It should be noted that the maximum LL/NLL criteria specified in SANS 780:2021 and IEC TS 60076-20 are not identical, however they are close and adoption of SANS 780:2021 in the initial phase will enable a softer EE DT market introduction in Malawi and allow South African manufacturers to remain competitive. In view of this, the following phased-step approach are recommended for introduction of DT MEPS in Malawi.

- **Step 1** – The Government of Malawi should consider adoption of SANS 780:2021 as the initial MEPS for DTs in Malawi and ESCOM to reference the maximum LL/NLL specified in SANS 780:2021 in its procurement specifications. This step would essentially move Malawi closer to IEC 60076-20 Level 1 efficiency requirements. Malawi may wish to also coordinate with SADC Countries to create a regional framework to improve the purchasing power and demand for manufacturers, hence sustain the supply of energy efficient DTs in the region.
- **Step 2** – This step is considered as an interim step towards higher efficiency DTs. During Step 1, the market would have evolved through the integrated policy approach (MEPS, HEPS, MV&E, stakeholder education). The maximum LL/NLL in this step could be IEC 60076-20 Level 1 or simply an average of SANS 780 standard and the IEC 60076-20 Level 2. This interim step helps to save more energy and keeps the focus in the sector on investing in reducing losses.
- **Step 3** – This provides final alignment with international best practices -IEC 60076-20 Level 2. This ensures that the country eventually transit to the international high efficiency standard and companies are given adequate time to procure new equipment and train staff. Setting this level out in the future gives the planning horizon suppliers and customers need so they are prepared.

The technical committee meeting on 15th June 2022 has agreed to the following timelines for implementation of the abovementioned steps, as summarized below.

- **Step 1** – one (1) year after adoption of MEPS (MEPS equivalent to SANS 780:2021)
- **Step 2** – four (4) years after adoption of MEPS (MEPS equivalent to IEC 60076-20 Level 1 or average values of SANS 780 standard and the IEC 60076-20 Level 2)

- **Step 3** – seven (7) years after adoption of MEPS (MEPS equivalent to IEC 60076-20 Level 2)

4.1.3 Actions & Timeframe

Although the Policy Working Group (PWG) members have identified that MBS would be the most cognizant government authority to be the custodian of MEPS, the unique characteristics of the DT market in Malawi has suggested that ESCOM shall also play a leading role in developing MEPS for DTs as it will be the main agency in implementing the DT MEPS. As DT MEPS levels have already been specified in regional and international standards, Table 4-2 lists actions for adoption of appropriate DT MEPS. It also includes country-specific activities that will support the future decision for ESCOM, MBS and MoE to harmonize MEPS and testing methods with the SADC/EAC MEPS.

Table 4-2: Action plan for Adoption of DT MEPS in Malawi

Actions	Lead Agency & Other Stakeholders	Timeframe
1. Develop an implementation plan on the national policy roadmap	ESCOM, MBS, MoE, and International/ national advisor	2023
2. Finalise the draft MEPS for voluntary implementation	ESCOM, MBS, MoE, and relevant stakeholders	2023
3. Establish/designate the Authority (preferably MERA) to regulate DTs	TWG and International/ national advisor	2023
4. Conduct a capacity-building program for regulated staff and other identified stakeholders (local manufacturers)	ESCOM, MBS, MoE, local manufacturers, and International/national advisor	2024
5. Conduct public consultation on the voluntary MEPS to become mandatory	MERA ESCOM, MBS, MoE, and International/ national advisor	2024
6. Develop a regulatory mechanism to enforce and implement mandatory MEPS and the testing method	MERA (lead), MoE, ESCOM (development process)	2025
7. Promulgate the mandatory MEPS	MoE, Cabinet, and Parliament	2025
8. Enforce the Mandatory DTs MEPS	MERA/MoE	2026
9. Review and adjust the MEPS level based on the analysis of statistical data collected and the regional harmonisation trend	MoE/ MERA/ESCOM	2026 onwards

4.2 Energy Labelling

DTs are considered as large electrical equipment and manufactured based on orders from electric utilities and commercial and industrial clients. Endorsement and comparative energy

labelling schemes can be beneficial for some commercial or industrial products, however affixing energy labels on DTs is not a common practice around the world as the product nameplates per IEC 60076-1 standard already provide information on LL and NLL. According to the U4E policy guide series on Accelerating the Global Adoption of Energy-Efficient Transformers, there are only six economies worldwide²³ implementing energy labelling programs for DTs. As for Malawi, ESCOM specifies the labelling requirements for DTs as per the IEC 60076-1 nameplate specifications, hence LL and NLL information should be available for designers and end-users to evaluate and compare efficiency of DTs. Considering this, an energy labelling scheme for DTs in Malawi is not considered as a priority action under the proposed national policy roadmap.

4.3 Communication Program

4.3.1 Current Situation

ESCOM's procurements represent more than 95% of DT procurement in Malawi. Procurements is typically handled by the Ministry of Finance (MOF) based on public procurement guidelines and criteria. The current energy efficiency criteria are based on the capitalization of losses per A and B factors shown in Table 4-1.

4.3.2 Recommended Communication Plan

Once the MEPS recommendations are adopted, the public procurement guidelines for DTs must be updated. ESCOM needs to be informed about financial benefits of more stringent MEPS and updated formulas for computation of the Total Cost of Ownership (TCO) in the procurement guidelines. Although non-utility DT procurement is still small in Malawi, communication, and educational programs on procurement of energy efficient DTs by public and private sector organizations should be developed and implemented for the following three major target groups for non-utility DT procurement.

- **Target Group A** includes engineers, consultants, and system design engineers. Their role is primarily to determine the specification, develop terms of reference and support the decision maker
- **Target Group B** includes decision makers, like CEO and owners
- **Target Group C** includes salespersons, distributors, and representatives. Their role is primarily to represent the efficient product effectively to the Target Group A.

Recommended communication and educational programs for the abovementioned target groups are discussed below.

Communication and Educational Program for Target Group A

This target group is responsible for equipment operation (cost and performance), and they are typically concerned with safety and reliability. Considering this, the communication and educational program objective would be to:

- Understand the energy consumption, efficiency, reliability, and cost aspects of DT.
- Create awareness of the life-cycle cost analysis (LCA) or total owning cost (TCO).
- Develop capacity on available tools.

²³ China, India, Japan, Mexico, Republic of Korea, and USA

- Understand how to lower the lifecycle cost (LCC) through improved DT reliability and the role of preventive maintenance
- Learn how to use IEC TS 60076-20 as a guideline of reference when they compare the specification and standard provided by the manufacturer

The communication and educational strategy for the Target Group A is summarized in Table 4-3.

Table 4-3 listing the messages that need to be communicated and the available tools to implement these.

Table 4-3: Communication and Educational Strategy for Target Group A

Message:	Tools Available:
<ul style="list-style-type: none"> • What is the right transformer for you? (LCA vs. TCO) • What is energy loss? “Load/No-Load Losses” • How to keep your transformer running at a minimum Total Cost of Ownership (TCO) while ensuring reliability? 	<ul style="list-style-type: none"> • U4E TCO²⁴ • Utilities informational content • Transformer manufactures content/data • Articles in electrical engineering magazines • Articles on Engineering & Construction association magazine and its website, etc.

Communication and Educational Program for Target Group B

This target group is ultimately responsible for the strategic management and sustainability of the organization, and they are typically the final decisionmaker. They should be apprised with the economy, legislative landscape, stakeholder demands, and consumer and public relations. This group is mostly concerned with business productivity and cost reduction, reliability, and efficiency. As such the communication and educational program should focus on how to:

- Understand the DT selection could impact their organization’s overall operating cost.
- Prioritise decision based on TCO
- Appreciate the energy loss from selecting lower efficiency transformer

The communication and educational strategy for the Target Group B is summarized in Table 4-4 listing the messages that need to be communicated and the available tools to implement these.

Table 4-4: Communication and Educational Strategy for Target Group B

Message:	Tools Available:
<ul style="list-style-type: none"> • What is the right transformer for you? (LCA vs. TCO) • What is energy loss? “Load/No-Load Losses” • How to keep your transformer running at a minimum Total Cost of Ownership (TCO) while ensuring reliability? 	<ul style="list-style-type: none"> • Articles/content in magazines, Website, and social media • Newsgroup • Support from electrical engineers and consultants (target group A)

²⁴ <https://united4efficiency.org/resources/a-guide-to-using-total-cost-of-ownership-when-purchasing-distribution-transformers/>

Communication and Educational Program for Target Group C

This target group is responsible for explaining product features, presenting, and demonstrating new products, and determining which products meet the needs of different customers. They are mostly concerned with their price offer since buyers who lack knowledge and understanding about TCO will favour least price offer. As such, the communication and educational program should focus on how to:

- Educate customers about the impact of DT efficiency on their overall operating cost.
- Convince decision makers to prioritize their selection based on TCO

The communication and educational strategy for the Target Group C is summarized in Table 4-5 listing the messages that need to be communicated and the available tools to implement these.

Table 4-5: Education strategy for target group C.

Message:	Tools Available:
<ul style="list-style-type: none"> • What is the right transformer for you? (LCA vs. TCO) • What is energy loss? “Load/No-Load Losses” 	<ul style="list-style-type: none"> • U4E TCO²⁴ • Incorporate energy efficiency and its impact on lifetime operation in company brochures or PowerPoint presentations. • Develop a stand-alone digital media and post on the company website, Facebook, etc.

ANNEX K – Awareness Raising and Education Campaigns further outlines international best practices.

4.3.3 Actions & Timeframe

Table 4-6 lists actions for development and implementation of communication and educational programs on DT MEPS and TCO for utility and non-utility procurements.

Table 4-6: Action Plan for Developing and Implementing Communication and Educational Program

Actions	Lead Agency & Other Stakeholders	Timeframe
1. Develop and implement an educational program on DT MEPS and TCO for utility procurements to communicate on financial benefits of more stringent MEPS and updated formulas for computation of the Total Cost of Ownership (TCO) in the procurement guidelines	ESCOM, MERA, MBS, MoE, and International/national advisor	2023
2. Develop and implement an educational program on DT MEPS and TCO for non-utility procurements to communicate on financial benefits of procurement of energy efficient DTs updated formulas for	ESCOM, MERA, MBS, MoE, International/national advisor, and relevant stakeholders	2024

computation of the Total Cost of Ownership (TCO) in non-utility applications		
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4.4 Financing Mechanisms

4.4.1 Current Situation

Malawi has a dedicated levy and program for rural electrification, MAREP. The levy provides steady financial resources to support procurement of new distribution transformers to replace, at the end of lifetime, of old ones; and to expand capacity to service the growing demand for electricity. The program caters for procurement of distribution network equipment (distribution transformers, conductor, meters, and necessary accessories) and installations up to service connections to the customers meter board.

The Rural Electrification Act 2004 and Rural Electrification Regulations 2009 provide for the identification and selection of sites for rural electrification. The Act establishes the Rural Electrification Management Committee with objectives, among them, to achieve electrification levels stipulated in the energy policy. The Committee is mandated to raise and receive funds for the benefit of rural electrification in Malawi (Rural Electrification Act 2004). It approves, in phases, rural electrification programs and uses the Rural Electrification Levy established under the Energy Regulation Act 2004 to execute the programs.

4.4.2 Recommended Financing Mechanism

Three financing schemes are recommended to facilitate greater adoption of energy efficient DTs in the residential sector, including: 1) Option 1: ESCO Energy Performance Contracts (EPC) – Shared Savings Model; 2) Option 2: ESCO EPC – Guaranteed Savings Model; and 3) Option 3: Bulk Procurement with Total Cost of Ownership (TCO). The ESCO's Energy Performance Contracts (EPCs) enables funding of energy efficiency upgrades from cost reductions. Under an EPC arrangement for energy efficient DTs, an Energy Service Company (ESCO) implements an energy efficiency project and uses the stream of income from the cost savings to repay the project costs. The ESCO can be any of the large distribution transformers providers or manufacturers.

There are two major contracting models defining the relationships and risk allocations among the ESCO, end-users, and lender: (i) the shared savings model, and (ii) the guaranteed savings model.

Option 1: ESCO Energy Performance Contracts (EPC) – Shared Savings Model

In the shared savings model, the ESCO invests and implements the energy-efficiency DT project, and a contract is signed between the ESCO and the client to stipulate the terms, conditions, and obligations. The cost savings resulting from the energy efficiency upgrade are quantified, and for the duration of the contract a pre-determined share of this amount will be used to remunerate the ESCO. The ESCO only receives full payment if the project delivers predicated energy savings. This transfers project technical risks from the client (e.g., Power Utility, mining companies, agricultural companies, etc.) to the ESCO. The ESCO thus takes over both the performance and the customer credit risk and acquires financing. The financing can come from the ESCO's own equity or from a financial institution (e.g., local banking institutions, MDB, NDB, green funds, etc.). If a green loan is granted from a financial institution

to the ESCO, conditional financing is applied including strong monitoring and reporting requirements, and the reimbursement of collected credit is done through the energy savings.

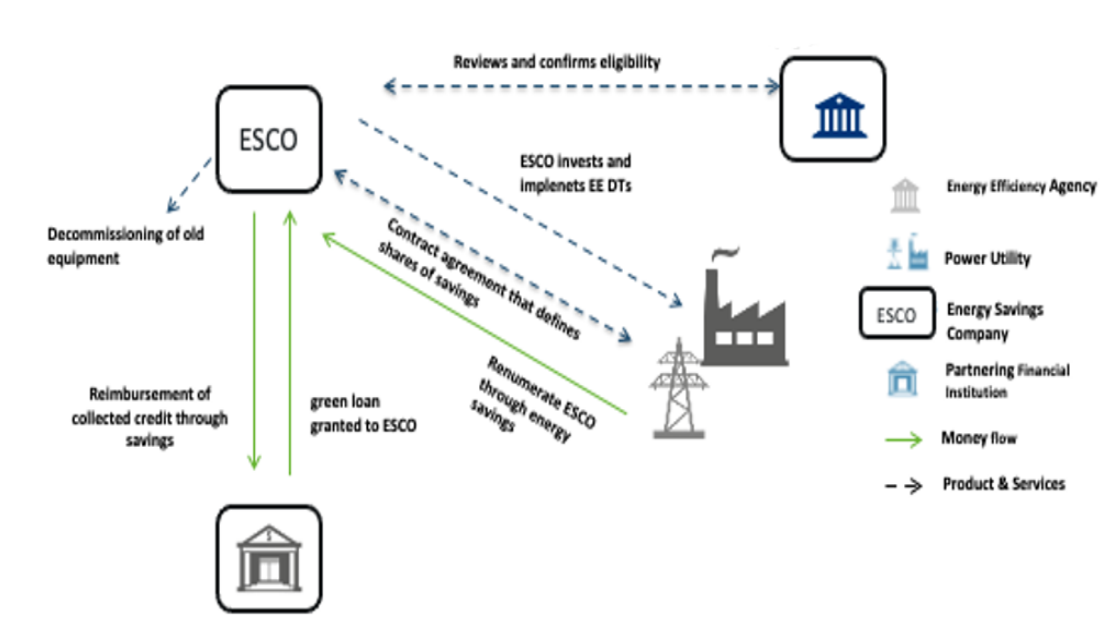


Figure 4-3: Recommended ESCO EPC - shared savings model scheme

Option 2: ESCO EPC – Guaranteed Savings Model

In the guaranteed savings model, the ESCO takes over the performance risk. The client invests and the ESCO implements (supply, installation) the EE DT investment projects. A contract is signed between the ESCO and the client to stipulate the terms, conditions, and obligations. The ESCO receives the full upfront payment (supply, installation) but guarantees a certain level of energy savings by covering, in case of underperformance, the monetary value of the difference between predicated and actual energy bill savings based on a specified utility rate. In case the energy savings are not achieved, the ESCO has to compensate the customer for the savings not achieved. This shields the customer (e.g., Power Utility, mining companies, etc.) from any performance risk. The client uses its own equity (i.e., investment project financing) or is directly financed or supported by a financial institution (e.g., MDB, NDB, green funds, banking institutions, etc.), repays the loan and assumes the investment repayment risk.

- ESCO takes over both performance risk
- Customer takes over credit risk

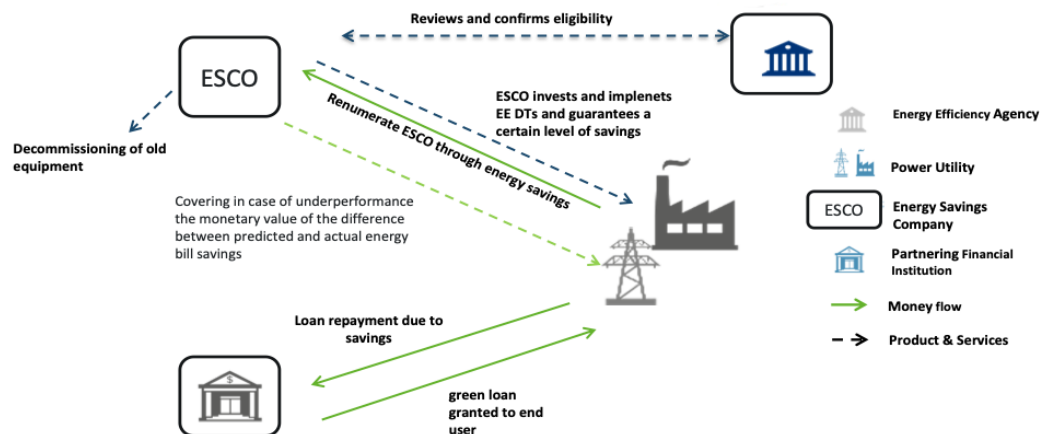


Figure 4-4: Recommended ESCO EPC - guaranteed savings model scheme

Option 3: Bulk Procurement with Total Cost of Ownership (TCO)

Bulk procurement is a no-subsidy, demand-driven mechanism that provides economies of scale, enabling manufacturers or distributors to bring down their process and costs through successive rounds of efficient and transparent bidding to create a large and sustainable market for EE DT technologies. The power utility issue tenders for itself and for all the non-utility end-users with a set of qualifying criteria including technical specifications and EE standards to buy large numbers of similar EE DT equipment, while manufacturers or distributors compete on price bids. The technical specification covers the design, manufacturing, testing, supply, delivery and performance requirements of the selected EE DT technology, and a criterion expressing maximum no-load and load losses. In each round, multiple bidders are selected and all of them are asked to match the Total Cost of Ownership (TCO) of the lowest bidder. The volume of the bid is then allocated to all the manufacturers who agree to match the lowest TCO in the bid.

Involvement of key national stakeholders

The following key national public and private stakeholders must be closely involved.

- MoE acting as the lead compliance entity/program manager
- Other relevant government institutions (e.g., Malawi Energy Regulatory Authority (MERA), Malawi Bureau of Standards (MBS), Environmental Affairs Department (EAD), Malawi Environment Protection Authority (MEPA), Ministry of Finance (MOF), Public Procurement and Disposal of Assets Authority (PPDA), etc.)
- Partner ESCOs and/or participating technology providers (e.g., manufacturers and distributors of EE distribution transformers)
- Power Utility (ESCOM) and large non-utility market end-users
- Partner financial institutions (e.g., MDB, NDB, green funds, banking institutions)

4.4.3 Actions & Timeframe

Table 4-7 lists key actions for developing and implementing a supporting financial mechanism for energy-efficient DTs (See ANNEX F – Financing Mechanisms for Refrigerators for details of the recommended implementation plan).

