

National Policy Roadmap



National Policy Roadmap Report on Residential Refrigerators in Lesotho

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ABBREVIATIONS

AfDB	African Development Bank
CAR	Conformity Assessment Report
CTCN	UN Climate Technology Centre and Network
DoE	Department of Energy
EU	European Union
GCF	Green Climate Fund
GWP	Global Warming Potential
HEPS	Higher Energy Performance Standard
IMF	International Monetary Fund
IPP	Independent Power Producer
LEC	Lesotho Electricity Company
LED	Light emitting diode
LNDC	Lesotho National Development Corporation
LSI	Lesotho Standards Institute
LSL	Lesotho Loti
MDG	Millennium Development Goals
MEPS	Minimum Energy Performance Standard
MV&E	Monitoring, Verification and Enforcement
NPR	National Policy Roadmap
ODS	Ozone Depleting Substances
PRS	Product Registration System
PWG	Policy Working Group
SADC	Southern African Development Community
TBD	To Be Determined
UA	Units of Account
U4E	United for Efficiency

1 INTRODUCTION

The ‘Leapfrogging to Energy Efficient Appliances and Equipment in Lesotho (Refrigerators and Distribution Transformers)’ project is delivered by the UN Climate Technology Centre and Network (CTCN) with funding from the Green Climate Fund (GCF) and under the guidance of the government of the Kingdom of Lesotho (Lesotho). The project is also being implemented simultaneously within 7 other countries of the Southern African Development Community (SADC) region, namely Botswana, Zimbabwe, Namibia, Malawi, eSwatini, Zambia and Tanzania. Lesotho is one of the few countries in the world that is completely encircled by another country. Lesotho is completely contained within the borders of South Africa. Thus, Lesotho has no access to the coast/sea. Therefore, it is heavily reliant on trade with South Africa be it for equipment or for commodities such as oil, petrol and even electricity. The electrification rate in Lesotho is currently under 45% [1] but it is on the increase. The government of Lesotho has embarked on an electrification campaign, which also targets rural areas. The electrification is also expected to drive economic growth in the country. Currently however, Lesotho imports over 60% of its electricity from South Africa [2]. For this reason, the average price of electricity (generation + import) in Lesotho is quite high and any losses are hence expensive. Refrigeration appliances (and distribution transformers), in particular household refrigerators, are appliances that are constantly operating. As such they always consume energy (24 hours per day, 365 days per year). Therefore, energy efficiency improvements in these appliances have a continuous impact on energy efficiency improvements for Lesotho.

The aim of the project was thus to focus on distribution transformers and household refrigeration appliances and attempt to establish a framework in order to improve the energy efficiency of these appliances. This was done through the establishment of national standards for both refrigerators and distribution transformers and development of Minimum Energy Performance Standards (MEPS) as well as an energy labelling scheme for refrigerators. During the project engagements were held with all of the key stakeholders within the country to create a system through which the necessary legislation can be developed related to the implementation of the MEPS and also to create a national implementation plan that will both enable the implementation of the MEPS but also create a framework within Lesotho for future development of related standards and legislation. Furthermore, the project investigated possible financing mechanisms available to assist the implementation of this project and the respective training programmes to enable transition into a self-sustained and managed implementation of the project in the future. Pegasys was contracted by the UNEP through the UN Climate Technology Centre and Network (CTCN) to implement this initiative in Lesotho. The CTCN is overseeing the project together with United for Efficiency (U4E) as a technical partner. This report focuses on the household refrigeration aspect of the project. As part of the project a number of tasks were completed as per the project plan. These include:

1. Development of the Lesotho National Standard on energy efficiency in refrigerators (including MEPS and HEPS)
2. Development of the Lesotho Energy Label (draft)

3. Development of the consumer awareness campaign
4. Development of the recommendations related to the financial supporting mechanisms
5. Development of the MV&E plan

This report outlines the National Policy Roadmap for the project in Lesotho related to refrigerators. The remaining sections thus outline the background to the project and the impact it can have on Lesotho. There are explanations of the national standard and the energy label and how it related to the regional standard. Furthermore, the implementational aspects are covered in more detail. These include the MV&E implementation and monitoring parts of the project, where recommendations of implementation in particular are detailed. The supporting aspects of the implementation in the form of the consumer awareness and financial mechanisms are explained in more detail. It is important to note that there are separate, more detailed reports on individual aspects of the project, including the energy label, consumer awareness campaign, financial mechanisms and the MV&E plan. However, this report outlines the most important part of each of these aspects and groups them in order to create a policy roadmap for implementation of the entire project. Importantly, the outline of the overall project budget is also presented, with actions and responsibilities.

2 Background

The electrical energy layout of Lesotho is one in which, at the moment, there is a reliance on imports of power from South Africa and a general lack of energy efficiency within household appliances. The legal, regulatory and standardisation frameworks are generally inexperienced and untried with regard to energy efficiency matters. Additionally, the general population is largely unaware of the benefits of energy efficiency and much work will need to be undertaken on the public awareness campaigns related to this issue.

However, there are also a number of opportunities for a successful implementation of MEPS in the refrigeration and distribution transformer environment. These are:

- Successful implementation of MEPS in the refrigeration and distribution transformer sectors could open up a pathway to implement similar projects in other sectors and with other appliances (e.g. washing machines and dishwashers, stoves and ovens, air conditioners, etc.)
- Successful training of the customs officials of the Revenue Services Lesotho (RSL – previously known as the Lesotho Revenue Authority - LRA) in relation to energy efficiency compliance will make them more capable of enforcing other governmental initiatives related to energy efficiency and quality on a variety of products (e.g. air conditioners, power cables, etc.)
- Development of energy efficient appliances could lead to a green building revolution in Lesotho and align with the national energy policies
- Increasing public awareness related to energy efficiency would be beneficial to the general behaviour of the population towards energy use and could provide general energy saving benefits and an energy conscious behaviour beyond the confines of this project.

In order to be able to implement the newly developed Lesotho National Standard on energy efficiency in refrigeration most efficiently a number of areas require understanding so that the impact can be quantified and some of the awareness campaign aspects targeted. Firstly, it is important to note that there are no local manufacturers of refrigerators in Lesotho. All of the refrigerators are imported. The import numbers are shown in Figure 1 below.

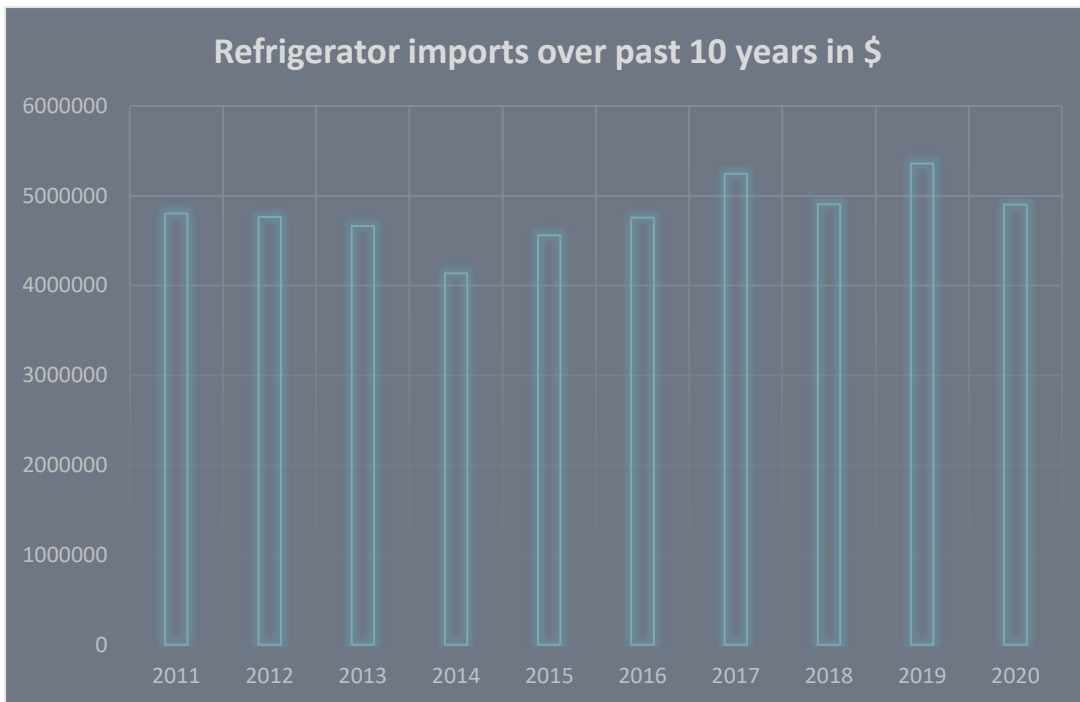


Figure 1. Refrigerator imports over the past 10 years [3]

- The number of units imported in 2020 was 86 962
- The average price per litre of volume of a refrigerator was in the range of 20 LSL/l

Lesotho has approximately 250 000 households electrified. the population of Lesotho is estimated at 2.1 million people [4]. The electrification rate is in the region of 45%. The assumption is made that all of those that have access to electricity would have a refrigerator. This is a fair assumption since refrigerators are one of the main and first appliances bought by persons with access to electricity. From the numbers mentioned above this would mean that 945 000 people in Lesotho live in a household with a refrigerator. The average household in Lesotho is 3.7 persons. Also there is on average 1 refrigerator per household. Therefore, from the figures above, there are approximately 255 000 refrigerators in the country. The DoE is in the process of increasing electrification, especially in the rural areas. Thus more consumers are expected in the near future. With increased electrification there is an increase in the number of electrically powered appliances that are purchased and utilised, including refrigerators. Currently the imports of refrigerators into Lesotho is in the region of 87 000 units per annum as shown above. This figure is likely to grow. The average price of a refrigerator per litre of volume must also be considered in context of the average income of households in Lesotho. This is presented in Figure 2 below.