Table 4-7: Action Plan for Establishing and Implementing Financial Mechanisms for DTs

Action	Lead Agency & Other Stakeholders	Timeframe
1. Establish finance/procurement strategies and detailed implementation plan for each financing mechanism	MoE leads, and ESCOM, MERA, MBS, EAD, MOF, PPDA, and international/national advisor	2023
2. Engage potential donors and prepare technical assistance project proposals for the proposed financing mechanisms	MoE and International/national advisor	2023
3. Develop and implement the proposed financing mechanisms through technical	MoE leads, with support from ESCOM, MERA, MBS,	2024

assistance projects supported by international donors and experts	EAD, MOF, PPDA, and with technical assistance projects supported by international donors and experts.	
4. Seek and develop partnerships with financial Institutions and ESCOM including T&C and agreements signing for the proposed financing mechanisms	MoE and ESCOM/financial institutions	2024
5. Assess eligibility and negotiate with ESCOs and/or technology providers, including MOU signing	MoE and ESCOM/ESCOs/technology providers	2024
6. Implement marketing and promotion strategy and activities to promote the pilot demonstration program(s)	MoE and ESCOM/financial institutions and ESCOs/technology providers	2024 onwards

4.5 Monitoring Verification and Enforcement

4.5.1 Current Situation

Currently, there is no regulatory framework for conducting MV&E for DTs, and witness testing at the factory is only conducted for verification testing for large power transformers (greater than 1000 kVA) or for a large procurements of distribution transformers larger than 315 kVA. DTs with lower capacities are typically approved with test certificates. For these tests, engineers can witness the tests; the results are then made available for evaluation before delivery of the distribution transformers. Manufacturers may provide either type or special tests on one transformer of each size or provide certificates of previous tests done on identical transformers.

4.5.2 Recommended MV&E Component

Table 4-8 provides a summary of MV&E components for the full implementation of MV&E actions for DTs in Malawi.

Table 4-8: Components of MV&E for Distribution Transformers

MV&E Component
<p>Establishment and operation of a national MV&E system</p> <p>The following aspects to be considered:</p> <ul style="list-style-type: none"> • Mandatory or voluntary participation • Legislative powers and program administration • Budget and financial considerations for compliance activities • Identification of key institutions for undertaking specific actions (certification and monitoring) under the legislation
<p>Establishment of a national registry system for distribution transformers</p> <p>The following aspects to be considered:</p>

<ul style="list-style-type: none"> • Procedure and process of registration to ensure that the applicant provides all the information to assess whether a product meets the requirements • Identification of information that the applicant must provide • Identification of stakeholder engagement in certifying and managing product registry system
<p>Establishment of communication program to promote compliance activities</p> <p>The following aspects to be considered:</p> <ul style="list-style-type: none"> • Main stakeholders involved in the supply chain • Key messages – compliance requirements, the risk of detection and sanctions
<p>Establishment of evaluation program for mandatory MEPS and labelling program for distribution transformers</p> <p>The following aspects to be considered:</p> <ul style="list-style-type: none"> • MEPS registration & certification process and compliance

A detailed description of MV&E can be found in *ANNEX J - Monitoring, Verification, and Enforcement (MV&E)*.

4.5.2 Actions & Timeframe

The actions and timeframe for MV&E system for DTs are summarized in Table 4-9:

Table 4-9: Key Actions specific to MV&E framework for DTs

Action	Lead Agency & Other Stakeholders	Timeframe
Establishment and operation of a national MV&E system for distribution transformers		
Develop a regulatory & enforcement mechanism - to address managing compliance activities and clearly specify roles and responsibilities of related enforcement authorities on all related MV&E activities including liability measures with a penalty structure	MoE, MBS, MERA, ESCOM, MAREP, EAD	Draft by end of 2023 and full enforcement by 2024
Organize consultation workshops with other GCF countries and the SADC region (public utilities) to ensure alignment with national MV&E framework and harmonization of DT product registry	MoE, MBS, MERA, ESCOM	2023
Develop administrative procedures/ operational manual for enforcing regulations on MEPS program	MoE, MERA, ESCOM, MBS	2023
Establishment of a national registry system for distribution transformers		
Develop a product registration system (PRS) for distribution transformers	MoE, ESCOM, MERA	2024

Action	Lead Agency & Other Stakeholders	Timeframe
Train responsible officers in charge of management and maintenance of PRS	MoE, ESCOM, MERA	2023
Develop national regulations on mandatory registration of distribution transformers	MoE, ESCOM, MERA	Draft by end of 2023 and full enforcement by 2024
Establishment of communication program to promote compliance activities for distribution transformers		
Design communication plan for DT suppliers, customs, and other stakeholders on enforcement obligations	MoE/MERA	2023
Develop information materials on regulatory compliance requirements and obligations (e.g., procedures to obtain registrations and import permits)	MoE/MERA	2023
Develop and publish annual reports to maintain market transparency and declare non-compliance cases for manufacturers, distributors, power utilities, and end users	MoE, MBS, ESCOM, MERA	2023
Establishment of evaluation program for mandatory MEPS for distribution transformers		
Plan and implement the evaluation program on MEPS registration & certification process, compliance, and impact	MoE, MBS, MERA	2025 and on an annual basis for the following years

5. Overall Action Plan & Budget

5.1 Action Plan & Estimated Budget

Key actions of the national policy roadmaps for refrigerators and distribution transformers with information on lead agencies and stakeholders involved, indicative timeframe and estimated budgets are summarized in [Table 5-1](#) and [Table 5-2](#) respectively. It should be noted that the estimated budgets shown in the tables primarily cover costs for technical assistance as well as tools and materials required for each action. These costs are exclusive of salaries and wages of government personnel and ESCOM's staff.

5.1.1 Refrigerators

Table 5-1: Action Plan for Establishment of Enabling Policy and Regulatory Environment for Refrigerators in Malawi

Action No.	Action	Lead Agency & Other Stakeholders	Timeframe	Budget (US\$)
A	MEPS			
A.1	Develop an implementation plan on the national policy roadmap	MoE, MBS, and International/ national advisor	2023	105,600
A.2	Finalise the draft MEPS for voluntary implementation	MBS	2023	35,200
A.3	Establish/designate the Authority (preferably MERA) to regulate refrigerating appliances	MoE & MERA	2023	158,400
A.4	Develop and implement a capacity building and training program for MERA to effectively regulate the refrigerating products	MoE & International Partners	2024	35,200

Action No.	Action	Lead Agency & Other Stakeholders	Timeframe	Budget (US\$)
A.5	Conduct public consultation on the voluntary MEPS to become mandatory	Regulator (MERA) designated to regulate the refrigerating appliances	2024	52,800
A.6	Develop a regulatory mechanism to enforce and implementation of Mandatory MEPS and the testing method	MoE & MERA	2025	105,600
A.7	Promulgate the mandatory MEPS regulation	MERA/MoE, Cabinet, and Parliament	2025	Included in A.6
A.8	Enforce the mandatory MEPS	MERA/MoE	2026	50,000
A.9	Review and adjust the MEPS level based on the analysis of statistical data collected and the regional harmonisation trend	MBS/MERA/MRA	Every 5 years	52,800
B	Energy Labelling			
B.1	Phase 1- Conduct consultation workshops to discuss with the South African authorities and adopt the South African label with relevant modifications on the label	MoE/MBS/MERA	2023 to 2024	35,200
B.2	Conduct market assessment to determine the initial impact of voluntary energy labelling implementation	MERA/MBS/MRA	2024 to 2025	35,200
B.3	Phase 2-Develop a uniform energy performance labelling for all residential refrigerators sold in Malawi (In coordination with the Mandatory MEPS regulation)	MERA/MoE/MBS	2025	70,400
B.4	Develop a labelling regulation on requiring all residential refrigerators imported to and sold in Malawi to be compliant with the mandatory labelling requirement	MoE/MERA/MBS/MRA	2025	70,400
C	Communication Program			

Action No.	Action	Lead Agency & Other Stakeholders	Timeframe	Budget (US\$)
C.1	Develop awareness campaigns and capacity building programs on new MEPS and labelling regulations	MoE/MERA	2023	26,400
C.2	Conduct a training program for MERA, MoE and relevant government agencies staff on evaluation and revision of the MEPS and labelling requirements	International Advisor	2025	Included in C.1
C.3	Conduct a training program for ESCOM on managing and maintaining on-bill financing scheme	MoE, MERA, International Advisor	2024	35,200
C.4	Conduct a training program for in-store salespersons on understanding energy label and educating customers on the label usage and value	MoE	2025	44,000
C.5	Implement awareness campaigns for retailers/ wholesalers/ distributors on MEPS and labelling regulations to manage inventories	MoE, MERA	2025	Included in C.4
C.6	Conduct regular public awareness and educational campaigns for consumers, and develop communication tools (incl. website, brochures, media reports, TV, and radio broadcasts, etc.)	MoE, MERA, and Consumers Association of Malawi	Every year	50,000
D	Financing Mechanisms			
D.1	Finalize finance strategies and detailed implementation plan	MoE leads, with support from MERA, EAD, EPA, MOF, etc.	2023	35,200
D.2	Engage potential donors and prepare technical assistance project proposals to turn the financial mechanism concepts (On-bill financing and/or Green on-wage financing) into programs	MoE	2023	35,200

Action No.	Action	Lead Agency & Other Stakeholders	Timeframe	Budget (US\$)
D.3	Develop and implement the On-bill financing mechanism program and/or the Green on-wage financing mechanism program	MoE leads, with support from MERA, EAD, MEPA (take-back scheme), MOF, and technical assistance projects supported by international donors and experts.	2024	250,000 (per mechanism)
D.4	Design and implement marketing campaigns to promote the financing mechanisms	MoE and ESCOM/financial institutions and technology providers	2024 onwards	50,000
E	Monitoring, Verification, and Enforcement			
E.1	Develop a regulatory & enforcement mechanism - to address managing compliance activities and clearly specify roles and responsibilities of related enforcement authorities on all related MV&E activities including liability measures with penalty structure for cases where non-compliance has been established	MoE (lead), MBS, MERA, MRA/MoF	Draft by end of 2023 and full enforcement by 2024	158,400
E.2	Develop administrative procedures/ operational manual for enforcing regulations on MEPS and labelling program	MoE (lead), MERA, MBS, Customs	2023	35,200
E.3	Assess and conduct capacity building on the national MV&E mechanism for responsible staff (customs and other related MV&E officials)	MoE/MERA	2023	57,800
E.4	Develop a procedure and process of product registration system (PRS) for refrigerators Review U4E's prototype PRS software and consider whether to use it (in whole or part) as the basis for developing a national PRS	MoE/MERA	2024	65,200

Action No.	Action	Lead Agency & Other Stakeholders	Timeframe	Budget (US\$)
E.5	Train responsible officers in charge of management and maintenance of PRS	MoE/MERA	2023	8,800
E.6	Develop procedures for customs personnel to monitor compliance of imported refrigerators with the import regulations for refrigerator products, listed under mandatory MEPS and labelling requirements	MoE (lead), MERA/MRA/MoF, Customs	Draft by end of 2023 and full enforcement by 2024	Included in E.2
E.7	Develop national regulations on mandatory registration of refrigerators	MoE	Draft by end of 2023 and full enforcement by 2024	Included in E.1
E.8	Design communication plan for all the main stakeholders involved	MoE/MERA	2023	17,600
E.9	Develop information materials for custom officials and consumers	MoE/MERA	2023	27,600
E.10	Develop and publish annual reports to maintain market transparency and declare non-compliance cases	MoE, /MERA/MBS	2023	17,600
E.11	Develop information materials for custom officials and consumers	MoE/MERA	2023	Included in E.8
E.12	Establish a methodology for identification of products selected and purchase for verification processes, allocate staff for verification (Market Surveillance) and implement	MoE, /MERA MBS	Draft by the end of 2023 and full operation on annual basis by 2024	26,400
E.13	Train responsible officers in charge of market surveillance	MoE/MERA	2023	Included in E.14



Action No.	Action	Lead Agency & Other Stakeholders	Timeframe	Budget (US\$)
E.14	Implement pilot market surveillance program and evaluate the results for full application deployment	MoE/MERA	2024 and full operation on annual basis by 2025	27,600
E.15	Develop procedures for verification testing and test laboratory selection (outsourcing lab testing and/or using shared test results from neighbouring countries or other entities) to verify EE of selected products	MoE MERA and MBS	2024	Included in E.14
E.16	Implement pilot verification testing program and evaluate the results for full application deployment	MoE MERA and MBS	2024 and full operation on annual basis by 2025	27,600
E.17	Plan and implement the evaluation program on MEPS registration & certification process, compliance, and impact	MoE/MERA	2025 and on an annual basis for the following years	17,600
			TOTAL	1,820,200

Note: The total budget is based on one financial mechanism (D.3) chosen for implementation

5.1.2 Distribution Transformers

Table 5-2: Action Plan for Establishment of Enabling Policy and Regulatory Environment for Distribution Transformers in Malawi

Action No.	Action	Lead Agency & Other Stakeholders	Timeframe	Budget (US\$)
F	MEPS			
F.1	Develop an implementation plan on the national policy roadmap	ESCOM, MBS, MoE, and International/ national advisor	2023	105,600
F.2	Finalise the draft MEPS for voluntary implementation	ESCOM, MBS, MoE, and relevant stakeholders	2023	35,200
F.3	Establish/designate the Authority (preferably MERA) to regulate DTs	TWG and International/ national advisor	2023	35,200
F.4	<p>Conduct a capacity-building program for regulated staff and other identified stakeholders (local manufacturers)</p> <p>Description: Budget for a capacity-building program covering all aspects of the EE policy implementation and transitioning to the regulated MEPS for local manufacturers:</p> <ul style="list-style-type: none"> • Training needs assessment, designing training courses & material for all relevant stakeholders including organizing the training - US\$105,600 • Benchmarking activities - US\$15,000 • Selection of a technology transfer partner <ul style="list-style-type: none"> ○ Transformer design software - US\$50,000 ○ Training for design software - US\$12,000 (4 engineers) ○ Hardware and tooling for meeting MEPS - US\$720,000* 	ESCOM, MBS, MoE, local manufacturers, and International/national advisor	2024	399,200*

Action No.	Action	Lead Agency & Other Stakeholders	Timeframe	Budget (US\$)
	<ul style="list-style-type: none"> ○ Prototype Tier 1-Tier 3 MEPS - US\$120,000 (12 QTY) ○ Temporary export to SA + transportation - US\$21,600 ○ Type tests at NETFA (South Africa) - US\$75,000 <p>Note: *Cost for new tools and manufacturing equipment for local manufacturers is not included.</p>			
F.5	Conduct public consultation on the voluntary MEPS to become mandatory	MERA ESCOM, MBS, MoE, and International/ national advisor	2024	35,200
F.6	Develop a regulatory mechanism to enforce and implement mandatory MEPS and the testing method	MoE/ MERA/ESCOM	2025	35,200
F.7	Promulgate the mandatory MEPS	MoE, Cabinet, and Parliament	2025	Included in F.3
F.8	Enforce the Mandatory DTs MEPS	MERA/MoE	2026	Included in F.3
F.9	Review and adjust the MEPS level based on the analysis of statistical data collected and the regional harmonisation trend	MoE/ MERA/ESCOM	2026 onwards	17,600
G	Communication Program			
G.1	Develop and implement an educational program on DT MEPS and TCO for utility procurements to communicate on financial benefits of more stringent MEPS and updated formulas for computation of the Total Cost of Ownership (TCO) in the procurement guidelines	ESCOM, MERA, MBS, MoE, and International/ national advisor	2023	27,600
G.2	Develop and implement an educational program on DT MEPS and TCO for non-utility procurements to communicate on financial benefits of	ESCOM, MERA, MBS, MoE, International/ national	2024	27,600

Action No.	Action	Lead Agency & Other Stakeholders	Timeframe	Budget (US\$)
	procurement of energy efficient DTs updated formulas for computation of the Total Cost of Ownership (TCO) in non-utility applications	advisor, and relevant stakeholders		
H	Financing Mechanisms			
H.1	Establish finance/procurement strategies and detailed implementation plan	MoE leads, and support from ESCOM, MERA, MBS, EAD, MEPA, MOF, PPDA, and international/ national advisor	2023	35,200
H.2	Engage potential donors and prepare technical assistance project proposals to turn the ESCO EPC mechanism concept (shared and guaranteed savings) and/or the bulk procurement mechanism with TCO concept into programs, as per guidance from the detailed implementation plan.	MoE and International/ national advisor	2023	35,200
H.3	Develop and implement the ESCO EPC mechanism program (shared or guaranteed savings) and/or bulk procurement mechanism program through technical assistance projects supported by international donors and experts	MoE leads, with support from ESCOM, MERA, MBS, EAD, MEPA, MOF, PPDA, and with technical assistance projects supported by international donors and experts.	2024	250,000 (per mechanism)
H.4	Seek and develop partnership with Financial Institutions and ESCOM including T&C and Agreements signing	MoE/MERA and ESCOM/Financial Institutions	2024	Included in H.3

Action No.	Action	Lead Agency & Other Stakeholders	Timeframe	Budget (US\$)
H.5	Assess eligibility and negotiate with ESCOs and/or technology providers, including T&C and agreements signing.	MoE and ESCOM/ESCOs/technology providers	2024	Included in H.3
H.6	Implement marketing and promotion strategy and activities to promote the pilot demonstration program(s) (i.e., both ESCO EPC and Bulk Procurement with TCO)	MoE and ESCOM/financial institutions and ESCO/technology providers	2024 onwards	50,000
I	Monitoring, Verification, and Enforcement			
I.1	Develop a regulatory & enforcement mechanism - to address managing compliance activities and clearly specify roles and responsibilities of related enforcement authorities on all related MV&E activities including liability measures with a penalty structure	MoE, MBS, MERA, ESCOM, MAREP, EAD	Draft by end of 2023 and full enforcement by 2024	158,400
I.2	Organize consultation workshops with other GCF countries and the SADC region (public utilities) to ensure alignment with the national MV&E framework and harmonization of the DT product registry	MoE, MBS, MERA, ESCOM	2023	35,200
I.3	Develop administrative procedures/ operational manual for enforcing regulations on the MEPS program	MoE, MERA, ESCOM, MBS	2023	35,200
I.4	Develop a product registration system (PRS) for distribution transformers	MoE, ESCOM, MERA	2024	65,200
I.5	Train responsible officers in charge of management and maintenance of PRS	MoE, ESCOM, MERA	2023	8,800
I.6	Develop national regulations on mandatory registration of distribution transformers	MoE, ESCOM, MERA	Draft by end of 2023 and full enforcement by 2024	Included in I.1



Action No.	Action	Lead Agency & Other Stakeholders	Timeframe	Budget (US\$)
I.7	Design communication plan for DT suppliers, customs, and other stakeholders on enforcement obligations	MoE/MERA	2023	17,600
I.8	Develop information materials on regulatory compliance requirements and obligations (e.g., procedures to obtain registrations and import permits)	MoE/MERA	2023	27,600
I.9	Develop and publish annual reports to maintain market transparency and declare non-compliance cases for manufacturers, distributors, power utilities, and end users	MoE, MBS, ESCOM, MERA	2023	Included in I.6
I.10	Plan and implement the evaluation program on MEPS registration & certification process, compliance, and impact	MoE, MBS, MERA	2025 and on an annual basis for the following years	17,600
TOTAL				1,454,400

Note: The total budget is based on one financial mechanism (H.3) chosen for implementation

5.2 Revenue Streams

The revenue streams for the implementation of MEPS and energy labelling can be generated through implementation of the MV&E scheme. The possible revenues would include product registration fees and enforcement fines. The program can charge the applicants (manufacturers and importers) based on the number of models registered. A Brief description of each revenue stream is described below.

- **Product registration fees:** The regulatory authorities that administer the MEPS and energy labelling legislation can charge fees for the registration levied on the number of equipment models registered (including "families" of models). The registration fees can vary for each product type and reflect variations in production costs or energy consumption.
- **Enforcement fines:** The potential revenues from product enforcement are directly tied to the suspension or cancellation of a product's registration. If non-compliance has been detected and no proper corrective actions are undertaken, the offender will be required to pay a specified penalty. Following the penalty payment, non-compliance products will still be deregistered if the non-compliance is confirmed by the check-testing process.