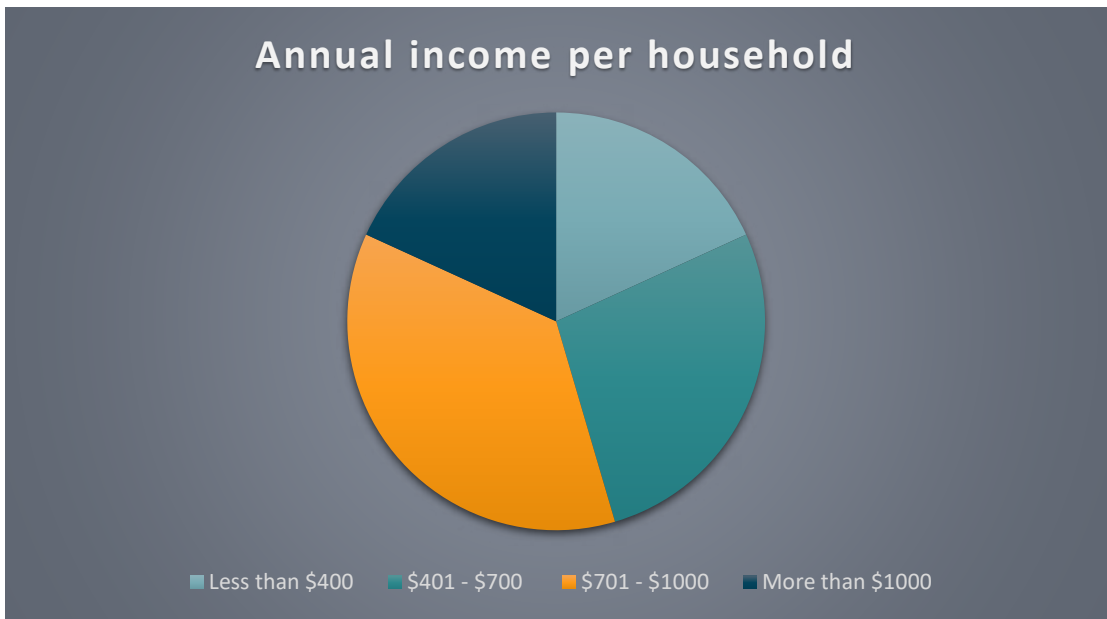


Figure 2. Average household income in Lesotho [4]

Additionally, the current expenditure on electricity in the country per household is shown in Figure 3 below.

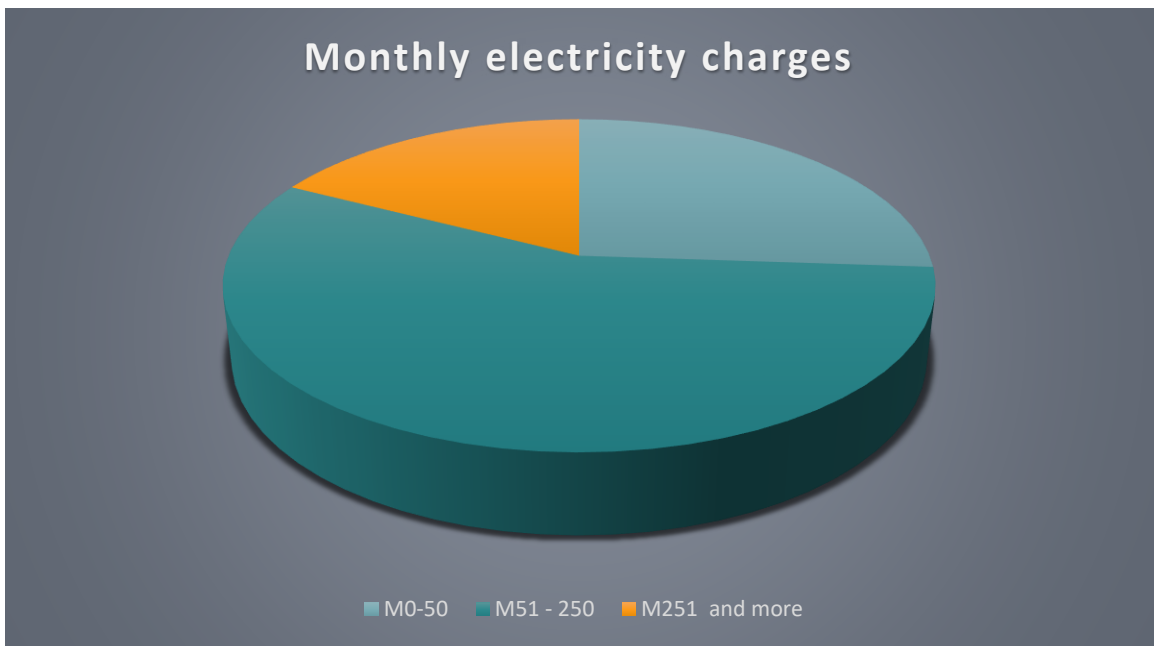


Figure 3. Breakdown of electricity monthly payments per household [4]

Therefore, one can see that a significant portion of the household budget is spent on electricity. Typically the disposable income per household is in the region of LSL 2000 per month [4]. Therefore, the spending is approximately 10% - 12% of disposable income.

Furthermore, it is important to note the age of the existing refrigerators in Lesotho. This is shown in Figure 4 below.

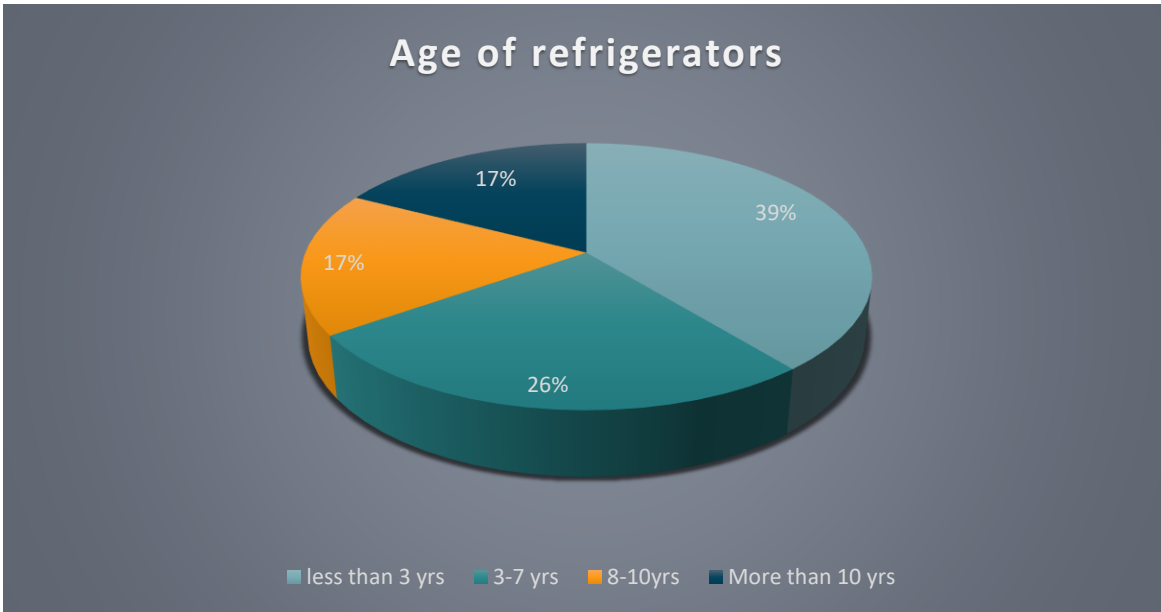


Figure 4. Figure 4. Age of refrigerators gathered from the market assessment surveys [4]

It is common for refrigerators to be replaced within 10 - 12 years of usage [5]. When replacing refrigerators the Lesotho consumers have the following behaviour of purchase as shown in the Figure 5 below.

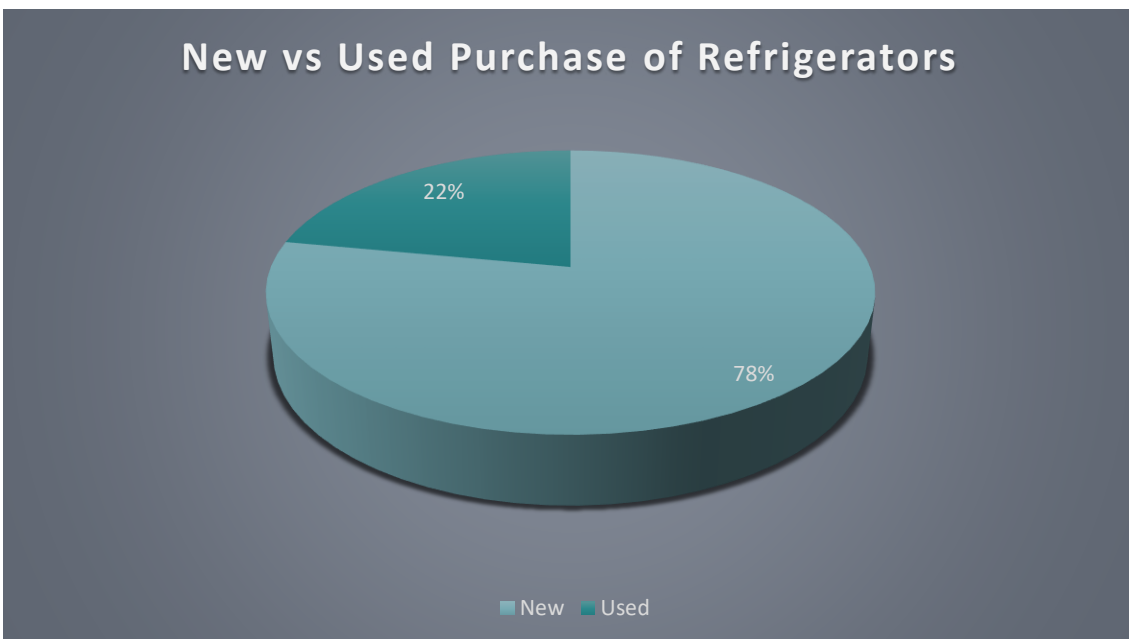


Figure 5. New vs used purchase of refrigerators in Lesotho [4]

Therefore as shown above it was found that approximately 80% of the refrigerators purchased are new. Therefore, there are going to be significant purchases of refrigerators in the next 2-3 years in Lesotho, of approximately 60 000 units per year, if one considers 80% of 87 000 units outlined above. Additionally, the disposable income in Lesotho is not large and therefore spending more on energy efficient appliances is not an easy decision to make even if there are cost savings to be made during the lifetime of the appliance.

There are thus significant savings possible as highlighted in the market assessment report. In order to effect some of these savings the most critical aspects are:

- Development of the national standard
- Development of the energy label
- Development of the regulatory framework
- Development of the implementation plan
- Development of the supporting aspects such as the consumer awareness campaign
- Obtaining financial backing for the implementation of the project

The sections below cover each of these aspects in more detail.

3 MEPS and Testing Standard

3.1 CONTEXT

In parallel with this project and the other 7 national projects in Botswana, Eswatini, Malawi, Namibia, Tanzania, Zambia and Zimbabwe, there is a regional project for SADC currently being implemented. The regional project is aimed at the development of regional MEPS, HEPS and the regional energy efficiency label for the SADC region. It covers cooling appliances such as refrigerators and air conditioners. The participation in the regional project includes all 16 SADC states. Whereas the regional project focuses on the alignment and endorsement of a regional MEPS, HEPS and label, the national project includes the underlying implementation aspects, such as the preparation of the national adoption, the National Policy Roadmap (NPR), the consideration of financing mechanisms to support consumers and consumer awareness campaigns.

The scope of the regional project as well as the national project includes residential refrigerators. The following types of refrigerators are included in the scope of both projects [6]:

- compression type
- with a rated volume at or above 10 Liters (L) and at or below 1,500 L
- powered by electric mains
- offered for sale or installed in any application

There are also certain exemptions that are listed. These are:

- wine storage appliances
- refrigerating appliances with a direct sales function
- mobile refrigerating appliances
- appliances where the primary function is not the storage of foodstuffs through refrigeration
- other products that do not meet the definition of a Refrigerator, Refrigerator-Freezer, or Freezer, and
- other refrigerating appliances different than vapour compression type

As part of the regional project the regional standard has been developed. It has been commented on and after the final comments MEPS and HEPS have been finalised, together with recommendations for the regional label.