6. References

UNEP/U4E: Policy guidebook for climate-friendly and energy-efficient refrigerators. Available at: <https://united4efficiency.org/resources/>

UNEP/U4E: Energy labelling guidance for lighting and appliances. Available at: <https://united4efficiency.org/resources/>

LBNL: Design of standards and labeling programs in Chile: techno-economic analysis for refrigerators. Available at: <https://www.osti.gov/biblio/1171355>

Compliance Counts: A Practitioner's Guidebook on Best Practice Monitoring, Verification, and Enforcement for Appliance Standards & Labeling. Available at: <https://www.clasp.ngo/research/all/compliance-counts-a-practitioners-guidebook-on-best-practice-monitoring-verification-and-enforcement-for-appliance-standards-labeling-1/>

7. Annexes

7.1 ANNEX A - Members of the Policy Work Group

Saidi Banda – PWG Chairperson

Gift Chiwayula – MoE – PWG Co-Chairperson

Fredrick Munthali – National Commission of Science and Technology, representative of Mr.
Lyson Kampira – NDE

Francis Kachule – MOF

Patrick Nyirenda – NOU/EAD

Hanna Siane – EAD

James Tsumba – Energy Expert ESCOM

Clement Phangaphanga – MOI

Phillip Jones Banda – MOT

Shaibu Mludi – MERA

Wongani Mtambo – MRA/Customs and Exercise



7.2 ANNEX B - Members of the Technical Committee for Refrigerating Appliances

Steven Chalimba – Malawi Bureau of Standards (MBS) – TC Chairperson

Chitani Kella – Malawi Bureau of Standards (MBS)

Mercy Nyekanyeka - MBS

Gunseyo Dzinjalama - MBS

Tati Ndalama - Malawi Engineering Institution (MEI)

Masozi Mwenifumbo –MBS

Bishop Hauya – MBS

Gift Chiwayula – Ministry of Energy (MoE)

Phillip Msambira – BICCO International

Peter Chimtali – University of Malawi

Diverson Mtalika – TEVETA

Doreen Kadzuwa – ESCOM

Gift Banda - ESCOM

Ernest Kilekwa – Soche Technical College

Willie Chimombo - Patience Technical College

Musa Melesha – Malawi Energy Regulatory Authority (MERA)

Barness Mphande – Malawi University of Business and Applied Sciences (MUBASM)

Wakisa Mwwalughali – Anderson Engineering

7.3 ANNEX C - Members of the Technical Committee for Distribution Transformers

Gerald Khonje - National Construction Industry Council (NCIC) – TC Chairperson

Chitani Kella – Malawi Bureau of Standards (MBS)

Mercy Nyekanyeka - MBS

Gunseyo Dzinjalama - MBS

Deus Byson - MBS

Masozzi Mwenifumbo –MBS

Bishop Hauya – MBS

Gift Chiwayula – Ministry of Energy (MoE)

Felix Majawa – Blantyre City Council (BCC)

Gilbert Chodzadza – Electricity Supply Corporation of Malawi (ESCOM) Limited

Kondwani Chikalamba – ESCOM

MaC Donald Nazomba – ESCOM

Gift Banda - ESCOM

Daniel Tembo – EGENCO

Elias Nyenyema – Soche Technical College

John Moffolo - Malawi Housing Corporation (MHC)

Harton Chisambo - Malawi Housing Corporation (MHC)

Musa Melesha – Malawi Energy Regulatory Authority (MERA)

Noel Dilli – (CM)

Leonard Duncan – Blantyre Water Board (BWB)

Gopal Sudnlaimuthu – Renewable Energy Institute Association of Malawi (REIAMA)

7.4 ANNEX D - Malawi's Socioeconomic Situation

Malawi is one of the most densely populated countries in Sub-Saharan Africa. The Population and Housing Census of 2018 pegged Malawi's population at 17,563,749 and an average annual/intercensal growth rate of 2.9% for the period between 2008 and 2018.²⁵ Malawi occupies an area of 118,484 square kilometres.²⁶ Land accounts for 79% of the total area at 94,080 square kilometres and the rest is covered by Lake Malawi. Of this total landmass, 53,070 square kilometres are suitable for cultivation. According to the Fifth Integrated Household Survey, the mean household size is 4.4 at national, urban, and rural levels.²⁷ The total number of households estimated at national level were 3,984,929.

In 2020, Malawi recorded a per capita Gross National Income (GNI) of US\$580.²⁸ Overall, 41.5% of the households reported that their current income only met their expenses and 19.2% reported that their income was not sufficient, so they needed to use savings. About 6% of the households reported that their current income allowed them to build savings. 42.0% of the households in rural areas reported that their current income only met their expenses compared to 38.5 % in urban areas. Most of the poor households are in rural areas (59.5 %) in contrast to 17.7 % in urban areas. Female-headed households at the national level are at 29.6 % and are slightly higher at rural areas, 31.4 %. More than 70 % of the population still lives below the international poverty line of \$1.90 per day in 2011 PPP prices.²⁹

The Malawi 2063 Vision (MW2063)³⁰ is the long-term development strategy which aspires to foster youth-centric "inclusive wealth creation and self-reliance". It aims to propel the country to an industrialised upper middle-income country by 2063. The MW2063 is anchored on three key pillars;

- Agriculture Productivity and Commercialization,
- Industrialization,

Economic infrastructure
Diversified range of affordable energy sources that will increase energy supply, ensure energy reliability, and focuses on renewable and sustainable energy to reduce the overdependence on hydro-generated power.

- Urbanization.

The Malawi Growth and Development Strategy (MGDS) III³¹ is the medium term (5 years from 2017 to 2022) strategy to contribute to the MW2063. The strategy will, however, focuses on five key priority areas, namely: 1) Agriculture, water development and climate change management; 2) Education and skills development; 3) Transport and ICT infrastructure; 4) Energy, industry, and tourism development; and 5) Health and population (Malawi Government, 2017). MGDS III is, however, phased out with the launch of MW2063 and is being

²⁵ Malawi Population and Housing Census. May 2018.

http://10.150.72.21:6510/www.nsomalawi.mw/images/stories/data_on_line/demography/census_2018/2018%20Malawi%20Population%20and%20Housing%20Census%20Main%20Report.pdf

²⁶ <https://www.malawi.gov.mw/>

²⁷ Fifth integrated Household Survey (IHS5). National Statistical Office, 2020.

http://www.nsomalawi.mw/images/stories/data_on_line/economics/ihs/IHS5/IHS5_Final_Report.pdf.

²⁸ The World Bank, 2020. The Country Profile.

https://databank.worldbank.org/views/reports/reportwidget.aspx?Report_Name=CountryProfile&Id=b450fd57&tbar=y&dd=y&inf=n&zm=n&country=MWI.

²⁹ <https://data.worldbank.org/country/malawi?view=chart>

³⁰ Malawi's Vision Malawi 2063. National Planning Commission, 2020. <https://npc.mw/wp-content/uploads/2021/02/MW2063-VISION-FINAL.pdf>.

³¹ The Malawi Growth and Development Strategy (MGDS) III (2017 - 2022). https://npc.mw/wp-content/uploads/2020/07/MGDS_III.pdf.

replaced by the first 10-year implementation plan, which is currently undergoing cabinet approval.

GDP growth is estimated to have weakened to 0.9% in 2020 from 5.1% recorded in 2019, reflecting the slowdown in local and cross-border economic activity caused by the Covid-19 pandemic. At this level, the 2020 growth is the lowest since 2001. The resultant negative demand and supply shocks proved to be unfavourable to most sectors in the economy. In particular, the accommodation and food sector, transportation, wholesale and retail, and manufacturing sectors were hit hard. In 2021, however, the economy was expected to rebound modestly, and GDP growth is projected at 3.8%.³²

Assessing the balance of payment by the Reserve Bank of Malawi, leaves the country in a net importing position. According to the Reserve Bank “merchandise exports contracted by 14.5% whilst imports shrank by 6.1% in 2020”. Further, the bank observed that “although the closure of borders in trading partners’ countries as well as low disposable income led to a fall in imports, the same adversely affected domestic exports, such that the merchandise trade balance remained in deficit.”

³² Report and Accounts for the Year Ended 31st December 2020. The Reserve Bank of Malawi (RBM), 2020.

7.6 ANNEX E - Energy Efficiency Implementation Ecosystem

The energy efficiency market transformation relies on 5 main pillars:

- MEPS
- Labels
- Communication - Consumer and Stakeholder Education
- Monitoring, verification, and Enforcement
- Financing

Minimum Energy Performance Standards (MEPS)

MEPS establish the minimum efficiency as a function of size or capacity of the product to allow market entry. The minimum efficiency can either be defined as the allowable energy or electricity consumption (as with the case of refrigeration appliances) or the allowable energy losses (as with the case of DTs). For refrigerating appliances; example MEPS include UNEP-U4E Model Regulation Guidelines, SANS941:2020, Ecodesign, US-DOE 10 CFR 430.32(a), and others. For DTs, example MEPS include the UNEP-U4E Model Regulation Guidelines, IEC 60076-20, SANS 780:2021.

MEPS typically rely on published standard test protocols/procedures in order to ensure fair comparison between products. For refrigerating appliances; example standard test protocols include IEC 62552-3:2015, SANS62552:2008, US-DOE 10 CFR 430, Subpart B, Appendix A and Appendix B, ASHRAE standard 72, and others. For DTs, example IEC 60076 series, SANS 780:2021, and SANS 60076 series.

MEPS generally create a “market push” and eliminate the least efficient appliances and equipment from entering the market. However, MEPS do not necessarily encourage higher efficiency equipment.

Labels

Labels provide a mechanism for customers to understand the relative performance of the appliance or equipment against other technologies on the market. Comparative labels improve the customer awareness and demand for higher efficiency products creating a “market pull.” Labels do not necessarily eliminate the least efficient appliances and equipment from entering the market; however, they shift the market towards more efficient products.

Cost-effective implementation of MEPS and Labels may be achieved through regional harmonization (as with the SADC/EAC harmonised MEPS that are developed using the global U4E tool) or the adoption of international standards (as with the adoption of IEC standards or major trade partner standards).

Communication - Consumer and Stakeholder Education

Consumer and stakeholder education is an important part of the energy efficient market transformation ecosystem. They raise the awareness towards energy efficient technologies and their socioeconomic impacts. Proper consumer and stakeholder education may involve communication campaigns, capacity building activities, etc. This is an important pillar of the ecosystem as it ensures that government officials understand the value of energy efficiency

and how to create the proper policies, the supply chain is well educated about the value of energy efficiency and how they can better advise and convince consumers to opt for higher efficiency products, and that consumers understand the labels and purchase the most efficient products.

Monitoring, Verification, and Enforcement (MV&E)

Monitoring, Verification and Enforcement (MV&E) ensure policy integrity and create a level playing field where manufacturers and distributors comply with MEPS and labels, consumers receive the benefits promised by the labels, and government achieve target national impact (e.g., NDC). Monitoring is the most important step where the authority regularly surveys the market to identify potential cases of non-compliance. This is followed by a verification where the potential offence is revealed through testing or validation of the products' performance claims. Finally, the enforcement step is the last where the authority takes action against the non-compliance offence. These actions should be commensurate with an offence in order to prevent any future offences from happening.

Financing Mechanisms

Achieving energy efficiency improvements will require a significant increase in global investments in energy efficiency. Much of the financing will need to be mobilised locally, and from private sources. In order to scale up the adoption of energy-efficient solutions such as energy-efficient and climate-friendly domestic refrigerators and distribution transformers, investments must be suitably enhanced with effective targeted financing strategies. This generally includes demand-side management (DSM) interventions that focus on process optimization, which achieve reductions in energy use, as well as equipment and technology interventions to ensure that the infrastructure in place is energy-efficient (e.g., purchasing energy-efficient appliances and equipment, replacing/retrofitting existing infrastructure with energy-efficient alternatives, and upgrading from old infrastructure to energy-efficient systems). Effective targeted finance strategies will require the review, development, and implementation of financial mechanisms that overcome key market barriers, facilitate the flow of financing for relevant technology solutions and address the untapped market potential. When developing such strategies, it is essential to understand the technical, financial, institutional, legal, and social barriers that are constraining investments in new energy-efficient solutions

- **Energy-efficient residential refrigerators:**

It is imperative to implement financial mechanisms that facilitate end-users in the residential sector to have access to energy-efficient and climate-friendly residential refrigerators (including to some extent off-grid solar refrigerators) and that provide some form of incentives along the demand and supply chain to overcome financial and technology barriers.

On the demand side, simple-to-access financial mechanisms with competitive conditions will help to motivate households to acquire high-efficient appliances that can generate important energy savings. Credit is important to facilitate that end-user disburse an amount equivalent or lower to what implies to purchase a second-hand system. On the supply side, the financing mechanisms will aim to engage and motivate providers to sell energy-efficient and climate-friendly appliances (including off-grid solar refrigeration systems) by increasing their sales volume through the provision of credit facilities to their clients.

On-bill financing and green on-wage financing which are both designed specifically to promote small investment in residential refrigerators and align with the country context, targeting on-grid end-users with the possibility to extend it to off-grid end-users too.

On the one hand, the on-bill financing mechanism option enables energy utility customers to acquire energy-efficient appliances, and to pay for the equipment over time through their monthly utility bills. In many cases, on-bill programmes are designed to deliver immediate overall cost savings from the very first day without the need for the customer to invest (bill neutrality). This means that the energy cost savings equal or exceed debt service, resulting in a lower total bill (debt repayment and electricity) after retrofit.

On the other hand, the green on-wage financing mechanism option is a consumer finance product designed to meet the short- and medium-term financing needs of salaried employees of public and private institutions that are profiled or have a business relationship with local financial institutions. Green on-wage financing mechanisms option offers flexible and simple repayment terms for EE products through salary deductions.

Both options intend to:

- Set up green credit facilities to ease access to concessional finance and help overcome the higher upfront cost barrier for end-users;
- Structure low-risk repayment mechanisms between key local stakeholders such as partner banking institutions or National Development Bank (NDB), the power utilities (the Electrical Supply Cooperation Malawi (ESCOM)) or the employer institutions, as well as EE technology providers;
- Address market barriers, align with the specific country context, and leverage local opportunities to maximise the technical and commercial feasibility of both options (e.g., targeting salaried employees or prepaid metering customers, building on experience with consumer finance products, etc.)

- **Energy-Efficient Distribution Transformers:**

It is imperative to consider financial mechanisms that facilitate end-users in the commercial and public sector, to have access to energy-efficient and climate-friendly distribution transformers and that provide some form of incentives along the demand and supply chain, to overcome financial and technology barriers.

On the demand side, financial mechanisms with competitive conditions, or tools that encourage efficient utility purchasing practices such as bulk procurement with Total Cost of Ownership (TCO) and fiscal incentives, would help motivate utilities, and private sector end-users to retrofit or acquire higher-efficiency distribution transformers that can generate important energy savings. On the supply side, the mechanism options aim to engage and motivate providers to supply or install energy-efficient and climate-friendly equipment in the public and commercial sectors.

Therefore, discussions shall lead to the exploration of financing mechanisms including a combination of financial and non-financial components that are tailor-made to the country context to facilitate the access high-efficiency and climate-friendly distribution transformers for end-users, such as (i) the ESCO model's Energy Performance Contracts (EPCs) – Shared Savings model, (ii) the ESCO's EPC – Guaranteed Savings model, and (iii) Bulk procurement with TCO and fiscal incentives. All options can incentivize the utility and non-utility market players to invest in the retrofits or replacement of high technical loss or end-of-life equipment for higher-efficiency distribution transformers.

7.7 ANNEX F – Financing Mechanisms for Refrigerators

7.7.1 On-bill Financing

The model:

On-bill financing is an innovative approach to financing energy efficiency that has proven to be effective for smaller investments and in increasing uptake of energy-efficient equipment. The model enables energy utility customers to acquire energy-efficient equipment, such as domestic refrigerators, and to pay for the equipment over time through their monthly utility bills.

In many cases, on-bill programmes are designed to deliver immediate overall cost savings from the very first day without the need for the customer to invest (bill neutrality). This means that the energy cost savings equal or exceed debt service, resulting in a lower total bill (debt repayment and electricity) after retrofit. Through on-bill financing, utility customers can purchase efficient equipment with their regular technology provider, who facilitates the credit request. There are several ways to structure on-bill financing models:

- In one approach, the utility incurs the capital cost of the energy efficiency upgrade, which is repaid through the utility. The utility thereby effectively takes on the role of a financing entity in addition to selling electricity.
- Another approach, sometimes referred to as “on-bill repayment”, the upfront capital is provided by a third party, typically public or private financial institutions, rather than the utility. The utility acts as a repayment conduit, collecting the payments through the electricity bills for the original lenders.
- It is also possible to tie the cost recovery for an efficiency investment to the property’s meter rather than the property owner, which means that tariffs remain in force regardless of a change in occupancy. These tariff-based on-bill models allow customers to make investments that may outlive their residency at the property, in which case the next owner can either repay the equipment in full or continue with monthly on-bill payments

Benefits:

The biggest customer benefits of this model are the avoided upfront capital expenditure, and the ease of repayment. This can help motivate investments that may not otherwise happen. The model can also enable access to finance for customers who are not able to qualify for traditional financing options by broadening customer eligibility. Indeed, on-bill financing models tend to have low default rates. This is and because the loan has bill neutrality, as well as due to people’s tendency to prioritise the payment of their utility bills and, where allowed the utility’s ability to shut off service in the event of non-payment.

The increased energy efficiency on the demand side benefits utilities from the avoided cost and risks of additional building of power plants, new power lines, substations, and transformers. Energy efficiency can also reduce a utility’s cost of complying with major national or international environmental rules. In some cases, the on-bill mechanism is a good opportunity for utilities to make inroads into financial services benefiting from their secured clients-base who are already making frequent payments for their utility services.

Risks and challenges:

The main risks and challenges to establish an on-bill financing mechanism are:

- Engaging the utility to support the transition towards energy efficiency and/ or to serve as a financier.
- Evaluating credit risk of customers through their historical electricity consumption and payments.
- Changing the utilities data and information management system to allow for on-bill repayment.
- Customer risk of power shut-off. This can be mitigated by enabling customers to obtain assistance with complaints, raise legitimate issues related to the loan and the project funded by the loan, and access to a dispute-resolution process.
- Managing the contractor network who might misinform the clients.
- Repayment allocation (i.e., whether utility or lender is paid first) can be an issue when customers partially pay their bills.

Supporting mechanisms:

On-bill financing can be supported by capitalising new on-bill loan funds, through credit enhancement for existing on-bill funds, such as loan guarantees, and by positive lists. The success of the model depends mostly on the interest and engagement of the utility, which in many cases is in part or in whole, government owned. The government can support the model by capitalising new on-bill loan funds, providing credit enhancement for existing on-bill funds, such as loan guarantees. Governments and development agencies can play important roles by providing technical support in setting up the model or providing green credit lines.

On-bill financing recommendations

1. Green loans and on-bill financing as a low-risk repayment mechanism

Malawi's banking system is competitive. Most of the banking institutions, as well as few microfinance institutions, offer consumer loans or credit facility, which are sought after by households to acquire movable equipment and appliances. In particular, consumer loans are intended more for employees who have a guarantee through the domiciliation of their remuneration, while the other applicants must present a guarantee acceptable to the banking institutions (collaterals). The terms and conditions differ from one institution to another. Consumer loans and credit facilities mainly target employed individuals or homeowners, who can more easily provide sufficient credit capacity or some collaterals, reducing the perception of risk for local financial institutions (LFIs), but limiting the attractiveness of such a product for self-employed or non-salaried households.

Therefore, the recommendation is to seek partnerships with one or two key local financial institutions (i.e., banking institutions such as National Bank of Malawi (NMB), FDH Bank, First Capital Bank of Malawi and Standard Bank or MFIs) in terms of number of retail customers, and if possible, existing partnerships with technology providers (i.e., distributors, retailers), and climate initiatives. Then build on the existing offer of consumer loans, credit facilities (e.g., employer guaranteed loan) in place and adapt the existing agreements and processes in place to comply with robust monitoring, reporting, and verification (MRV) measures to collect data on emissions, mitigation actions and support. Green loans and credits will be specifically

dedicated to finance certified energy-efficient and climate-friendly residential refrigerators (including some off-grid refrigerator products) for households through the mechanism.

Through these green loans or credit facilities, the burden of up-front cost is reduced for households wishing to acquire a new appliance. Coupled with a positive list of certified appliances and partner technology providers, and a simple repayment recovery mechanism such as through household electricity consumption, the perceived default risk is much lower for partner local financial institutions wishing to favour green investment in the residential sector, while households face a simplified credit application procedure, providing them with more liquidity and reducing their borrowing costs.