The aim was for the 8 countries of the national project to align as far as possible with the regional project. The MPES of the regional project are presented in Table 1 below:

Table 1. Regional MEPS

Product Category	R (2023)	R (2026)
All categories	1.00	1.25

As is evident the regional MEPS R level is 1 from 2023 until 2026 and from 2026 the R level is 1.25 [6].

The regional standard is based on the model regulation guideline as presented by the U4E. This guideline, and the regional standard are largely aligned with international best practices.

Additionally, the regional manufacturing capabilities were taken into account. Furthermore, South Africa is a major role player in the region as the largest economy and with the largest number of manufacturers. This is particularly important to Lesotho as it is landlocked and completely surrounded by South Africa. As a result the vast majority of refrigerators that enter the country do so via South Africa or come from South African manufacturers. Therefore, the decision was made to align the level for tier 1 with South Africa and as a result R was increased from 0.75 to 1 and for tier 2. This is critical as it shows intent and a commitment to move towards higher energy efficiency in the future both regionally and through the adoption of the various countries, including Lesotho.

The testing of the regional standard is based on the IEC 62552:2015 version. The energy consumption is therefore measured according to IEC 62552-3:2015 - Household refrigerating appliances: Characteristics and test methods Part 3: Energy consumption and volume [7]. As per this standard energy consumption is determined from measurements taken when tested as specified at 16° C and at 32° C. This is an extremely important point as this means that the refrigerator only needs to undergo one set of tests (2 tests, one at each temperature). After that calculations can be made to evaluate its consumption and R value for any ambient temperature within the range.

The previous version of the standard is IEC 62552:2007 [8]. In this version the testing is only performed at one ambient temperature. Therefore, if a specific country or region utilises an ambient temperature of, for example, 25° C then the testing would be performed at that ambient temperature. If the same refrigerator model is then to be sold in another country or region with an ambient temperature requirement of 22° C the testing would have to be repeated at that specific ambient temperature. In the new version of the standard one would simply recalculate using weighting factors.

In the regional standard therefore, in order to calculate the R value the following process is utilised:

Firstly, the annual energy consumption of the refrigerator is calculated from the testing performed. The annual energy consumption is calculated using the formula:

$$AEC = EC_T \times (365/1000) \text{ in kWh per year ... (1)}$$

- where EC_T is energy consumption in Wh per 24 hours based on ambient temperature T

In order to calculate EC_T the following equation is used:

$$EC_T = a \times E_{\text{daily}16} + b \times E_{\text{daily}32} \text{ in Wh per day ... (2)}$$

- where $E_{\text{daily}16}$ is energy consumption measured at ambient temperature 16° C
- and $E_{\text{daily}32}$ is energy consumption measured at ambient temperature 32° C

in accordance with IEC 62552-3:2015. In the regional standard the reference ambient temperature for determining maximum energy use requirements is 24 °C. Hence, coefficients $a = b = 0.5$

Therefore, the refrigerator is tested at 16° C for 24 hours and the daily energy consumption is measured. This is multiplied by 365 to get an annual energy consumption at 16° C. Similarly, the refrigerator is tested at 32° C for 24 hours and the daily energy consumption is measured. This is multiplied by 365 to get an annual energy consumption at 32° C. Since the regional standard requires the energy consumption to be indicated at 24° C and this is exactly half way between 16° C and 32° C, the weighting factors a and b are equal and are 0.5. Effectively the two energy consumptions are added and divided by 2 to get the average.

Now that the annual energy consumption of a refrigerator in question has been measured and calculated it has to be compared to a value in order to ascertain whether the energy consumption is good/acceptable or not. This reference value is known as Maximum Annual Energy Consumption (AEC_{Max}). In order to obtain AEC_{Max} there are several processes to take and understand. AEC_{Max} corresponds to the yearly energy consumption of a reference appliance in the standard conditions. It is defined for 3 categories of appliances and this definition depends on the Adjusted Volume (AV), as can be seen in Table 2 below.

Table 2. Adjusted volume conversions [7]

Reference Ambient Temperature	Product Category	AEC_{Max} (kWh/year)
24°C	Refrigerators	$0.163 \times AV + 102$
	Refrigerator-Freezers	$0.222 \times AV + 161$
	Freezers	$0.206 \times AV + 190$

There are therefore conversion factors for the type of appliance as defined in the standard. These are factors based on reference refrigerators that were calculated over years of testing. The aim of the above calculation is to be able to compare the energy calculated in the actual, tested refrigerator against a reference value but the reference value needs to be adjusted/normalised so that the comparison is of the same values/types of refrigerators (effectively comparing like for like).