Through the operationalisation and pilot of the financing mechanism, partner local financial institutions will be able to quickly build a green loan portfolio with support from external donors such as MDBs. Indeed, local financial institutions might benefit from de-risking instruments (i.e., credit guarantees) and green credit lines, access to revolving loans funds, grants, or technical assistance, which will enable partners to offer concessional on-lending to end-users (i.e., longer tenor periods, lower interest rates) who invest in eligible energy-efficient assets in the residential sector. This will boost the visibility and uptake of the mechanism in the market. In return, the financing mechanisms will fast-track the disbursement of existing green credit lines provided by MDBs or other donors. In a first phase, the operationalisation and initial piloting of the mechanism will target on-lending to specific low-risk high-return market segments of the population (e.g., on-grid urban households and micro entrepreneurs). Once partner local financial institutions are comfortable with the risk level of their green loan portfolio, the mechanism will then be eventually expanded to other eligible climate technologies (e.g., off-grid solar refrigerators, SHS, etc.) and target market segments (e.g., rural communities, off-grid rural households, and micro entrepreneurs) who are generally perceived as having a higher risk profile and lower credit capacity.

2. Eligibility assessment and bulk rebate negotiations with technology providers

Through the mechanism, technology providers first apply for participation in the mechanism and their appliances must comply with the policy framework and beyond to be promoted and sold through the mechanism. The Government of Malawi (e.g., Ministry of Energy, etc.) or any non-commercial institutions (Malawi Energy Regulatory Authority) certify the residential refrigerator technologies (i.e., brand models) submitted for review by the technology providers that are willing to supply new energy-efficient and climate-friendly residential refrigerators in the market through the mechanism. Technology provider applicants and their products must comply with a list of commercial and technical eligibility criteria set by the entity playing the compliance role in the mechanism. Eligibility criteria may include type of products, age of products, product size, refrigerants, GWP and ODP limits of foam blowing agents, minimum warranty, safety certification, energy efficiency (higher than MEPS), eligible brands, production duration, price, etc. The scope of the criteria can be broadened to include energy-efficient and climate-friendly off-grid solar refrigerator technologies too.

Once the brand models of residential refrigerators are deemed eligible, bulk rebates are negotiated with the eligible retailers or distributors of complying technologies. After successful negotiations are concluded, they have to agree and sign terms and conditions for participation in the mechanism, as well as finance agreements with each partner local financial institution to themselves become partners of the programme enabling the sales and promotion of certified energy-efficient residential refrigeration through on-bill financing. This might come with financing or de-risking support (i.e., green credit lines, revolving loans funds, credit guarantees) from MDBs and credit recovery from the relevant partner electricity distributors or utilities (e.g., Local Authorities and Regional Councils, Electrical Supply

Cooperation Malawi (ESCOM)). The aim of the partnership with the technology providers is not to procure the products but to negotiate with distributors and retailers a minimum percentage rebate on the sale of each certified brand model through the mechanism. Part of the rebate is used to lower interest rates and increase tenor periods offered by partner banking institutions to consumers through credit facilities and another to incentivise consumers and offer vouchers or cash-back in exchange for the collection and disposal of end-of-life appliances through the programme. The benefit for the partner distributors and retailers is that the programme will aggregate demand for premium brand models and offer support to significantly increase the sales in energy-efficient and climate-friendly refrigeration technologies (which are difficult to sell due to upfront cost and competition with inefficient equipment) through facilitating access to credit to the certified products. If sufficient, the rebate is also used to cover the costs related to collection and disposal of the end-of-life equipment that is turned-in by households in alignment with e-waste management regulations in the country. Bulk rebate negotiations with providers are a practice that was proved successful in Ghana, Rwanda, and Senegal to facilitate access to energy efficient cooling appliances to households through ECOFRIDGES and the Rwanda Cooling Finance Initiative.

3. Marketing and Promotion of qualifying residential refrigerators

There is the need to implement a marketing and promotion strategy to showcase the energy-efficient and environmentally friendly residential refrigerators that are deemed eligible for the programme, explain the financing options and economic benefits to households, and connect partner stakeholders with customers. It is recommended that the promotion strategy is coordinated by partners (local financial institutions, technology providers, utility), with some advisory support and guidance from institutions which are playing the main compliance role and providing key support in the mechanism to provide credibility and international visibility. It is important to show in the market that partners that are part of the programme have a distinction from the compliance entities and they belong to a group of trusted partners financing and offering energy-efficient and environmentally friendly domestic refrigerators. This will help build trust in the mechanism and products.

4. Positive list

It is necessary to build partnerships with at least one banking or microfinance institution to provide consumer loans or credit facilities to acquire new energy-efficient and climate-friendly refrigeration systems. However, at the moment, consumer loan products and credit facilities that are offered by banking institutions are used by households to finance any kind of products (including inefficient equipment) without much restriction. Therefore, it is important that the programme generates a list of certified brand models of domestic refrigerators that are certified and sold by partner distributors and retailers. Only these certified brand models registered on a positive list are eligible for financing through the mechanism. The list should be aligned with criteria that increases ambition in terms of energy-efficiency and lower global warming potential refrigerants, such as through the [United for Efficiency Model Regulations](#). Also known as a qualified product list or positive list, it is informed by eligibility criteria for products to qualify to participate in the programme that is prepared by the main compliance entity (e.g., Ministry of Energy, GCF, else), refined based on inputs from local experts in Malawi, and endorsed by partners. The positive list can be easily updated with new certified brand models and technologies (e.g., off-grid solar refrigerators, solar water heater, lighting, rooftop solar PV, air conditioning, etc.) as the programme goes.

5. Monitoring, Reporting, and Verification (MRV)

Partners have to comply with the terms and conditions (T&C) for participation in the mechanism including robust MRV guidelines and monitoring and evaluation of customer applications for participation. MRV guidelines are used to estimate the Greenhouse Gas (GHG) emissions impacts attributable to the sales of certified models in lieu of a typical unit in the market, and a set of result indicators. MRV activities focus for instance on tracking GHG emission reductions, funding mobilization, and target co-benefits, which are directly related to the intended impact of the project. The general methodologies, key indicators that will be tracked, as well as the data collection methodologies and responsibilities will be detailed in the guidelines. The findings will be used in reporting to financiers and donors, for communications and outreach, and to help evaluate progress on an ongoing basis.

Also, providers of certified products would have to submit a conformity assessment report that would be checked by the main compliance entity (e.g., MoE etc.). A subset of these products would undergo random sample testing to verify claims in the conformity assessment report.

It is recommended that partner banking institutions and technology providers adapt and eventually integrate their information management systems to monitor and report on the financing and sales of certified brand models through the mechanism closely with the utility, which manages the credit recovery mechanism.

6. Collection and disposal

A requirement for sales of the energy-efficient and environmentally friendly domestic refrigerators and access to green loans and credit facilities should be conditioned on the turn-in, collection, and disposal of end-of-life refrigerating appliances. This includes agreements with partner providers and local financial institutions may include a clause that the household can only access the rebate if an end-of-life equipment is turned in, collected and disposed properly. Two approaches are proposed for efficient collection and disposal; a) the procedure in place that is used by partner providers to deliver and install the new equipment can also be used to collect and dispose of the old equipment. The partner provider in charge of delivering the new equipment would then pay a small payment (coming from the agreed rebate) to cover the costs associated with the disposal to eligible e-waste management companies. In the absence of delivery and installation services from partner providers, eligible e-waste management companies are used to collect and dispose of end-of-life equipment against a commercial transaction. The e-waste management company benefits from a payment coming from the rebate. In both cases, the end-of-life equipment is sent to any existing e-waste management facility where potentially harmful gases can be disposed of in a safe and environmentally friendly manner.

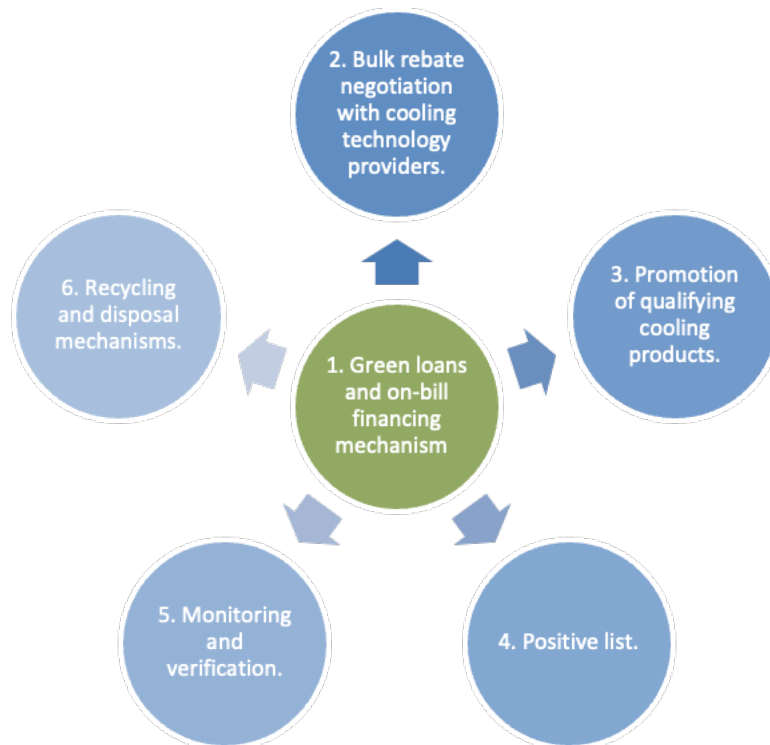


Figure 7-1: Financial and non-financial components of on-bill financing mechanism

Recommended On-bill financing scheme:

On-bill financing is a low-risk high-feasibility repayment mechanism. It aims to create a win-win situation for the Government of Malawi, households, the utility, partner local financial institutions, and partner technology providers with potential support from GCF, CTCN, MDBs, or others.

On the demand side:

- Households wishing to take advantage of the attractive conditions of the programme announce themselves with a partner provider or a partner financial institution submitting an application to acquire an eligible equipment on credit to a partner banking or microfinance institution, in exchange of an agreement to reimburse credit through their electricity bill with the utility.
- Households, customers of the utility then refund their credits on their electricity bill for post-paid customers or pre-paid meters for prepaid customers. More than 84% of surveyed households were on a prepayment metering system, compared to less than 16% on post payment metering systems in Malawi in 2021. On-bill financing through prepayment metering systems is easier to implement than through post payment metering systems, due to the greater effectiveness and flexibility of prepayment information management systems, lower reputational risk, and regulatory costs for the utility. Indeed, the utility does not have to interrupt electricity service when facing non-repayments from prepaid customers if credit repayments are prioritised over electricity consumption in the prepayment metering systems of eligible customers.
- While the utility reimburses on a regular basis partner local financial institutions with whom it has entered into an agreement for its customers.
- The utility thus guarantees the repayment of household loans by enabling the linkage between electricity consumption and loan repayments, which make it easier for

households to obtain a green loan at preferential conditions and reduce the need to provide additional collaterals or loan guarantees for households.

On the supply side:

- On-bill financing will address the risks associated with the lack of trust in reliability of different technologies and contracts, by encouraging partner providers of certified brand models to provide and install energy-efficient at lower costs through cost effective support mechanisms
- On the one hand, the use of a positive list directs households to the formal market and thus ensures that the technologies acquired will provide consistent and high-quality results in terms of energy savings, in line with the programme.
- Moreover, following bulk rebate negotiations with distributors and retailers of certified brand models, partners will commit to indirectly reducing the sale price of certified energy-efficient and climate-friendly appliances eligible for the programme through vouchers or cash-back and concessional green credit conditions enabling payment in instalments with partner banking or microfinance institutions.
- Distributors or retailers of eligible domestic refrigerator technologies based on the set of product eligibility criteria voluntarily apply to enter into the list of partners and gain access to the demand generated by the financing mechanism.
- Partner distributors and retailers benefit from the sale, installation, and maintenance of certified energy-efficient and environmentally friendly equipment.

On-bill financing mechanism is a unique solution that can be used by partner technology providers to promote and sell certified highly efficient and climate-friendly appliances as well as by partner financial institutions seeking to provide green loans to households for the purchase of products generating significant energy savings and climate benefits. The power utility (ESCOM) and MoE act as facilitators and intermediaries of choice, through coordination and market surveillance, implementing and strengthening their positions as key actors in energy efficiency in Malawi. They promote certified systems and partners and are also able to refer potential household customers to partners. On-bill financing will increase the supply of green credit to support energy efficiency in the residential sector, greatly facilitate access to efficient and climate-friendly domestic refrigerating appliances, open access to new markets for technology providers and will promote the modernization of the utility as the electricity provider company of the future through this national energy efficiency programme. The following financial structure is recommended based on the market assessment.

On-bill financing is a low-risk mechanism supported by modern technology. Adapting the existing consumer loans or credit facilities to make it accessible to a larger number of households requires adapting and simplifying the conditions for allocating loan or granting credit, by unlinking them from the condition of domiciliation of household income. Indeed, a simple and effective solution is to rethink the recovery mechanism for the loan repayments and link repayments to household prepayment metering systems instead, in order to broaden the outreach of the programme. This offers a similar or improved management of risks for the partner local financial institutions. The mechanism combines various complementary financial and non-financial components and offers a simple credit recovery mechanism.

On-bill financing is an innovative mechanism that proves very effective for smaller investments and is therefore ideal for households who are customers of the partner utility and wish to replace their domestic refrigerating appliances for new energy-efficient and climate-friendly ones. The mechanism allows these households to repay green loans or credits

obtained from partner financial institutions and vendors through their prepaid metering systems with the utility.

Targeting prepaid metering increases the feasibility, management, and efficiency of operationalising the mechanism for the utility and adapting the repayment interface for households, increasing the incentives for households to make repayments on due date. Indeed, households tend to always prioritize their electricity consumption payments because they do not want their access to electricity to be ceased. The linkage between electricity consumption and credit repayments thus lowers default as the credit repayment is prioritised over the electricity consumption payments in the prepaid metering systems.

Operationalisation of the on-bill financing mechanism requires significant support from the partner power utility (ESCOM). Among other things, the utility adapts its information management system and prepaid metering system. In return, ESCOM switches from being a simple electricity provider to a provider of electricity and financial services and also has the opportunity to control the electricity consumption of its customers through this energy efficiency initiative, reducing country peak demand and savings on very expensive investments in avoided additional generation capacity. In the preferred approach, ESCOM does not provide financing itself, but is supported by partner local financial institutions, which provide green consumer loans or credit facilities with partner technology providers to households through on-bill financing. The loan is not registered on ESCOM, and it does not bear the default risk. ESCOM is not directly responsible to assess the creditworthiness of beneficiaries but help partner banks by leveraging data on electricity consumption and payments from customer applicants. Partner technology providers and banking or microfinance institutions are the main interface with the beneficiaries. Indeed, the partner local financial institutions provide the financing and assess credit risks for beneficiaries and on-lend to them according to set terms. ESCOM in return collects the payments through the purchase of electricity, where a portion is sent back to the partner local financial institution to pay back the credit. Customer applicants are in agreement to share customer data with partner local financial institutions and reimburse credit through their prepaid metering system with the utility. Approved customers then pay for electricity consumption including contractually agreed deductions from the prepaid metering system. ESCOM collects credit repayments of loans on behalf of the partner local financial institutions and returns these payments to the partner financial institutions monthly.

Simplified customer application and credit risk evaluation. An utility customer wishing to benefit from the mechanism simply gets a pro forma invoice from a partner providers selling certified brand models and submits an application to a partner local financial institution, which verifies the eligibility of the household by directly or indirectly consulting ESCOM applicant customer data (e.g. customer names, contract number, metering number, phone number, email address, electricity consumption history, payment transaction history, etc.) combined with the partner's standard credit data from the applicant. Due to the confidentiality and data privacy policies in Malawi, it might be recommended that ESCOM directly leverages the applicant's customer data in its management information system to evaluate the applicant's credit risk using a simple algorithm combining history of customer data. Doing so, the utility does not have to share the detailed customer data, but instead shares an aggregated credit rating for each applicant customer with the partner local financial institutions.

Semi-integrated systems between ESCOM and partner local financial institutions. ESCOM's customers refund their electricity credits through their prepaid metering systems while the utility, on a regular basis, reimburses partner local financial institutions with which it has entered into repayment agreement for its customers. In order to achieve this, there needs to be either systems integration for an online process or a paper-based approach. It is

recommended that the lead compliance or implementing entities develop and manage the interface between the customers and the programme with support from ESCOM, partner technology providers, and local financial institutions for increased system integration. This takes the form of an online shop for customers wishing to apply for the programme.

Semi-automated credit recovery processes between ESCOM and partner banks. With semi-integrated systems, it is recommended that partner local financial institutions and the utility follow semi-automated processes rather than fully automated processes to avoid further development related costs. When the utility's customers are approved for a credit from a partner banking institution, a list of names is shared by email with specific information on allocated credit that ESCOM needs to recover on an agreed frequency. This can also potentially be done by logging into ESCOM system and uploading the file with the list on the utility server. After getting approved credit customers into the utility system, the credit recovery is then automatic. Precisely, once contacted by a partner banking institution, ESCOM fetches for approved customers in its database one by one or adds a file of approved customer names by the partner banking institution and the system connects it automatically. Partner banking institutions can gain limited access to the utility's system in which they input all the required credit information allocated for each approved customer. Then, the utility's system carries the information into the prepaid metering payment system.

Bill repayments and credit recovery. When it comes to the customer's bill repayments and credit recovery on behalf of the partner bank, ESCOM shall confirm bill repayment transactions and credit recovery to partner banks are feasible and can be accommodated. ESCOM shall also confirm that customers are attached to a single metering system. The tracking of customer credit would be feasible because credit repayments are linked with a single customer account identification in the utility's system. The utility's systems might allow various types of customer payments for electricity bills including credit recovery. For instance, customers can either pay by a number of instalments or by a percentage amount charged to a specific meter, in accordance with the type of meter in place. Customers can easily identify the number of instalments or percentage amount charged that is needed to pay back the credit. Nevertheless, to add an extra layer of control, it is recommended that the draft loan agreement with the partner local financial institutions for approved customers clearly stipulates terms, conditions, and obligations, when it comes to loan repayments. To mitigate the risks where landlords might not notify new tenants that an ongoing credit is linked to the new meter or tenants who might not notify a change of address, it is recommended that ESCOM provides a notification to metering customers warning tenants that there is a « credit outstanding of a certain value of money » on the meter. The utility shall confirm whether it is technically possible to flag this directly on the prepaid meter or to send SMS/email notifications to new tenants.

Digitisation of customer application process and MRV into an online shop. The development of an online shop including smart customer interface and customer application embedding credit risk evaluation tool is recommended to lower the entry barriers for interested households and administrative costs for partners. In this case, the application process is done through an online shop where the household selects the desired certified brand model and submits the application directly online. Partners' information management systems are fully integrated, while processes are fully automated. Such a centralised digital solution also facilitates the monitoring, reporting and evaluation as well as MRV of the programme.

Recommended involvement of key national stakeholders:

The following public and private stakeholders are important and are recommended to be closely involved.

- **Ministry of Energy (MoE).** The support from the Government of Malawi is essential for the success of the on-bill financing mechanism option in Malawi. MoE can play a key compliance role in the development and implementation of the mechanism, coordination with public stakeholders, facilitating access to the programme to new partners and technologies, promoting certified domestic refrigeration equipment and partners, and directing households towards the programme. MoE can be central in coordinating and regulating the market and thus offers quality control to households and different stakeholders involved in the proposed financial mechanism when it comes to monitoring, reporting and verification as well.
- **ESCOM.** The partner power utility plays a central role in on-bill financing by collecting credit repayments from customers in their respective regions. ESCOM must adapt, set up, manage, and maintain the credit recovery mechanism. By supporting the programme, ESCOM helps reducing the peak electricity consumption of its customers and thus avoiding the costs associated with running costly additional generation capacity during peak load and the construction of future additional power plants which would require expensive investments.
- **Partner financial institutions.** The partner local banking or microfinance institutions play a key role in developing, implementing, financing, and promoting the mechanism. Partner local financial institutions adapt their offering of consumer credits to propose green credits, while MDBs or GCF might eventually support them with green credit lines, revolving loans funds, or credit guarantees to help mitigate any credit risk and improve concessional lending terms to households. Other key donors such as CTCN could provide technical assistance to promote and develop key components of the mechanism, as well as streamline and digitalise the system integration and processes. MDBs and GCF can advise partner local financial institutions and structure products to reduce their risks and improve their credit terms by eventually offering concessional green credit lines or credit guarantees to finance or de-risk energy efficiency investments starting with energy-efficient and climate-friendly domestic refrigerators and providing technical assistance to support the promotion and marketing, as well as the operationalisation and digitisation of the mechanism.
- **Partner technology providers of energy-efficient domestic refrigerators.** In order to implement the on-bill financing mechanism option to accelerate the adoption of energy-efficient domestic refrigeration equipment, providers must be involved from the beginning as they will play an important role in supplying the market and serve as technical experts. In the proposed on-bill financing mechanism, they are the main interface of the programme, allowing the interested household to consult a catalogue of certified and eligible equipment and get a pro forma invoice and credit application material to be then submitted to partner banking institutions and co-verified by ESCOM and the lead compliance entities such as MoE. Once a customer is declared approved, a partner provider of certified brand model will dispatch and install the household equipment on credit and eventually collect the turned-in end-of-life equipment into any eligible e-waste management facilities for disposal. As the mechanism is being scaled-up to other market segments, technology providers of off-grid solar refrigerator technologies might be invited to join the programme.
- **Households and micro entrepreneurs.** The principal beneficiaries of the proposed mechanism, on the demand side, are households including micro entrepreneurs that must be customers of ESCOM and thus connected to the grid. Households have been involved from the beginning and engaged through surveys to ensure that the



programme corresponds to their preferences and expectations. Credit and participation conditions to the proposed financial mechanism must be easily accessible, concessional, and transparent, while the application process must be as simple and efficient as possible. Advantages of the programme should be explained through target communications and awareness campaigns. Although the market assessment has already shown findings about households' preferences and expectations, households should be informed continuously on the financial mechanism progress and be invited to provide feedback directly when possible.

7.7.2 Green On-wage Financing

The model:

Green on-wage financing is an innovative mechanism offering flexible and simple repayment terms for sustainable energy products through salary deductions. Green on-wage financing is a consumer finance product designed to meet the short- and medium-term financing needs of salaried employees of public and private institutions that are profiled or have a business relationship with local financial institutions.

First, local financial institutions enter into consumer finance agreements with technology providers and set up credit facilities. Parties agree on a rebate scheme of the amount of a minimum set percentage of the selling price of the selected products sold by the technology providers to qualified customers. Local financial institutions use the rebate received from technology providers to cover the financier's cost of funding to offer short- and medium-term unsecured consumer loans with 0 % interest rate, usually with tenor periods up to 12 months, to qualified salaried employees. This typically supports small investments of up to US\$ 1500 corresponding to the sales of energy-efficient and climate-friendly systems.

Once a qualified salaried employee has successfully lodged a customer application with the selected technology provider and received in return a pro forma invoice, the customer can proceed with the credit application directly with the selected local financial institution. Once approved, the financier is able to credit the account of the technology provider with the amount corresponding to the sales price of the selected product minus the rebate almost immediately from the receipt of the proof of delivery of the selected product.

In some instances, a take-back scheme can be integrated into the green on-wage financing scheme where technology providers agree to cover both the amount of minimum percentage of the selling price of the product to be accorded to the customers in the form of a voucher or cash-back for future purchases and to contracted compliant e-waste management companies to cover the costs of collection, transport, treatment, and disposal of returned end-of-life eligible appliances. In this case, local financial institutions shall also receive a collection certificate from technology providers to proceed with the disbursement of credit.

Finally, consumer loan repayments are directly made from the customers to the local financial institutions and are either guaranteed by their profiled employers or deducted directly from the employees' after-tax salaries. There are different ways to structure the repayments:

- Employees of profiled employers who hold accounts with local financial institutions make repayments through their checking accounts at the end of each month. In the case of default, employers guarantee the repayments. In this case, the balance of due repayments is directly deducted from the salaries. Same conditions apply if the salaried employees leave the employers earlier than expected.
- Employees who hold accounts with local financial institutions agree to make direct reimbursements through salary deductions at the end of each month.
- Employers make the salary deductions for each employee and make a bulk reimbursement for all their employees to the local financial institutions at the end of each month.

The success of the model depends mostly on the interest and engagement of the local financial institutions and their number of existing profiled employer institutions.

Governments and development agencies can play important roles by providing technical support in setting up the model and ensuring compliance once operationalized.

Benefits:

The biggest customer benefits of this model are the avoided upfront capital costs, and the ease of repayment. This can help motivate investments that may not otherwise happen. Access to credit is facilitated and the loan terms offered by local financial institutions are more attractive for end-customers due to rebate negotiations with participating technology providers who wish to promote and sell certified premium appliances through the mechanism. In addition, the establishment of both robust and certified monitoring and reporting of customer applications, as well as measurement, reporting and verification (MRV) processes allows local financial institutions to align with the principles of green finance through the mechanism. Additionally, take-back schemes for proper collection, transport, treatment, and disposal of discarded appliances can also be included, increasing both the incentives and co-benefits of this scheme.

Green on-wage financing facilitates the creation of a pipeline for sustainable energy investment, improves the monitoring and reporting of green loans and sales of energy products, significantly eases access to sustainable energy solutions, tackles the issues of collection and disposal of used products, and opens access to new green markets for partners.

Risks and challenges:

- Engaging a committed and neutral institutional entity that is willing to support the transition towards sustainable energy and play a lead compliance role in green on-wage in order to ensure quality and durability of the scheme in the market. This includes the on-boarding of additional participating local financial institutions and vendors, the certification and registration of sustainable energy products sold through the scheme on a positive list, as well as the tracking and measurement of robust co-benefits of the mechanism.
- Aligning market expectations with the environmental goals of the scheme by negotiating an ambitious but fair percentage of rebates from participating vendors to support key components of green on-wage such as enabling preferential financing from local financial institutions, providing incentives to end-users to return discarded appliances, and supporting the costs of collection and disposal of these, while letting market forces play the main role.
- Building on existing business relationships and agreements between local financial institutions and profiled employer institutions limiting the highest potential market share of the scheme and requesting as many participating local financial institutions as possible in the scheme to maximize its outreach.

Supporting mechanisms:

Green on-wage financing can be supported by bulk rebates negotiations, or green credit lines from international financiers to local financial institutions, to help offer the best loan features to end-consumers (e.g., low interest financing for longer tenor periods) and a viable green lending strategy. Green on-wage financing can be complementary with on-bill financing which would target both salaried and unsalaried customers from the energy utilities allowing loan repayments through electricity bills instead.

Green on-wage financing recommendations

Recommended key components:

1. Green loans and green on-wage financing as a low-risk repayment mechanism

An option is to use bank loans to employees to finance the new energy-efficient and climate-friendly domestic refrigeration systems. The mechanism is well-known in the country and there are existing partnerships between banking and microfinance institutions and employers in Malawi as well, including with Government institutions and private companies, to finance employees through salary deductions. The employee loan will both target customers who are government's employee (40% of survey respondents) and private sector employees (25% of survey respondents). The former target group being perceived as almost credit risk-free by financial institutions due to their employer's strong backing. Both, the burden of upfront investment and the need for collateral are hence removed or reduced, providing more liquidity, and reducing borrowing costs for customers, while drastically reducing perceived risk for financial institutions. Local financial institutions in Malawi offer employee loans with repayment periods extending over a few years. Banking or microfinance institutions might be able to charge below market rates monthly to employees due to lower default risk. Employees' debt burden ratio must be between a certain maximum percentage ratio of net monthly income. Loans are normally between a minimal and a maximum amount in local currency.

2. Bulk rebate negotiation with technology providers

Bulk rebates are negotiated for specific products with the providers in exchange for including their energy-efficient domestic refrigeration products in the programme. With green on-wage financing, both on-grid and off-grid solar refrigerator technologies can be targeted. The aim is not to procure products but to facilitate the entry and sales of energy-efficient products into the market. The benefit for the provider is that the green on-wage financing option will offer them support to significantly increase their sales in energy-efficient systems which are difficult to sell due to competition with inefficient equipment, through facilitating access to credit to their products.

Bulk rebates are expected to be negotiated with providers (distributors, retailers, and eventually brand manufacturers). These rebates are expected to cover the following expenses:

- A reduction in the interest rate charged by partner local financial institutions;
- A voucher gift or cash-back to end-users in exchange of turned-in end-of-life appliances (optional) and;
- To cover costs related to the collection, disposal, and treatment of turned-in end-of-life systems (optional).

A reduction in interest rate offered by partner local financial institutions is of great interest to end users as it reduces costs related to the purchase of highly efficient and environmentally friendly but relatively expensive refrigerating appliances. For instance, an interest rate of 0% serves as a powerful motivational tool to convince end-users to replace their old inefficient equipment. Purchasing a new appliance with a credit facility of 0% gives end-users the feeling of acquiring a new product without bearing upfront fee costs and without any extra charges such as interest rate.

In the process of selecting partner retailers and distributors and arriving at a finance agreement, it is important to understand the estimated margin of the retailer, the likely rebates which the brands may extend. Trade margins are estimated as follows:

- Averagely, a retailer's margin can be estimated at 35% if appliances are purchased directly from a local distributor
- Averagely, a distributor's margin can be estimated at 15%
- If the distributor is also the retailer, it can be estimated that the retail margin is around 45%

Different scenarios are available based on the relationship between the distributor and retailer (e.g., the retailer is the distributor, the retailer is supported by a minimum percentage margin by the distributor, retailers are not supported). Technology providers acting as both distributors and retailers or retailers that are supported by their distributors are identified as the highest potential target partner technology providers in the market in Malawi.

It is worth noting that some local financial institutions might have experience in negotiating with partner technology providers for rebates to enable them to provide consumer loans through wage deductions at concessional rates. Rebates obtained are thus usually used to cover for interest rate income loss.

3. Promotion of qualifying products

There is a need to implement a marketing and promotion strategy to showcase the energy-efficient and climate-friendly products (and eventually off-grid solar PV refrigerators) that are deemed eligible for the mechanism, to explain the financing options and economic benefits to households, and to connect partner technology providers and banking and microfinance institutions with customers. It is recommended that the marketing and promotion strategy is coordinated by the lead compliance entity or implementing agency (e.g., MoE) supported by MDBs, GCF, CTCN to provide credibility and resources, and closely aligned with partner retailers, distributors, and local financial institutions. It is important to show in the market that the partners that are part of the programme have a distinction from the Government of Malawi and supporting partners and that they belong to a special group of partners offering and financing highly efficient and environmentally friendly products.

4. Positive List

It would be required to build partnerships with the banking and microfinance institutions to provide credit to customers for new energy-efficient systems. Employee loan through wage deduction or consumer finance products that might be currently offered by local financial institutions are used by households to finance any kind of products (including inefficient equipment), so it is important to generate a list of certified products and partner providers that are certified by lead compliance entity (e.g., MoE) for the programme. Also known as a qualified product list or positive list, it is informed by eligibility criteria for products to qualify to participate in the programme that would be prepared by the lead compliance entity, refined based on input from local experts in Malawi, and endorsed by the Government. Eligibility criteria can include off-grid refrigerator technologies and distributors.

5. Monitoring, Reporting, and Verification (MRV)

Partners have to comply with the terms and conditions (T&C) for participation in the mechanism including robust MRV guidelines and monitoring and evaluation of customer applications for participation. MRV guidelines are used to estimate the Greenhouse Gas (GHG) emissions impacts attributable to the sales of certified models in lieu of a typical unit in the market, and a set of result indicators. MRV activities focus for instance on tracking GHG emission reductions, funding mobilization, and target co-benefits, which are directly related to the intended impact of the project. The general methodologies, key indicators that will be tracked, as well as the data collection methodologies and responsibilities are detailed in the guidelines. The findings will be used in reporting to financiers and donors, for communications

and outreach, and to help evaluate progress on an ongoing basis. Also, providers of certified products would have to submit a conformity assessment report that would be checked by the main compliance entity (e.g., MoE) or implementation agency and institutional partners or donors (e.g., MDB, GCF, CTCN, etc). A subset of these products would undergo random sample testing to verify claims in the conformity assessment report. It is recommended that partner banking institutions and technology providers adapt and eventually integrate their information management systems into a programme managed online MRV platform to better monitor and report on the financing and sales or certified brand models through the mechanism closely with the compliance entity.

6. Collection and disposal of old systems

It is estimated that for less than US\$ 25, an e-waste management company could be engaged to collect used appliances and to dispose of refrigerant gases in an environmentally and safe manner based on past experiences on the African continent. Those US\$ 25 represents roughly 2-6% of the total cost of a new energy-efficient appliances ranging from US\$ 400 to US\$ 1500. End-users are to bear costs related to the collection and disposal of old systems; however, and in order to reduce financial burdens on households and to make the programme even more attractive to households, it is envisaged to shift this burden on partner retailers and distributors. Thus, costs related to collection and disposal of end-of-life systems are negotiated within the bulk rebate (i.e., 2-6%).

In addition, gift vouchers or cash-back might serve two different purposes. From one side, it provides a further incentive to end-users to replace their old inefficient domestic refrigerating appliance with an energy-efficient and environmentally friendly product. Voucher or cash back are tangible tools that end-users can receive upon the collection of their end-of-life appliance which they can exchange in the future against any other product at their discretion. On the other hand, gift vouchers will serve as a tool to incentivize technology providers to engage in the programme as it gives them the opportunity to build up stronger relationships with customers, to increase their sales and thus their revenues through selling other equipment and appliances to targeted users. It is not clear whether gift vouchers or cash-back are a common practice used in Malawi, whether it is used by many providers; and whether it is widely accepted and appreciated by households though.

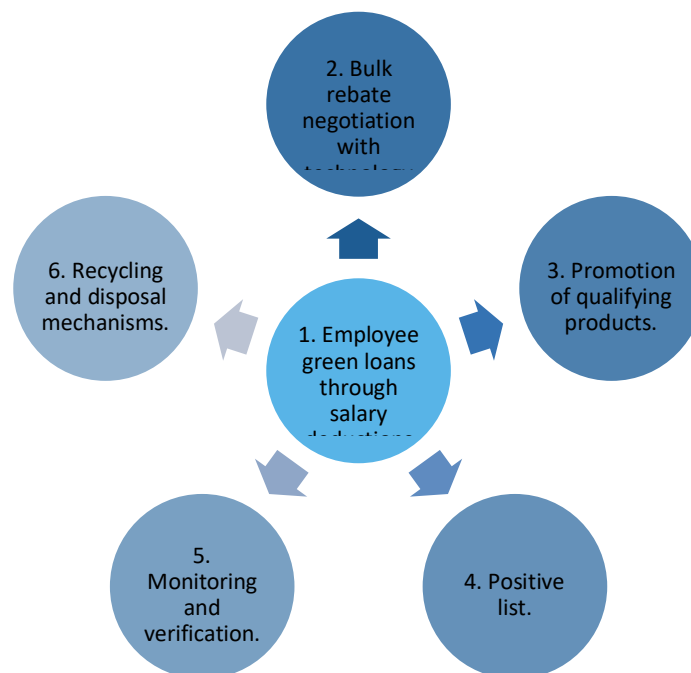




Figure 7-2: Financial and non-financial components of green on-wage financing

Recommended Green on-wage financing scheme:

The green on-wage financing mechanism including all these financial and non-financial components would solve a major hurdle for targeted low-risk segments of the urban household population in Malawi since access to finance was identified as a barrier in the market assessment. As a consequence, green on-wage financing can help lower household energy consumption, boost household welfare, increase household disposable income, while reducing the informal market and formal market for inefficient appliances and transforming the primary market for energy-efficient and climate-friendly residential refrigerators and off-grid solar refrigerators. Green on-wage financing shows high scalability potential as it can be easily extended to more partners and more energy-efficient and climate-friendly systems such as off-grid products or other type of energy-efficient appliances throughout its development, its implementation, and beyond, to enable further upgrading of equipment and decreasing of energy consumption in the residential sector in Malawi. Once the mechanism is robust and visible in the market and that partner local financial institutions are comfortable with managing the risk, higher-risk segments of the population (e.g., rural, off-grid, self-employed, etc.) can be then targeted with updated financing products.

On the demand side, partner local financial institutions can provide loans to end-users as long as they are salaried and can provide the necessary implicit guarantee from their employer that their salaries can cover loan payments and that the employer will transfer part of or full salary to the financial institution throughout the loan period of time. An additional interesting option for Malawi is to have the financing provided by a partner financial institution indirectly to eligible clients through their employer entity. In that case, the financial institution enters into an employee green loan finance agreement with the profiled client's employer entity. The salaried customer makes loan repayments through wage deductions while his/her employer entity makes bulk repayments for all their employees to the financial institution at the end of every month. The employer entity is thus guarantor of the client's loan, reducing the need for stringent credit assessment and collaterals. The client thus receives a green loan from the partner financial institution and buys the equipment upfront from the partner technology supplier based on a positive list of certified cooling technologies and partner technology providers pre-approved for lending. The certified cooling systems are owned by the clients and do not need to be used as collaterals. The use of both scenarios simultaneously is expected.

On the supply side, green on-wage financing addresses the technology and contract risks and motivates partner distributors and retailers to supply highly efficient and climate-friendly systems at concessional terms through support mechanisms. The use of a positive list of certified technologies and partner providers will direct the client towards the primary market which ensures that the acquired equipment delivers high quality output in compliance with the programme. Bulk negotiations with technology providers supplying certified energy-efficient and climate-friendly domestic refrigerators provide further incentives to end-users to choose energy efficient technologies acquired at the primary market rather than equipment available at the second-hand market. After successful rebate negotiation, technology providers agree to the terms and conditions for participation in the mechanism on a voluntary basis to be listed by the compliance entity as special partners in order to access the aggregated demand generated by the programme.

Digitisation of customer application process and online shop. With funds and technical assistance support from MDBs, GCF, or CTCN, the development of an online shop including smart customer interface and customer application embedding credit risk evaluation and

MRV tools is recommended to lower the entry barriers for interested households and administrative costs for partners. In this case, the application process is done through an online shop where the household selects the desired certified brand model and submits the application directly online. Partners' information management systems are fully integrated, while processes are fully automated. Such a centralised digital solution also facilitates the monitoring, reporting and evaluation including MRV of the mechanism.

Recommended involvement of key national stakeholders:

The following public and private stakeholders are important and must be closely involved.

- **Ministry of Natural Resources, Energy and Mining (MNREM).** The support from the Government of Malawi is essential for the success of the green on-wage financing mechanism option in Malawi. MoE can play a key compliance role in the development and implementation of the mechanism, coordination with public stakeholders, facilitating access to the programme to new partners and technologies, promoting certified domestic refrigeration equipment and partners, enforcing the mechanism, and directing households towards the programme. MoE can be central in coordinating and regulating the market and thus offers quality control to households and different stakeholders involved in the proposed financial mechanism when it comes to M&E and MRV as well.
- **Partner financial institutions.** The partner banking or microfinance institutions play a key role in developing, implementing, financing, and promoting the mechanism with support from MDBs, GCF, or CTCN. Partner local financial institutions adapt their offering of salary loans or consumer credits to propose green credits, while MDB and GCF might eventually support partner local financial institutions with green credit lines, revolving loans funds, or credit guarantees to help mitigate further any credit risk and improve concessional lending terms to households, as well as provide technical assistance (from MDBs, GCF, CTCN) to promote and develop key components of the mechanism, as well as streamline and digitalise the system integration and processes. MDB or GCF advise partner local financial institutions and structure products to reduce their risks and improve their credit terms by eventually offering concessional green credit lines or de-risking instruments to finance energy efficiency investments starting with energy-efficient and climate-friendly domestic refrigerators and providing technical assistance to support the promotion and marketing, as well as the operationalisation and digitisation of the mechanism. Partner local banking or microfinance institutions sign agreements with private and public institutions to extend financing to their employees through green on-wage financing.
- **Partner technology providers of energy-efficient residential refrigerators.** In order to implement the green on-wage financing mechanism option to accelerate the adoption of energy-efficient domestic refrigeration equipment, providers must be involved from the beginning as they will play an important role in supplying the market and serve as technical experts. In the proposed green on-wage financing mechanism, they are the main interface of the programme, allowing the interested household to consult a catalogue of certified and eligible equipment and get a pro forma invoice and credit application material to be then submitted to partner banking institutions and co-verified by the lead compliance entity (e.g., MoE) Once a customer is declared approved, a partner provider of certified brand model will dispatch and install the household equipment on credit and eventually collect the turned-in end-of-life equipment into any eligible e-waste management facilities for disposal.