Therefore, for refrigerating appliances, the main energy service is expressed in terms of the storage volume, but only after it has been normalised to take into account the storage temperature differences in different compartments using a metric called the adjusted volume. Therefore:

This metric takes into account the different compartments, their volume and their temperature

$$\text{The Adjusted Volume}(AV) = \sum(V_i \times K_i \times F_i) \quad \dots(3)$$

Where:

i = index of the compartment

$$K_i \text{ is the volume adjustment factor: } K = (T_1 - T_c) / (T_1 - T_2) \quad \dots (4)$$

The conversion factors with the reference temperature of 24° C are shown in Table 3 below:

Table 3. Conversion factors with the reference temperature of 24° C [7]

Reference Temperature	Fresh food compartment	Frozen food compartment	
T ₁ =24°C	K=1 (T ₂ =4°C)	T _c = -6°C	K = 1.50
		T _c = -12°C	K = 1.80
		T _c = -18°C	K = 2.10

Additionally, F_i is the frost adjustment factor:

- $F=1.1$ for frost-free (automatic defrost) is applied only to frozen food compartments
- $F=1.0$ is applied to all other compartments and manual defrost frozen food compartments

Therefore, now that the AEC_{Max} has been calculated and since we have the AEC we are able to calculate the ration between the measured value and the reference value. This effectively becomes the R value.

Therefore,

$$R = AEC_{Max} / AEC$$

This means that is the energy consumption of the measured (actual unit we are importing or manufacturing) is greater than the reference value for that size and type of refrigerator the R value will be below 1. If the energy consumption of the measured refrigerator is lower than the reference value the R value will be above 1!

Thus the higher the R value the better the energy efficiency of the refrigerator that has been manufactured.

The MEPS and HEPS for refrigerators are therefore determined by this R value. In the regional standard the MEPS have been set to R = 1 unit 2023 and then to R = 1.25 from 2026 as mentioned previously and shown in Table 1. The HEPS have been set as shown in Table 4 below:

Table 4. Regional HEPS

Product Category	Low	Intermediate 1	Intermediate 2	High
All categories	$1.00 \leq R < 1.25$	$1.25 \leq R < 1.50$	$1.50 \leq R < 1.75$	$1.75 \leq R$

These HEPS effectively set the levels for the energy label. Some of the additional requirements of the regional standard, especially related to testing include:

- The temperature inside the fresh food compartment of the refrigerating appliance shall be adjustable to +4°C, as described in IEC 62552-3.
- The temperature inside the freezer compartment of the refrigerating appliance shall be adjustable between -6°C and -18°C, as described IEC 62552-3.
- A four-star compartment must be qualified with the minimum freezing capacity requirements of Clause 8 of IEC 62552-2.
- Refrigerating appliances shall be tested at an AC voltage and frequency, as described in IEC 62552-1.
- Refrigerating appliances shall operate appropriately with the rated voltage with surge protection +/-15%.
- Refrigerating appliances which, according to the manufacturer's instructions, can be used in ambient temperatures below +16°C and have a winter switch, shall have this winter switch automatically activated or de-activated according to the need to maintain the frozen compartment at the correct temperature.

The majority of these requirements are taken directly from IEC 6225:2015. Importantly, the IEC 62252:2015 standard also has other requirements, specifically ones related to refrigerants and these have also been adopted into the regional standard and the Lesotho National standard.

These requirements for Refrigerant and Foam Blowing Agent Characteristics are shown in Table 5 below (the numbers are upper limits):

Table 5. Upper limits of refrigerant in the regional standard [7]

Product Class	GWP	ODP

All types	20	0
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This is a very important point. The previous version of the IEC standard IEC 62552:2007 makes no mention of the refrigerants. Therefore, with the regional standard aligning with the new version of the IEC standard (IEC 62552:2015) there is also alignment with the prohibition of refrigerants with ozone depleting substances (ODS). Importantly, the Lesotho National Standard is aligned with the Regional Standard on this also and hence prohibits the use of refrigerants with ODS. This is in alignment with the various international best practices and agreements that Lesotho has undertaken as described in the previous sections of this report.

Additionally, products using hydrocarbon (HC) refrigerants shall comply with IEC 60335-2-24:2020, or a subsequent revision, or a nationally modified edition of IEC 60335-2-24

The Regional Standard also provides guidelines as to the labelling of the refrigerator, or the use of the Energy Label. The following is stated:

The original equipment manufacturer (OEM) shall provide a label to the importer, product retailer, or installer before the product enters the market [6].

The label shall indicate:

- Model name / number;
- Type of unit;
- Country where the product was manufactured;
- Volume of the different compartments and an indication of whether they are frost-free;
- Rated performance grade;
- 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.
- All representations of energy performance shall indicate that the performance rating is an indicative value, and not representative of actual annual energy consumption in all situations.
- The label shall be affixed on the product in a location that is readily visible for the consumer.
- Products that meet the higher performance grade requirements per Clause 3 of this document are eligible for [TBD by country].

As one can see, there are certain elements of the label that are required by the Regional Standard. Furthermore, the label indicates that the specific countries can specify the higher energy performance levels as per the in country standard. Lesotho has decided to align with the Regional Standard and hence the HEPS are aligned with the HEPS levels of the Regional Standard. The Regional Standard also has additional indications related to proof of compliance/conformity. These are:

Compliance with the requirements of Clause 3 and any additional optional claims shall be demonstrated in the Conformity Assessment Report (CAR), which:

- demonstrates that the product model fulfils the requirements of this standard;
- provides any other information required to be present in the technical documentation file; and
- specifies the reference setting and conditions in which the product complies with this standard.
- The measured storage temperatures of fresh food compartment, frozen food compartment, freezer compartment, other compartments, where applicable, shall comply with the requirements of Table 2 of IEC 62552-2.
- The measured storage volume for each of the compartments shall not be less than the rated storage volume by more than 3% or 1 litre, whichever is the greater value. Where the volumes of fresh food compartment and cellar compartment are adjustable relative to one another by the user, this requirement applies when the cellar compartment is adjusted to its minimum volume.
- The measured energy consumption (kWh/24h) in the energy consumption test shall not be greater than the rated energy consumption by more than 10%.