- **Households.** The principal beneficiaries of the proposed mechanism, on the demand side, are households that must be salaried from private or public institutions that are profiled by or in business with partner local financial institutions. Households have been involved from the beginning and engaged through surveys to ensure that the programme corresponds to their preferences and expectations. Credit and participation conditions to the proposed financial mechanism must be easily accessible, concessional, and transparent, while the application process must be as simple and efficient as possible. Advantages of the programme should be explained through target communications and awareness campaigns. Although the market assessment has already shown findings about households' preferences and expectations, households should be informed continuously on the financial mechanism progress and be invited to provide feedback when possible.

7.8 ANNEX G – Recommended Detailed implementation Plan of the financing mechanism for Refrigerators

This section describes the recommended detailed implementation plan, including engagement and coordination with partners for the development and implementation of the financing mechanisms. The responsibilities and activities related with the development and implementation of the mechanisms with partners include the following key action items:

Lead compliance entity (e.g., MoE)

- Source and engage interested local financial institutions and ESCOM to participate in the selected mechanism
- Source, identify, and analyse vendors of certified energy-efficient and climate-friendly domestic refrigerating appliance brand models
- Source, identify, and analyse e-waste management companies for the collection and disposal of used systems through the mechanism (optional)
- Review the details of banking and microfinance institutions' relevant current financing product schemes (consumer loans, salary loans, credit facilities, hire purchase schemes, etc.)
- Review the details of interested retailers and distributors supplying relevant eligible model brands
- Sign Memorandum of Understandings (MOUs) to officialise partnership with interested local financial institutions and ESCOM (partner utility)
- Support the assessment of full integration of financing support, payments, and flow of funding (including rebate)
- Support the assessment of potential costs for the collection and disposal of used equipment (optional)
- Support the preparation and implement of product eligibility criteria and the positive list of certified systems eligible for financing through the financial mechanism option
- Certify brand models (in alignment with the U4E Model Regulations) offered by interested retailers and distributors based on the product eligibility criteria and agree on the monitoring, testing requirements, and verification protocols for certified products sold through the mechanism (i.e., conformity assessment report, random sample testing, etc.)
- Verify conformity assessment report sent by partner technology providers to approve certified energy-efficient and climate-friendly systems
- Supervise random quality testing of a sample of a subset of these products being certified to verify compliance
- Negotiate bulk rebates with interested providers; partners commit to indirectly bring down financing and prices of certified brand models sold through the mechanism for clients (i.e., vouchers, cash-back, and credit facility agreements with partner local financial institutions)
- Sign Memorandum of Understandings (MOUs) to officialise partnership with partner vendors

- Develop a marketing and promotion strategy that aims to raise awareness of the selected mechanism option during the development and implementation including a “communication toolkit” which includes programme branding, possible press release and social media posts to announce partnership on partner communication channels, as well as support on marketing and promotion to integrate the financing product into partner communication channels
- Refine cost-benefit analysis of certified eligible technologies and internal financial structure, which can help partner local financial institutions to define appropriate financial conditions based on available de-risking or concessional financing support from MDBs or GCF to structure financing products to potential customers
- Prepare and implement guidelines to support partner local financial institutions adapt relevant current financing product scheme to deliver of the new financing products to target customers including financing product details, lending terms, conditions, eligibility, and simplified requirements, procedures for reviewing applications, end-user credit assessment template through the on-bill mechanism
- Prepare and implement guidelines and provide framework for monitoring and evaluation (M&E) and monitoring, reporting and evaluation (MRV) for a data management system as part of the mechanism to track financing of approved products to customers and climate benefits attributed to the financial mechanism option (specify the features it should include, recommended protocol for integration into the financial mechanism processes, advising on existing software that may be a good fit for the digitisation of the M&E and MRV, agreement, processes, pricing, etc).
- Certify and oversee the programme and guide households wishing to apply for the programme through partners
- Help structure the flow of information between the different key actors including partner providers of certified brand models, enabling the tracking of project status and develop interface platform and systems for connecting salaried customer or ESCOM (partner utility) customer applications with partner local financial institutions and technology providers
- Capacity building, training, and implementation meetings with partner local financial institutions to support the development and operationalisation of the mechanism option
- Promote certified domestic refrigerating appliances, technology providers, financial institutions, and partners
- Provide an advisory role to partners for the operationalisation of the mechanism option
- Define, review, and enforce product application and customer application processes and draft standardized agreements and contracts to clarify terms and conditions of participation and responsibilities of different actors (e.g., partner technology providers, partner local financial institutions, ESCOM, etc.)
- Review draft standardized agreement between partner providers and partner local financial institutions and ESCOM including credit terms and conditions for customers in the financial mechanism option as well as rebate on credit
- Support the full financial integration of the collection and disposal of used but operable products into the mechanism option in a financially sustainable manner (covered by the rebate), including the proper disposal of the refrigerant gasses.

- Help partner vendors identify and negotiate with e-waste management companies which will support on the collection and disposal of gases in an environmental and safe manner
- Capacity building, training, development and implementation meetings with partner distributors, retailers, banking, or microfinance institutions, ESCOM, MDBs, GCF, CTCN to support the operationalisation of the mechanism option in 2022
- Structure financing, support mechanisms, or de-risking mechanisms based on feedback from partner local financial institutions in order to improve on-lending conditions offered to end-users through the financing mechanism

Partner local financial institutions (e.g., banking institutions, microfinance institutions, etc.) and key institutional partners (e.g., ESCOM, etc.)

- Set up green credits facilities with partner technology providers, structure and provide green loans through salary or prepaid metering system deductions with profiled institutions to low-risk salaried customers or with ESCOM to eligible customers on concessional terms (e.g., 0% financing and long tenor periods)
- Implement the positive list of certified brand models, partner distributors and retailers based on product eligibility criteria set by the lead compliance entity
- Develop a quick and simplified credit application procedure for salaried customers or ESCOM's customers (i.e., credit scoring) wishing to access green loans in exchange of credit repayment on their salary or prepaid metering system with support from profiled employer entities or from ESCOM
- Define standard credit process and sign standardized contract to clarify terms and conditions of participation and responsibilities of different actors (e.g., partner providers to set up the credit facilities, ESCOM aggregating repayments through prepaid metering system, profiled employer institutions guaranteeing the repayment of the green loans of its salaried employees in the event of default, timing of repayments, transaction costs, etc.)
- Draft standardized agreements with profiled employer entities or ESCOM – the entities responsible of the loan repayment collection. This agreement aims to include the application process, requirements, eligibility criteria for salaried employees or ESCOM's customers, the commitment of the entities to act as guarantor of the loans to customers and define the conditions of such guarantees including the timing of repayments and the transaction cost flow, as well as system integration and credit recovery processes
- Exchange information to help monitor the programme
- Monitor, verify and evaluate the results of programme and exchange information on the extent of green employee loans granted to participating salaried individuals and M&E and MRV
- Analysis of the possibility of extending green consumer loans and credit facilities with partners for other certified climate technologies

Partner technology providers (e.g., domestic refrigerators, off-grid solar refrigerators, etc.)

- Express interest, go through application and certification to participate in the selected financing mechanism and supplying certified energy-efficient and climate-friendly domestic refrigerators in return for negotiated bulk rebates on systems introduced into the market and sold through the programme

- Provide supporting documents to register certified appliances on the positive list based on product eligibility criteria defined by the lead compliance entity (submission of conformity assessment report, random sampling test, etc.)
- Proceed with signing of terms and conditions, and agreement with partner local financial institutions wishing to become partners detailing the rebate, in accordance with policies and regulations
- Implement the monitoring and evaluation (M&E) and the monitoring, reporting, and verification (MRV) guidelines to track the climate benefits of the programme
- Exchange information with partners to track the progress of the programme
- Consider extending the mechanism to supply other types of climate solutions into the market

7.9 ANNEX H – Distribution Transformers Supply Chain & Market Landscape in Malawi

The supply market for distribution transformers (DT) comprised product suppliers, government officials and other stakeholders as follows:

- The Electricity Supply Corporation of Malawi (ESCOM) Limited – ESCOM is the national power utility company licensed to transmit and distribute electricity in all the regions in Malawi. It was commercialized in 1998 under the Electricity Act 1998 and incorporated as a limited company with 100% shares owned by Government.
 - ESCOM is mandated to sign Connection Agreements (CA) with the electricity generating companies. Malawi operates the Single buyer model where general rights and obligation of market participants are defined by the market rules for the Malawi Electricity Supply Industry.
 - ESCOM installs, operates, and maintains the transmission systems at 400 kV, 132 kV, and 66 kV; and the distribution system at either 33 kV or 11 kV, which is stepped down to 400 V for customers' consumption. ESCOM Procures the bulk of its transformers either directly from foreign manufacturers or through traders. Use local refurbishing companies for servicing and repairing its defective transformers and provides projects that requires connection to the national grid based on the types of contracts used.
 - ESCOM uses detailed specifications to procure its transformers and refers to several IEC Standards, which to the contrary excludes the internationally used IEC 60076-20 on losses. However, ESCOM uses the international best practice to capitalize the future values of no-load losses and load losses. They use the A and B factors to evaluate the total owning cost of their distribution transformers. Their specifications require bidders to supply distribution transformers of either cold rolled grain oriented (CRGO) silicon steel or Amorphous core type, which are the energy efficient type.
 - Malawi Rural Electrification Program (MAREP) – Operating under the ministry of energy to increase access to electricity through grid extension and mini grids development, MAREP is financed through the rural electrification levy, which collects at 4.5% of all energy sales including on fuels defined by law as liquid fuels and gas. The levy is gazetted in the principal legislation, the Energy Regulation Act 2004. MAREP procures and installs, among others, distribution transformers through competitive bidding from foreign suppliers and through local traders. MAREP contracts ESCOM and private contractors to carry out extension of its transmission and distribution networks. MAREP is the second largest importer of distribution transformers after ESCOM and borrow their specifications and evaluation formulae from ESCOM for transformers and power lines.
- Industry - supplied from the main grid at 33kV and 11kV, with dedicated transformers. The survey established that the industrial energy users procure and install own transformers, which are bought and supplied either from foreign suppliers or could be supplied by ESCOM. Some industries, such as Limbe Leaf Tobacco Company for instance, indicated that operation and maintenance of the distribution remains with the power utility to manage while they concentrate on their core business.

- Mini Grids - There are three established and operational mini grids in Malawi:
 - Illovo Sugar Company – The company is supplied through a bulk metering and is connected to the national grid system at a medium voltage of 11kV. The company operates and maintains a 13.53MW, 11kV network complete with distribution transformers to step down voltage to 400 V. The network is used for irrigation and producing sugar. It is in the southern region district of Chikwawa at Nchalo and processes sugarcane to produce sugar. A second plant of installed capacity of 8.24MW and grid connected, is in the central region district of Nkhotakota at Dwangwa.
 - Community Energy Malawi (CEM) – “is a Malawian led and membership driven organization formed as part of the Community Energy Development Programme (CEDP) under the Malawi Renewable Energy Acceleration Programme (MREAP) funded by Scottish Government. CEM are incorporated as Non-Governmental Organization with Government.” It has in total six (6) transformers installed comprising one step up to 33kV and 5 step down to 400Volts. These were all supplied new from K2 Transformers, a local manufacturing company.
 - Mulanje Electricity Generation Company (MEGA) – is a social enterprise funded by international donor agencies. It was developed with support from the British Government’s Department for International Development through the Business Innovation Facility. It is wholly owned by Mulanje Mountain Conservation Trust (MMCT), an endowment trust supporting conservation and development around the mountain.³³ MEGA is a 220kW off-grid micro hydro-based power generation plant. It distributes power at a medium voltage of 11 kV and use transformers to step down the voltage to 400 V. It has in total thirteen (13) transformers installed comprising one step up to 11 kV. These were bought from a foreign supplier in India through a competitive tender.

DT suppliers in Malawi include foreign suppliers, local traders accredited by the national power utility (ESCOM), local manufacturers and local refurbishing companies. The survey established the leading suppliers as listed below:

- K2 Transformers - is a leading local manufacturing and refurbishing company for distribution transformers in Malawi. Their services include manufacturing, repairing, and servicing while their manufactured products comprise 16, 25, 50, 100, 200, 315, 500, 800 kVA and 1 to 3.5 MVA
- Yemurai Pvt Ltd T/A Hawker Siddeley Electric - engages in both manufacturing and refurbishing of distribution transformers with an annual turnover of about 20 units on manufacturing. Their manufactured products ranged from 25 kVA to 2000 kVA of DTs and from 2500 kVA of system transformers while refurbished transformers ranged from 50 kVA to 1000 kVA
- Global Trans-electric Services - engages in refurbishing of DTs of sizes ranging from 50 to 1000 kVA. They reported annual turnover of about 35 in 2020 to 80 in 2021 and projected to over a 100 in 2022 and thereafter.

³³ Mulanje Electricity Generation Agency (MEGA). <https://www.mega.mw/about-us>.

Most refurbishing was draining and replacing oil and changing of bushings. ESCOM’s indicated that 15% of installed DTs were refurbished.

The main stakeholders for DTs in Malawi include:

- MBS - through collaboration with industry develops and adopts standards for the country. The standards are voluntary. The end users refer to the Malawi Standards (MS) developed by the MBS when making procurements.
- MERA – is the energy sector regulator with a mandate to enforce the standards wherever required. MERA is currently not monitoring and enforcing compliance with the standards. A Distribution Code is being developed by MERA in collaboration with the industry players which may incorporate the requirement to comply with relevant standards including the MEPS.
- EAD – is a Department under the Ministry of Natural Resources. They are responsible for the Environment Management (Chemicals and Toxic Substances) Regulations and the Waste Management and Sanitation Regulations.

In summary, the distribution channels emerging from the survey show that the DTs supply chain comprises foreign suppliers, importers, local manufacturing and refurbishing companies and end users in the combinations as presented in Figure 7-3, which implies that all imports are subjected to regulations and codes imposed by the EAD and MERA, where applicable.

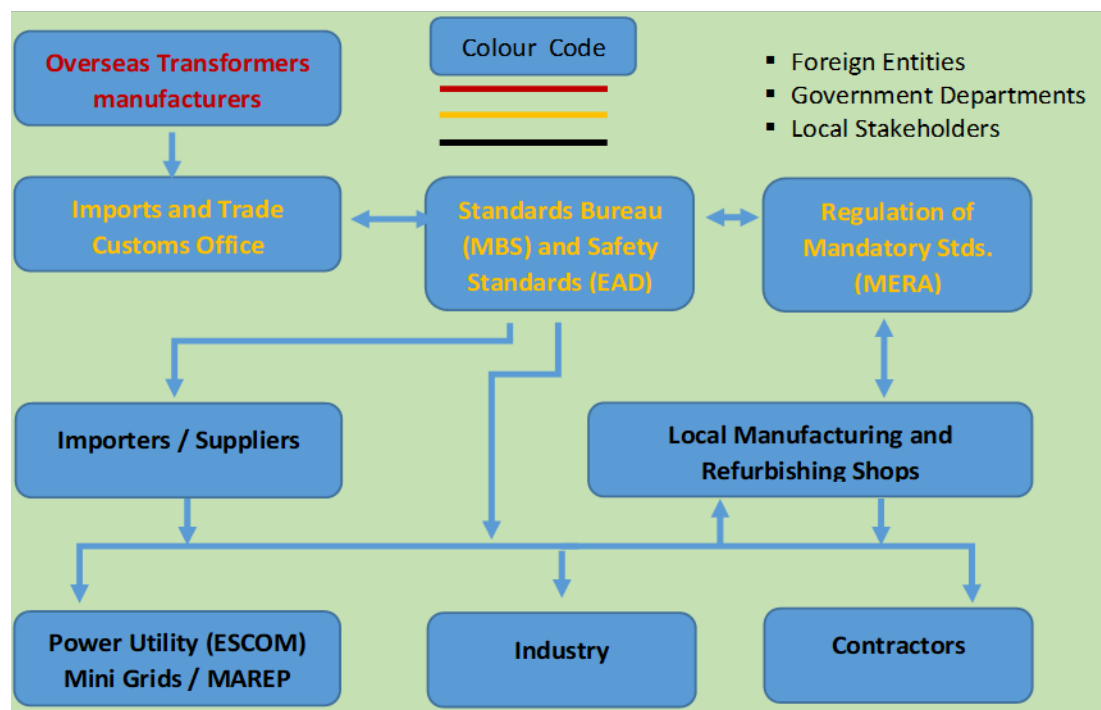


Figure 7-3: Emerging Distribution Channels for Distribution Transformers.

All imports are subjected to the Import and Trade Customs Office, EAD Regulations and Malawi Standards. Compliance with the Malawi Standards is either voluntary or mandatory depending on MERA regulations. Local suppliers are also subject to compliance with the EAD Regulations, Malawi Standards and MERA regulation on the same basis as importers.

The number of new distribution transformers manufactured locally was very small compared to imports. The proportion of the new transformers manufactured locally during the period

2015 to 2020 was at 3.5%. ESCOM imported 55.1% and MAREP imported 41.5% as shown in Figure 7-4.

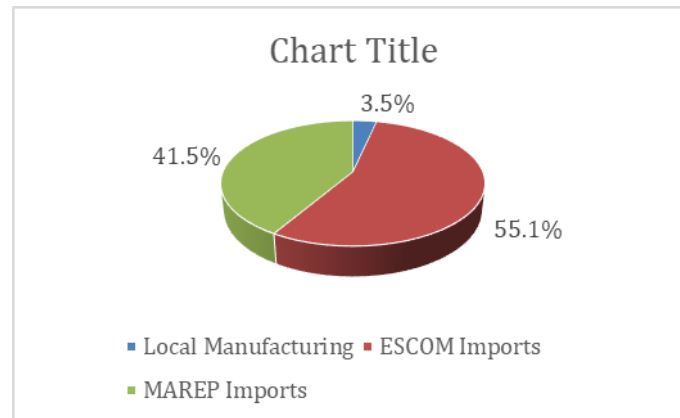


Figure 7-4: Distribution by Suppliers of Distribution Transformers

Malawi’s distribution transformers market landscape

The main purchasers of DTs in Malawi are:

- ESCOM and MAREP – remained the major importers. In addition to importing, ESCOM purchased from all local manufacturers including servicing and repairing using the local service providers.
- Illovo Nchalo, a Grid Connected Mini Grid, despite being supplied bulk power and operating own distribution system, bought from ESCOM;
- Industry, the water boards, and tobacco companies, connected to ESCOM at medium voltage levels of 11kV and 33kV, bought from ESCOM;
- CEM Off Grid Solar Mini Grid - bought from the local manufacturer, K2 Transformers, but the volume of trade was limited due to small size of their system with installed capacity of 80 kW and had six transformers installed in its system; and
- Contracting Companies and commercial suppliers purchased from the local manufacturers.

Two practices were noted on the limitations for pole mounting. The first is by weight and the second by voltage rating of the transformer. ESCOM and MAREP specified in terms of capacity rating while the suppliers specified by weight. Pad mounting was rarely used.

7.10 ANNEX I – Recommended Detailed Implementation Plan of the financing mechanism for DTs

This section describes the expected involvement of key stakeholders, as well as the engagement and coordination with partners for the development and implementation of both options (ESCO EPC mechanism - shared or guaranteed savings and/or Bulk Procurement mechanism). The responsibilities and activities related with the development and operationalisation of the selected option with partners may include, but are not necessarily limited to:

Lead compliance entity (e.g., Ministry of Energy, MDBs, NDBs, GCF, CTCN if providing financing and technical assistance, etc.)

- Source, identify, and analyse ESCOs and technology providers of certified energy-efficient and climate-friendly distribution transformers.
- Source and engage interested local financial institutions to participate in the selected mechanism.
- Sign Memorandum of Understandings (MOUs) to officialise partnership and initiate technical assistance with interested ESCOs and/or technology providers of EE DTs, financial institutions (e.g., commercial banks, MDBs, NDBs, GCF) if providing financing, major end-users (e.g., Power Utility, non-utility market players), and partner government institutions (e.g., MOF, procurement regulatory authority, custom authority, etc.) during the development and implementation phase of the selected mechanism.
- Review the details of interested ESCOs and/or technology providers supplying eligible DT technologies.
- Review the details of interested banking institutions' relevant current financing product schemes.
- Review the details of the procurement regulatory authority and the Power Utility and major non-utility market players' procurement policies, regulations, framework, and processes.
- Support the assessment of full integration of procurement and financing support, tendering and payments, and flow of funding for the selected financing mechanism.
- Support the preparation and implementation of commercial and technical eligibility criteria for financing (e.g., positive list) and review and amendment of technical specifications and procurement regulations through the selected financial mechanism.
- Certify eligible DT technologies (in alignment with the U4E Model Regulations) based on the product eligibility criteria and agree on the monitoring requirements, and verification protocols for certified products supplied and/or procured through the selected mechanism.
- Verify conformity assessment report sent by partner ESCOs, technology providers to approve certified energy-efficient and climate-friendly equipment through the selected

financing mechanism option.

- Support policy and legal framework reforms to support the selected financing mechanism option (e.g., procurement, finance, customs, etc.)
- Refine cost-benefit analysis of eligible EE DT technologies and internal financial structure, which can help partners to define appropriate financial conditions based on available de-risking or concessional financing support from MDBs, NDBs, or GCF to structure financing products to potential clients.
- Prepare and implement guidelines to support partner financial institutions green relevant current financing product scheme to deliver of the new financing products to target clients including financing product details, lending terms, conditions, eligibility, and simplified requirements, procedures for reviewing applications.
- Prepare and implement guidelines and provide framework for monitoring and evaluation (M&E), monitoring, reporting and evaluation (MRV) for a data management system as part of the mechanism to track financing of approved products to clients, energy savings, and climate benefits attributed to the selected financial mechanism option (specify the features it should include, recommended protocol for integration into the financial mechanism processes, advising on existing software that may be a good fit for the digitisation of the M&E and/or MRV, agreement, processes, pricing, etc).
- Certify and oversee the programme and guide ESCOs, technology providers, financial institutions, and end-users wishing to apply for the programme through partners.
- Define, review, and enforce program processes and draft standardized agreements and contracts to clarify terms and conditions of participation and responsibilities of different actors (e.g., ESCOs, Power Utility, non-utility market players, participating technology providers, partner financial institutions, etc.) in the selected financing mechanism option.
- Review draft standardized agreements among lead compliance entity, ESCOs, technology providers, end-users, and partner financial institutions including energy savings agreements, procurement specifications, credit terms and conditions for end-users in the selected financial mechanism option, etc.
- Provide an advisory role to partners for the development and operationalisation of the selected mechanism.
- Capacity building, training, development, and implementation meetings with ESCOs, participating technology providers, financial institutions, the Power Utility, MDBs, NDBs, CTCN, other partners, to support the operationalisation of the selected mechanism.
- Develop and implement a marketing and promotion strategy that aims to raise awareness of the selected mechanism option during the development and implementation including a “communication toolkit” which includes programme branding, as well as support on marketing and promotion to integrate the financing product into partner communication channels.
- Promote certified EE DTs, partner ESCOs, participating technology providers, partner financial institutions, pilot projects, and other partners.

- Consider extending the mechanism to supply other types of climate solutions into the market beyond the program implementation through the Super ESCO model led by energy efficiency agency.

Partner ESCOs and/or participating technology providers (e.g., manufacturers and distributors of EE distribution transformers)

- Express interest with lead compliance entity to develop and implement the selected financing mechanism.
- Sign Memorandum of Understandings (MOUs) to officialise partnership and receive technical assistance from lead compliance entity to structure financing mechanism with interested end-users (e.g., the Power Utility, non-utility market players), financial institutions (e.g., MDBs, NDBs, GCF, commercial banks, etc.) during the development and implementation phase of the selected mechanism.
- Provide supporting documents including financial statements, technical standards of equipment, procurement specifications, etc.
- Support the assessment of full integration of financing and procurement support, tendering and payments, and flow of funding for the selected financing mechanism.
- Support the preparation and implementation of commercial and technical eligibility criteria for financing (e.g., positive list) and/or procurement technical specifications through the selected financial mechanism.
- Comply with product eligibility criteria, additional or revised procurement regulations and agree on the monitoring requirements, and verification protocols for certified products supplied and/or procured through the selected mechanism.
- Support cost-benefit analysis of eligible EE DT technologies and internal financial structure, which can help partners to define appropriate financial and procurement conditions based on available de-risking or concessional financing support.
- Develop and implement the monitoring and evaluation (M&E), and monitoring, reporting, and verification (MRV) guidelines to track the energy savings and climate benefits of the selected financing mechanism option.
- Proceed with signing of terms and conditions, and agreements with lead compliance entity, end-users (Power Utility, non-utility market players), and other partners for the development and implementation of the selected financing mechanism.
- Exchange information with partners to track the energy savings and progress of the development and implementation of the selected financing mechanism.
- Support the development and implementation of a marketing and promotion strategy that aims to raise awareness of the selected mechanism option.
- Consider extending the mechanism to supply other types of climate solutions into the market beyond the program implementation.

Power Utility:

- Express interest with lead compliance entity to develop and implement the selected

financing mechanism.

- Sign Memorandum of Understandings (MOUs) to officialise partnership and receive technical assistance from lead compliance entity to structure financing mechanism with partner ESCOs and/or participating technology providers, non-utility market players, financial institutions (e.g., commercial banks, NDBs, MDBs, GCF), other government institutions, during the development and implementation phase of the selected mechanism.
- Provide supporting documents including financial statements, technical standards of equipment, procurement documents including technical specifications and processes, etc.
- Support the assessment of full integration of financing and procurement support, tendering and payments, and flow of funding for the selected financing mechanism.
- Support the preparation and implementation of commercial and technical eligibility criteria for financing (e.g., positive list) and/or additional or revised procurement through the selected financial mechanism.
- Comply with product eligibility criteria, additional or revised procurement regulations, and agree on the monitoring requirements, and verification protocols for certified products supplied and/or procured through the selected mechanism.
- Support cost-benefit analysis of eligible EE DT technologies and internal financial structure, which can help partners to define appropriate financial and procurement conditions based on available de-risking or concessional financing support.
- Develop and implement the monitoring and evaluation (M&E), and monitoring, reporting, and verification (MRV) guidelines to track the energy savings and climate benefits of the selected financing mechanism option.
- Proceed with signing of terms and conditions, and agreements with lead compliance entity, ESCOs and/or participating technology providers, other partners, and non-utility market players for the development and implementation of the selected financing mechanism.
- Exchange information with partners to track the energy savings and progress of the development and implementation of the selected financing mechanism.
- Support the development and implementation of a marketing and promotion strategy that aims to raise awareness of the selected mechanism option.
- Consider extending the mechanism to supply other types of climate solutions into the market beyond the program implementation.

Partner financial institutions (e.g., MDBs, NDBs, banking institutions) and key institutional partners (e.g., GCF, CTCN, etc.)

- Set up green credits lines or credit guarantees with ESCOs and/or end-users (Power Utility, private users), structure and provide green loans and develop quick relevant application

procedures.

- Define standard credit process and sign standardized contract to clarify terms and conditions of participation and responsibilities of different actors
- Draft standardized agreements between ESCOs and end-users where the shared savings model or the guaranteed savings model terms are accurately stipulated.
- Exchange information to help monitor the programme.
- Monitor, verify and evaluate the results of programme and exchange information on the extent of green loans granted to ESCOs and/or end-users
- Analysis of the possibility of extending green loans and credit lines with partners to promote investment in other climate technologies through the selected financing mechanism.
- Support the development and implementation of a marketing and promotion strategy that aims to raise awareness of the selected mechanism option.

7.11 ANNEX J - Monitoring, Verification, and Enforcement (MV&E)

The Monitoring, Verification, and Enforcement (MV&E) is a core component of the integrated policy approach toward energy efficiency market transformation. It revolves around monitoring markets, verifying compliance, and enforcing regulations on companies that fail to meet them. MV&E’s major activities are:

- Monitoring: market surveillance activities to identify potential cases of non-compliance
- Verification: testing or processes to evaluate the product’s performance compared to its claimed energy performance usually through third-party
- Enforcement: acting against non-compliance offenses with a suite of timely and appropriate actions

Error! Reference source not found. highlights the fundamental aspects of MV&E.

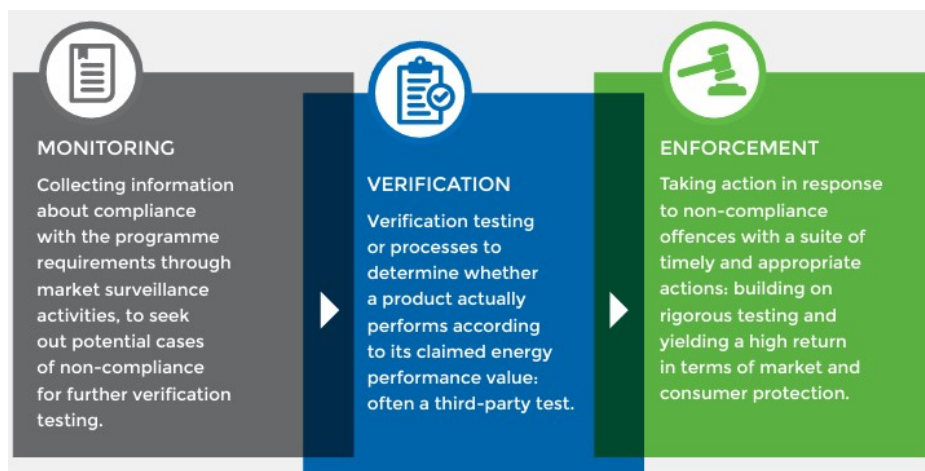


Figure 7-5: MV&E Process

Source: U4E (2017). Accelerating the Global Adoption of Climate-friendly and Energy-Efficient Refrigerators³⁴

The benefit of a proper MV&E program is to ensure compliance as summarized in Figure 7-6.



Figure 7-6: Benefits of Proper MV&E Program for Energy-Efficient Appliance and Equipment Regulation

Source: Toolkit: Monitoring, verification, and Enforcement (MV&E), IEA

³⁴ <http://united4efficiency.org/wp-content/uploads/2017/06/U4E-RefrigerationGuide-201705-Final-R1.pdf>

MV&E is considered a mechanism with the highest return in terms of market and consumer protection. An effective MV&E scheme ensures policy integrity and creates a level playing field where manufacturers comply with standards and labelling programmes, consumers receive the benefits promised by the appliance label, and government achieves target national impact (i.e., energy savings and emissions reduction towards their NDC goals).

When starting to implement the MEPS and Labels program, the following issues must be reviewed to identify:

- Regulatory authority power
- Public and private technical capacity
- Required market entry conditions and testing infrastructure
- Compliance assessment
 - How to streamline the process
 - How to regularly monitor and survey the market
 - How to verify the performance
 - What are the potential areas of non-compliance

This information is then used by the designated authority to:

- Design the market entry conditions, as shown in **Error! Reference source not found..**
 - Recognize the cost distribution between the Government/Program, Industry Participant, and Consumer
 - Understand the trade-off in complexity for the different entry conditions.
- Devise the market surveillance plan
- Develop the verification plan – regional harmonization and discussions with major trade partners can be quite important in this step
- Develop an enforcement plan with a penalty structure (monetary and otherwise)
 - Penalty should be commensurate with the level of offense
 - Visible and communicated with the region (e.g., SADC) and trade partners

Table 7-1: Trade-off between entry conditions and distribution of costs

Entry Condition	Distribution of Costs		
	Government/ Programme	Industry Participant	Consumers
In-house testing, calculation or self declaration allowed	High cost in market surveillance & verification testing	Low compliance costs	None
Independent tests required	Medium cost in market surveillance & verification testing	Medium initial compliance costs	May fund compliance costs in price of equipment
Third-party verification and/or certification required	Low cost in market surveillance & verification testing	High initial compliance costs	May fund compliance costs in price of equipment

Figure 7-7 depicts the overall framework for planning and reviewing the MV&E regime for appliance standards and labelling.

Planning and Reviewing a MV&E regime

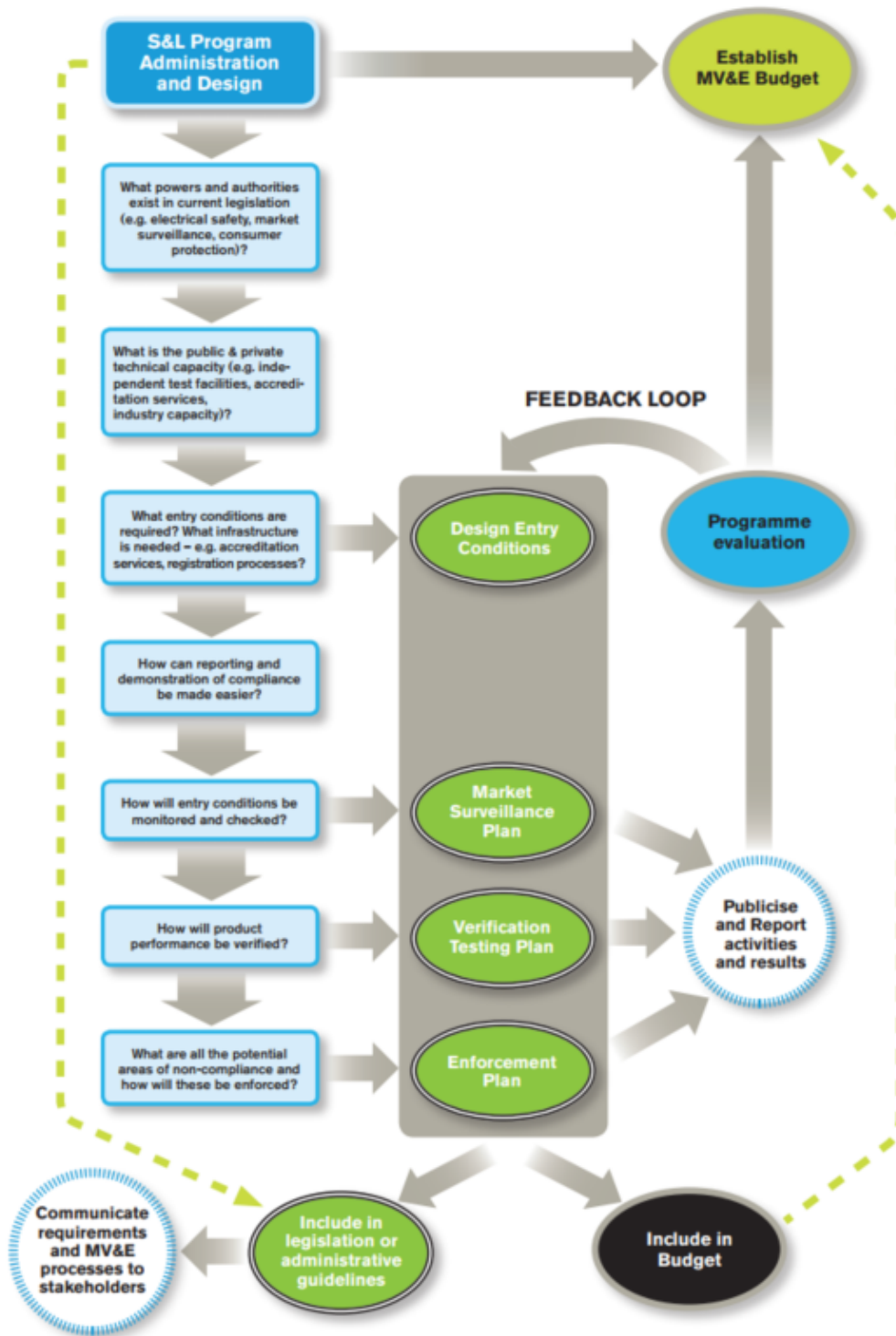


Figure 7-7: Planning and reviewing an MV&E regime

Source: Compliance Counts: A Practitioner’s Guidebook on Best Practice Monitoring, Verification, and Enforcement for Appliance Standards & Labeling, CLASP³⁵

³⁵ <https://clasp.ngo/publications/compliance-counts-a-practitioners-guidebook-on-best-practice-monitoring-verification-and-enforcement-for-appliance-standards-labeling>

Figure 7-8 presents a typical MV&E plan for DTs.



Figure 7-8: Typical MV&E plan for DTs

The following concerns must be considered in planning MV&E

- **Legal and Administrative Framework**

When establishing the requisite legal powers and processes, the first step is to assess existing legislation and administrative procedures to determine what extant legal powers and authorities exist to enforce similar regulations. If suitable existing frameworks exist, MEPS and labelling legislation can take advantage of these to speed up implementation and minimize costs.

Legal frameworks must clearly delineate responsibilities between the different government agencies that implement MV&E nationally. Including, for example, the agency responsible for coordinating the MV&E scheme and agencies such as customs and standards and metrology.

An important aspect of MV&E for refrigerators is that in addition to *energy performance* itself, *refrigerant gases* and *foaming agents* should be part of the programme (if legal requirements have been set for these gases). In this case, MV&E should at least cover information requirements that are crucial to facilitate recycling. Their nature and volume should be tested to determine their GWP and ODP.

- **Specification of Requirements**

Conformity assessment procedures need to be specified for each regulated product and should be included in the applicable legislation. These procedures must be drafted and adopted by the regulators responsible for MEPS and energy labelling.

A conformity assessment procedure includes steps by suppliers and officials to ensure that products adhere to MEPS and labelling requirements before being placed on the market. It includes testing to determine performance, a declaration of performance, and documenting the assessment.

The procedure lists the steps that a supplier must follow to ensure that a product that they wish to place on the market complies with all legislative requirements. If the requirements are unclear to suppliers or impractical, there is an elevated risk of non-compliance and missing documentation, even when market actors aim to abide by the law.

The aim is to secure the confidence of consumers and public authorities in the conformity of regulated products, allow fair competition between manufacturers/importers in the conformity of regulated products, and ultimately ensure that the environmental objectives are met.

U4E Guidance on Ensuring Compliance with MEPS and Energy Labels further presents examples of conformity assessment protocols for refrigerators, as cited in European Union regulations³⁶.

- **Product Registry Systems**

The establishment of a product registration system (PRS) is good practice to offer an initial compliance gateway whereby suppliers register products with the regulatory authority, and to enhance conformity. When government sets up PRS, it has to do so via legislative and/or regulatory authority.

The registration process usually requires manufacturers/importers to submit test results on the products and certify that the product performance meets the MEPS, and/or any labelling requirements before the product can be placed on the market. Such registration systems can facilitate market compliance controls. Suppliers need to enter product information into the database.

With the system in place, the assigned ministry checks declarations and supporting documentation. If all required information has been provided and automatic consistency checks are satisfactory, the ministry either grants permission for the product to be placed on the market by providing a mandatory *registration number* or withholds approval until identified issues have been resolved. Additional manual assessment is necessary to verify that all the details have been properly provided and that there are no contradictions or other remaining non-compliance concerns.

Such a system helps ensure that there is a systemic third-party inspection of the technical documentation and that the supplier is fully aware of the requirements. It is important that the parameters in the PRS permit the calculation of each product's energy efficiency so that the consistency of this information with the declared energy efficiency can be checked.

The data fields typically recorded in the PRS databases for domestic refrigerators include brand, model, category (for example refrigerator, refrigerator-freezer), volumes of the different compartments, climate class, nature, and volume of refrigerant gases.

U4E guidance notes on product registration systems further outline best practices³⁷.