Furthermore, the Regional Standard has additional comments related to market surveillance, which are:

- The designated authority implementing this standard shall develop a program to check compliance with this standard and survey the market for noncompliance. The program should include details on sample size, lab accreditation requirements (ISO/IEC 17025 certified), and a challenge process that manufacturers can utilise if the initial testing of their product is found to be out of compliance.
- The competent authority will be responsible for enforcement activities that include potential assessment of penalties for non-compliant products in the country. The competent authority shall establish written policies that clearly spell out its authority, procedures, and penalties. All testing done for compliance and market surveillance testing purposes shall be done penalties. All testing done for compliance and market surveillance testing purposes shall be done using the measurement and calculation methods set out in this standard.

In terms of conformity assessment and market surveillance the Lesotho National Standard has largely aligned with the Regional Standard but has also added specifics related to conformity assessment and compliance as well as market assessment. These are further explained in the next sections. The Regional Standard also indicates/prescribes the revision period as follows:

“This harmonized standard shall undergo a systematic review once every five years after approval in accordance with the SADC harmonization procedures. In further revisions, if R values higher than 1 are chosen to determine a stringent requirement in maximum annual energy consumption, the equations in Table 4 do not need to be revised. If R=1 indicates the requirement of maximum annual energy consumption, the equations in Table 4 need to be updated by adjusting the coefficients”.

With regard to the Lesotho National Standard it will be revised after 3 years. This also aligns with the adjustment of the MEPS value after 3 years as indicated in both the Regional Standard and the Lesotho National Standard (from R=1 to R=1.25 as the MEPS). It is however also important to note what the South African energy efficiency standard and regulation look like. This is because the vast majority of refrigerators in Lesotho and in SADC are purchased from South Africa (either from imports or from South African manufacturers). South Africa uses a standard called SANS/IEC 62552:2008. Importantly, it is based on the previous version of the IEC standard, namely, the IEC 62552:2007. The standard has been adopted by South Africa with in country modification. Primarily, the modifications related to the addition of Annex A, where the energy efficiency metrics are defined as well as the energy efficiency classes.

South Africa also has a regulator dealing with what it terms compulsory specifications. These are typically specification that relate to equipment that is either critical to people’s safety or in certain cases (such as energy efficiency) performance that is critical to the country as decided by the government. This regulator is called the National Regulator for Compulsory Specifications (NRCS) and it is established under the Department of Trade, Industry and Competition. The NRCS then publishes compulsory specifications, which set out rules for compliance and often refer to the relevant SANS for specific products. For example, the compulsory specification for energy efficiency refers to SANS 941. SANS 941 deals with all types of appliances (e.g. washing machines, refrigerators, ovens, etc.). From there SANS 941 refers to SANS 62552:2008. This is the standard based on the previous (2007) version of the IEC. This means that the compliance in South Africa is based on testing and calculations as listed in the previous version of the IEC 62552 standard [9].

Hence some of the main differences between the standard in South Africa and the Regional standard are:

The South African standard has the following product categories:

- Refrigerators: Cat. 1-6
- Refrigerator-Freezers: Cat. 7
- Freezers: Cat. 8-9
- As well as Multi-use and other refrigerating appliances: Cat. 10

Additionally, energy consumption:

- Measured according to the old IEC 62552:2007 Household refrigerating appliances -Characteristics and test methods
- Reference ambient temperature : 25°C

It is also important to understand that the testing methodology is different and that the indexes for representing energy efficiency are different. This is critical in understanding that the two standards and the results obtained in each are not interchangeable and cannot be corrected with a factor.

In the previous IEC and the current SANS 62552 the following applies:

Energy Efficiency Index : $IEC = AC / SC \times 100$

Where:

- AC: annual energy consumption of the appliance (tested, measured)
- SC: standard annual energy consumption of the appliance (reference, calculated)

In order to calculate SC the following formula is used:

$$SC = \text{Max} \sum (V_c \times (25 - T_c) / 20 \times FF \times CC \times BI) \times N_a + CH$$

Where:

- V_c: net volume of the compartment
- T_c: design temperature of the compartment
- M_a and N_a: appliance category specific factors
- correction factors:
 - FF: Frost Free
 - CC: Climate Class
 - BI: Built-in
 - CH: Chill Compartment

From these calculations the energy efficiency classes are determined. The South African energy efficiency classes are shown in Table 6 below:

Table 6. Energy efficiency index and corresponding energy efficiency class in South Africa [10]

Energy efficiency index	Energy Efficiency Class
$IEC < 22$	A+++
$22 \leq IEC < 33$	A++
$33 \leq IEC < 42$	A+
$42 \leq IEC < 55$	A
$55 \leq IEC < 75$	B

$75 \leq I\alpha < 95$	C
$95 \leq I\alpha$	D

The current South African MEPS are set on following level:

- Class B for refrigerators and for fridge-freezers
- Class C for freezers

In summary the main differences between the standards are summarised in Table 7 below:

Table 7. Comparison of the SADC and RSA standards

Category	SADC Regional Standard	South African Standard
Test Standard	IEC 62552:2015	IEC 62552:2007
Test ambient temperature	16°C and 32°C	25°C
Ref. ambient temperature	24°C	25°C
Product categories	3	10
EE Metric	$R = AEC_{Max} / AEC$	$I\alpha = AC/SC \times 100$
AEC	Different approach for measurement	
AV	Different approach for calculation	
Refrigerant requirements	GWP = 20 (or less) ODP = 0	Not available

Therefore, critically: results with IEC 62552:2015 cannot be easily compared to results according to IEC 62552:2007!