- **Testing Laboratory**

Although having a national laboratory can be a prestigious asset to manage, in reality, laboratories are expensive facilities to establish, commission, earn accredited and maintain. A certain minimum level of business generated by the market is needed to sustain the laboratory and to ensure it has adequate revenue to operate.

Countries with smaller economies should consider looking at outsourcing their laboratory test needs to neighbouring countries or other entities until their economy grows and they are able to justify direct investment in a domestic facility. Sharing of facilities themselves is not a common practice due to the difficulty of transporting refrigerators long distances. However, the same results can be achieved by simply sharing test results. This should be considered in particular for neighbouring countries that have similar products on their markets and have chosen the same test standard for their MEPS and labels.

³⁶ <https://united4efficiency.org/resources/ensuring-compliance-with-meps-and-energy-labels/>

³⁷ UNEP U4E (2020) Product Registration System Guidance Notes include 1) What is a Product Registration System and Why Use One? 2) Planning to Build a Product Registration System? – Foundational Considerations 3) Planning to Build a Product Registration System? 4) Detailed Consideration Implementing a Product Registration, all available at: <https://united4efficiency.org/product-registration-systems/>

- **Communications**

Communication is a critical element of any successful MV&E scheme. For manufacturers/importers, it helps to ensure they are aware of their legal obligations, and what happens if they were found to be non-compliant. For consumers, it lets them know that their government is working hard for them, ensuring that the national market for a given product offers a fair and level playing field. Communication can also be a powerful tool in gaining the respect of regulated businesses, and improving compliance rates –

In order to achieve these programmatic outcomes, it is necessary for the government to develop a communications plan. This plan should be fine-tuned and appropriate for the domestic market, taking into account all the main stakeholders involved in the supply chain, and the importance of communicating key messages to them about the requirements themselves, the risk of detection and sanctions, and any corrective action taken.

The government may consider identifying products and brands that are non-compliant (also called the “name and shame” approach).

In addition to these communications tools, there are a number of tools, training activities, and guidance that can be offered by the government, which will help improve rates of compliance. For example, the government can offer training courses explaining the regulatory requirements. It can maintain a regulatory hotline or email service to answer questions that suppliers may have, publish a frequently asked questions (FAQ) website, and provide guidance on compliance reporting and documentation requirements. All of these approaches will help to minimise the costs of demonstrating compliance and ensure higher compliance rates and more successful outcomes.

- **Market Surveillance Management and Responsibilities**

Market surveillance is conducted by a designated market surveillance authority. As market surveillance is also required for electrical safety, compliance with the Montreal Protocol, and so forth, surveillance functions may be conducted in the same agency rather than separately to avoid duplication of efforts. The techniques are similar, so there can be synergies that provide better value for money. However, adequate market surveillance must also be carried out for energy performance reasons, and the responsible agency must be adequately invested in this arena. The approach typically depends on the primary legislation and the relevant responsibilities of line ministries.

- **Conformity Verification**

Conformity verification begins with the market surveillance authority but links to customs authorities who are responsible for some level of inspection of products to ensure they are approved for entry when they record customs data. Customs authorities need to be informed of MEPS and labelling activities and be actively engaged.

This needs to include training customs officials, linking compliance software tools, and establishing inspections at custom authority control points with supporting back-office expertise supplied by the market surveillance authority. Where product registration systems are used with a remote pre-approval mechanism, customs authorities should have access to the database of compliant registered products to be able to verify that the imports are in the database and permitted to enter the country. Also, check products manufactured/imported within the country, check retailers, and respond to complaints of non-conformity.

The degree to which conformity verification actions are systemic or only conducted at the request of the market surveillance authority is a trade-off, balancing careful consideration of the cost and complexity relative to the benefit of enhancing compliance. The types of

conformity verification, ordered from least costly but least certain, to most certain and more costly, include:

- Documentation inspection and consistency checks.
 - Visual inspections at the point of entry.
 - In-person inspections at stores and online distribution facilities.
- Verification testing at laboratories on energy performance and the stated refrigerant gas and foam blowing agent.

- **Regulatory Enforcement**

In cases of non-compliance, the enforcement authority should carefully consider the degree of non-compliance. The available enforcement actions should be flexible, enabling the enforcement authority to assess the non-compliance situation and initiate a proportionate action. The penalties and powers of the enforcement authority should be set out in law.

The toolkit of powers and actions should be further outlined in administrative procedures or operational guidelines.

Many enforcement authorities develop an “Enforcement Pyramid” to inform and manage their enforcement response strategies. The bottom of the pyramid typically features more informal actions, while the top of the pyramid should reflect the most severe enforcement response to non-compliance (see Figure 7-9 **Error! Reference source not found.**).



Figure 7-9: Pyramid of Escalating Enforcement

Source: UN Environment (2017)³⁸

Recommendation

In order to lower the barrier to the market transformation towards energy-efficient refrigeration appliances, the government might want to consider using soft market entry conditions

- Importers needs to provide third-party test certificate and up-to-date product labels for each model imported

³⁸ U4E Policy Guide Series: Accelerating the Global Adoption of Climate-Friendly and Energy-Efficient Refrigerators, UN Environment, 2017

- Each imported appliance should bear the Energy Label in compliance with the adopted standard

Furthermore, the MV&E officials would need to be trained to verify the labels and the test certificates; this would require:

- Organizing capacity-building activities
- Develop virtual and self-guided training modules (1-hour modules) for customs and other MV&E officials through the EELA training platform <https://training.eela-project.org/>
- Develop brochures for customs officials in the local language
- Coordinate with local training centres to train officials from relevant government organizations and large wholesalers

Finally, the designated authority may wish to explore regional coordination and consider the establishment of a regional product registry to minimize the cost associated with product certification and a regional alert system to ensure that if an offense is revealed in one of the countries, other countries are made aware to avoid potential dumping (diverting of low-quality products to neighbouring countries).

The enforcement framework should follow a systematic approach as shown below:

1. The designated authority submits a notice of non-compliance to the importer
2. The importer is allowed to provide rebuttal information – e.g., third-party test certificates, updated product labels, etc.
3. The designated authority inspects the rebuttal information
 - a. If valid, update the product registry and/or affix the modified label
 - b. If not valid the designated authority has to reject the non-compliant shipment, inform SADC partners of the offense to warn against dumping, and ensure the non-compliant shipment is returned to the country of origin or properly disposed of at additional cost (e.g., reclaim refrigerant charge, recycle plastic and metal, and incinerate or recycle polyurethane foam)³⁹.

³⁹ More information about end-of-life can be found at: GUIDE № 4, Recycling and Disposal of Refrigeration and Air Conditioning Systems at the End-of-Life Phase, September 2020 (https://www.semanaspodsmexico.info/files/guide_4_eol.pdf)

7.12 ANNEX K – Awareness Raising and Education Campaigns

Awareness-raising communication campaigns support national strategies to promote energy-efficient appliances and equipment through MEPS and labelling. In addition to these, changes in end-user behaviour (purchasing more energy-efficient appliances and equipment) can also contribute to energy savings, by making end users more “energy aware” through communication and education programmes.

CASE STUDY: Market Transformation Through the Introduction of Energy Efficiency Standards and the Labelling of Appliances in South Africa

In South Africa, the communication and public awareness campaign under the Market Transformation project started relatively late but has gained momentum in the last couple of years of the project. The mass publicity campaign in newspapers, radio, and television was undoubtedly the key piece to raising consumer awareness about the benefits of energy-efficient appliances and contributed to the recognition of the EE label by the appliance end-users.

Although it commenced relatively late and lasted only for a short period, the campaign proved to be effective. However, the fact that related training of the retailers’ staff was delayed for almost 2 years after the development of the training module shows insufficient coordination and harmonization in the implementation of the campaign and the retailers’ staff training. UNDP recommended that the awareness-raising campaign and related promotional programmes should continue beyond the project time boundary since achieving full market transformation and a shift towards energy-efficient appliances requires a cultural change that requires continued efforts.

Source: UNDP (2020). Terminal Evaluation Report⁴⁰

Designing a Communications Campaign

The success of a communications campaign depends on its design of the following elements:

- **Objectives** should be established in line with policy goals. The objectives should be specific, measurable, attainable, relevant, and time-bound (SMART). They determine the choice of communication tools and messages as well as evaluation parameters.
- **Communication messages** should be simple and relevant to the audience. Messages should make the desired behaviour attractive and easy and should clearly demonstrate the benefits to end users. Usually, monetary savings are a strong motivator in all communications campaigns about efficiency, but in some countries, messages that tap into a sense of national pride may resonate as strongly.
- **Communication plans** should be flexible. They should allow for adjustments based on monitoring results and any circumstantial changes. Project-

⁴⁰ <https://erc.undp.org/evaluation/documents/download/16823>

management skills are needed to successfully manage the launch and ongoing operation of the campaign. Diagnostic skills are used to recognise whether the campaign fulfills its expectations. If the campaign falls short of its goals, then its problems must be addressed.

- **Target audience** should be correctly identified for a communications campaign. This helps in tailoring the messaging to that audience.
- **Communication tools** should include both offline and online channels. Some means of external marketing communication with target audiences are, for example, digital television, and advertising on websites. For written media (offline), the tools can be annual reports, handbooks, or newsletters. The *energy label* also constitutes a successful tool to communicate or provide information about the energy consumption of an electrical appliance to help consumers choose products with increased energy efficiency.

Typical stakeholder education tools include:

- Organizing events at selling places
- Training of trainers for key stakeholders
- Roadshows
- Exhibitions taking advantage of the local energy exhibits
- Brochures
- TV and Radio advertisements

Figure 7-10 depicts the four major target audiences for a communications campaign around energy-efficient appliances and equipment, with some examples of the stakeholders who can be found in those major groups as follows:

- **Government and institutions** that support regulatory and legislative work and oversee policy implementation
- **Retailers and distributors** who facilitate the education of end-users through advertising and training of salespersons
- **Media** that engage end-users in communication campaigns
- **End-users** who should receive clear information and messaging to help make informed decisions

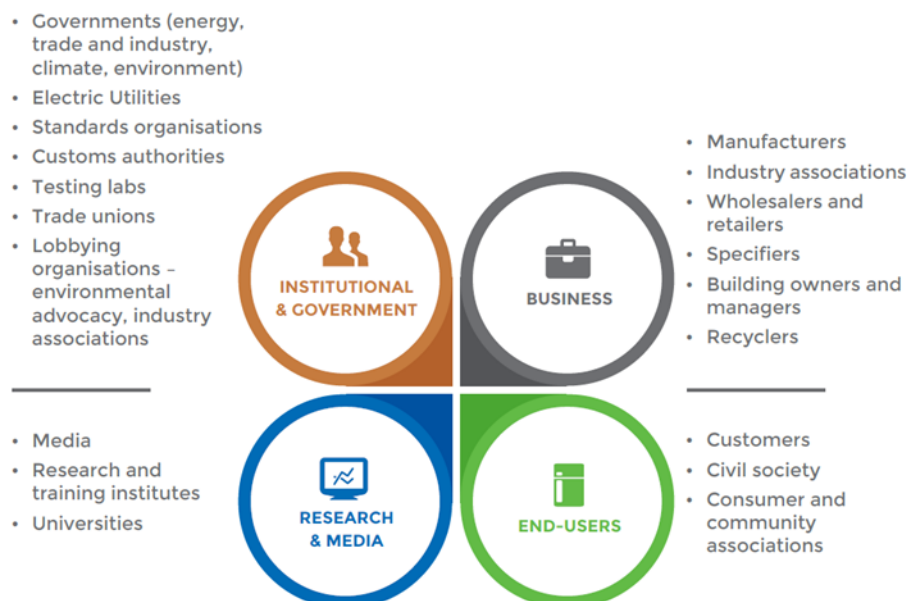


Figure 7-10: Major Target Audiences for a Communication Campaign

Source: UN Environment (2017)⁴¹

Table 7-2 provides more information on the communication interests of these major target audiences. It includes their primary interests and their areas of involvement with respect to energy efficiency for appliances. How exactly various groups of stakeholders are engaged varies a lot between countries and should be defined taking into account the cultural context and available resources. For example, the US has a culture of documenting all decisions and rationale. All stakeholders listed above are invited to take part in the discussions to build a negotiated consensus. The Mexican process relies mostly on subsets of selected stakeholders gathered in technical committees.

Table 7-2: Communication campaign stakeholders and areas of interest and involvement

TARGET AUDIENCE	PRIMARY INTEREST	AREAS OF INVOLVEMENT
INSTITUTIONS/ GOVERNMENTS <ul style="list-style-type: none"> • Governments (potentially several ministries) • Electric utilities • Standards organisations • Customs authorities • Testing labs • Trade unions • Lobbying organisations – environmental advocacy; industry association 	<ul style="list-style-type: none"> • For refrigerators several ministries may be involved: industry, energy, climate, and environment; each of which would have different interests • Reduce electricity use and GHG emissions through energy-efficient and climate-friendly appliances • Ensuring efficiency standards and product quality in the market • Ensure competitiveness of local manufacturers on global markets • Promote market penetration. 	<ul style="list-style-type: none"> • Support regulatory and legislative initiatives and policy implementation through available funding opportunities. • Provide experienced support in identifying success factors for promoting efficient appliances and market transformation. • Evaluate and monitor processes against established targets. • Provide in-kind support to regulatory and legislative initiatives and policy implementation through technical expertise. • Institute green public procurement programmes where only top labelled products would be acceptable.
BUSINESS <ul style="list-style-type: none"> • Manufacturers • Industry associations 	<ul style="list-style-type: none"> • Promoting innovative, energy-efficient new technologies 	<ul style="list-style-type: none"> • Facilitate direct and indirect end-user communication

⁴¹ U4E Policy Guide Series: Accelerating the Global Adoption of Climate-Friendly and Energy-Efficient Refrigerators, UN Environment, 2017

<ul style="list-style-type: none"> • Wholesalers and retailers • Specifiers • Building owners and managers • Recyclers 	<ul style="list-style-type: none"> • Business prospects • Corporate responsibility • Reducing electrical consumption • Managing the end-of-life of refrigerators. 	<ul style="list-style-type: none"> • Guide key actors in promoting sustainable policies and transforming markets to efficient appliances • Provide best practice solutions at the local, regional, or international level • Provide guidance on technical feasibility and realistic time schedules.
<p>END USERS</p> <ul style="list-style-type: none"> • Customers • Civil society • Consumer and community associations • Environmental organisations 	<ul style="list-style-type: none"> • Acquire information to make informed decisions about the savings associated with a switch to efficient refrigerators • Own energy-efficient products. 	<ul style="list-style-type: none"> • Accept and utilise of energy efficient appliances based on first-hand experience and affordability • Provide information about buying habits • Increase the market share of energy-efficient refrigerators and sustain the change in consumption patterns.
<p>MEDIA AND OTHERS</p> <ul style="list-style-type: none"> • Media • Research and training institutes • Universities 	<ul style="list-style-type: none"> • Increase awareness and develop knowledge about energy-efficient refrigerators among professionals and consumers. 	<ul style="list-style-type: none"> • Disseminate information on energy-efficient refrigerators and their benefits to consumers • Identify best practices and policies • Assist governments in implementing sustainable appliance policies • Publish formal and informal education and training materials.

Source: UN Environment (2017)⁴²

In addition, effective communication and education campaigns should gain the active support of the key stakeholders. They should focus on the range of *benefits and outcomes* that end users will enjoy as a result of seeking out and selecting higher-efficiency appliances (refrigerators) or equipment (transformers). If end users can feel good about the outcome, they are more motivated to take an interest in seeking out information and to understand

⁴² U4E Policy Guide Series: Accelerating the Global Adoption of Climate-Friendly and Energy-Efficient Refrigerators, UN Environment, 2017

why it is meaningful to their purchasing decision. Dry, factual messages will have less impact than positive, beneficial statements.

Programme implementers should avoid developing complicated or technical text, graphs, or charts. Messages should be factual enough to be compelling but also user-friendly and simple to be memorable. Some successful energy efficiency communications campaigns have focused on the following benefits and attributes:

- Monetary savings
- National pride
- Energy efficiency and energy savings
- Convenience (long life)
- A simple and hassle-free switch
- Environmental responsibility
- Political and economic advantages and
- Energy security and reliability.

Recommendation

Malawi is considering the design and implementation of its first batch of MEPS and labeling. Energy labeling is a critical component of national market transformation efforts, which allow consumers to make informed purchasing decisions. The campaign will focus on publicizing the refrigerator label and establishing brand recognition around energy efficiency labels for subsequent campaigns. While for distribution transformers (DTs); the communication will focus on educating key stakeholders on the impact of higher-performance DTs and the financial benefits of integrating MEPS in their procurement guidelines. The following recommendations are made as follows:

- **Peer-to-peer communications** (networking/ collaborating peers or partners that define clear functions for the parties involved) should be used to create social and group pressure to change behaviour among like-minded or in physical neighbourhoods/ communities. The combined information instruments can be used such as website, e-groups, media reports, public service announcements etc.
- Campaigns should be designed based on a clear legal framework and contain more practical information on how to comply with the new legal framework. For instance, more focus can be on providing facts about the energy efficiency refrigerator. This can also be combined with efforts to **inform the consumer about the benefits and environmental advantages**. Finally, these campaigns should also provide **information on available financing schemes**.
- These campaigns need to work across ongoing interventions to provide **tailored communications messages** related to the value and function of the product, environmental consequences of switching towards efficient refrigerators, and encourage spin-off effects and local initiatives, like technician capacity building.
- Developing economies working on increased electrification rates may wish to consider equitable access to information and benefits for *low-income groups*. As such, the role of **retailers, point-of-sale information, and local promoters** is crucial in promoting higher-efficiency products. Retail personnel typically affect consumer choices, particularly in rural areas. Awareness and training activities should be directed to retail personnel on the benefits of efficient refrigerators, with information exchange workshops on promotion campaigns in small cities

and rural towns. More skilled and knowledgeable retail staff or other professionals that give advice options can be complemented by more extensive point-of-sale information in terms of information posters or signage.

- **Localized, pilot-tested messages** from different points of view are recognized across the literature on international best practices. For smaller-sized campaigns, or campaigns for a shorter duration, it is important to consider how messages add value or complement ongoing campaigns. Humour and positive reinforcement are considered preferred campaign angles as indicated by several international experiences.
- Multiple **channels** and **approaches** are needed to support the communications and behavioral change objectives. These may include **TV spots (most popular and effective), radio advertisements, road shows**, and involving school children in various writing and drawing competitions with award ceremonies. In nearly all campaigns reviewed, **information dissemination (top-down)** was combined with more engaging methods and approaches (e.g., social networking media, school competitions), and in setting up systems for peer-to-peer communications to occur.

For a developing economy like Malawi, and with the aspirational goal of increased electrification, information access is important. As such, the Malawian authorities may wish to consider a multi-pronged approach to stakeholder education that include:

- **Mini film series** (5 minutes/film) providing the public with information on the benefits of energy-efficient refrigerators
 - The episodes should be developed with different themes, using different real characters or a real character throughout the series. It will be most effective to broadcast the series during prime time on both central and local levels.
- Organize **training, workshops, and forums** related to EE refrigerators shall be held each year for different target groups
 - Officials in government and power utilities
 - Retailers, wholesalers, and salespersons
 - Media agencies and consumers
- Organize **contests nationwide** to support the educational campaigns to encourage the purchases of higher efficiency refrigerators among the Youth Union members nationwide
- Print **communication materials** such as leaflets, panels, posters, notebooks, and student notebooks with contents related to the transition towards higher efficiency environmentally friendly refrigerators shall be designed and printed nationwide
- Explore **links with DSM activities by the electric utility** (roadshows; ESCOM responses to consumers who inquire about high electricity bills: opportunity to encourage them to buy higher efficiency refrigerators).
- Explore **links with Institutions** that have social media channels (e.g., Facebook pages and or blogs) related to energy efficiency to use them to disseminate this information.
- Leverage networks of PWG members.
- Provide timely **“Training of Trainers”** (including current members of the PWG).
- Develop **tailored educational campaigns** for the different target groups (utility and non-utility DT market). These education campaigns should also target municipalities. financial benefits of integrating MEPS in their procurement guidelines. For other customers, it is important to consider including MEPS in public procurement for DTs