There are a number of reasons for the update of the IEC standard. And significant improvements have been made in the new version. Therefore, it is a positive that the Regional Standard and the Lesotho National Standard are aligned with the new version of the IEC standard. Some of the main differences and advantages are summarised below:

Advantages of IEC 62552:2015 compared to IEC 62552:2007 and main reasons for change:

- Interpolation of any ambient temperature based on tests carried out at 2 ambience temperature (16°C and 32°C)

- Better capture new technical features of modern refrigerators placed on the market
- Factors M and N (see IEC 62552:2007) are derived from a statistical assessment of the linear trends of the commercially available models in 1992 in the 10 categories: outdated
- The correction factors, also unchanged since a long time, were based on a technical assessment of what would be fair compensation for these features. It has been decided:
 - To eliminate the climate correction factor CC completely;
 - To redefine the chill-compensation CH in a fixed part N_{ch} and a variable part (depending on V_{eq}) M_{ch} , which on average equals the current compensation but aims at more correct distribution
 - To redefine the frost free compensation FF to make it no longer dependent on the equivalent volume V_{eq} but to link it directly to the standard annual energy SAE. The value of such a parameter would still need to be established
 - For the Built-in appliances to use different categories and thus also different reference lines (factors M and N or similar).

All parts of the standard have been largely rewritten and updated to cope with new testing requirements, new product configurations, the advent of electronic product controls and computer based test-room data collection and processing equipment:

- For more efficient analysis and to better characterise the key product characteristics under different operating conditions, the test data from many of the energy tests is now split into components (such as steady state operation and defrost and recovery). The approach to determination of energy consumption has been completely revised, with many internal checks now included to ensure that data complying with the requirements of the standard is as accurate as possible and of high quality.
- Now provides a method to quantify each of the relevant energy components and approaches on how these can be combined to estimate energy under different conditions on the expectation that different regions will select components and weightings that are most applicable when setting both their local performance and energy efficiency criteria while using a single set of global test measurements.
- For energy consumption measurements, no thermal mass (test packages) is included in any compartment and compartment temperatures are based on the average of air temperature sensors (compared to the temperature in the warmest test package). There are also significant differences in the position of temperature sensors in unfrozen compartments.
- The energy consumption test now has two specified ambient temperatures (16°C and 32°C).
- A load processing energy efficiency test has been added.

Furthermore, research was conducted on the compatibility of results obtained when testing with the old vs the new versions of the IEC standard and is presented in [11].

The following conclusions are derived from this study with respect to energy consumption:

- For refrigerators (Category 1, 2 and 3) an average increase of 19 % has been found for a large part due to the lower average fresh food compartment temperature in the new global standard.
- For refrigerator-freezers (Category 7) with a single control (type I) a large spread in data has been found. Product adaptations to better match the new global standard are expected but will be limited. By filtering from the analysis those products which will likely be adapted, an average increase in consumption of 19 % has been found.
- For static refrigerator-freezers with multiple controls (type II) an increase of 7 % was found. The new global standard advantages the frozen food compartment which results in this lower increase compared to the refrigerators group.

- For frost-free refrigerator-freezers of type II an increase of 9 % was found. The difference with the previous group is the fact that the energy for defrost is more strongly taken into account in the new global standard.
- For static upright freezers an average reduction of 1 % was found while for frost free upright freezers an increase of 2 % was found. Again the difference can be contributed to different treatment of the energy needed for defrost.
- For the chest freezers an average reduction of 2 % was noted.

Therefore, energy consumption using different measurements is not interchangeable. It is important to note that many countries and regions around the world have been adopting the new version of the standard (IEC 62552:2015). For example, it has been adopted and applied in China, EU, Indonesia, Kenya, Malaysia, and Thailand. This regional standard will also aim to introduce the usage and adoption into the SADC region.

The above would make the new version of the standard is the logical choice. However, one does need to take note of the fact that South Africa has a unique place in the region as the dominant economy and as the housing of the majority of the manufacturers that sell refrigerators in the region. Therefore, it is crucial that South Africa also aligns with the regional drive towards energy efficiency and the move towards the new version of the IEC. Otherwise, there could be significant challenges for both manufacturers based in South Africa and for the importers into the SADC region, exporters from South Africa, wholesalers and chain stores and the general public. There could be a situation where the South African manufacturers would either need to test their product to the South African standard as per the old IEC and then test again as per the new standard for the SADC region or where they lose out on the market due to the excessive costs of this additional testing. This could also lead to shortage of supply for consumers or inflated prices.

Discussions were held with South Africa on a regional level. South Africa has indicated that it is also updating its regulations and aligning with the regional standard in a sense of transition to the new version of the IEC standard and the update of its MEPS. Whether its new MEPS and HEPS will be completely aligned with the regional standard is unknown at this point, however the most important is the alignment with the new version of the IEC. From above one can see that this will mean that the manufacturers will only require one set of testing to be able to supply to the region.

The one challenge is the South African laboratory for energy efficiency testing, housed by the South African Bureau of Standards. It is currently accredited to the SANS 62552:2008 standard, which is based on the IEC 62552:2007 standard. Therefore, it is capable of testing with an ambient temperature of 25° C. Through discussions with the SABS laboratory during this project it was ascertained that the laboratory in its current setup is unable to perform testing at 32° C, as required by the new version of the standard. This has been raised during the meetings with the South African counterparts and investment will be required into the laboratory to enable it to test to the new version of the standard and get the relevant accreditation. In the region there is another laboratory, housed by Palfridge (the Eswatini based manufacturer). It is capable of testing at 32° C and as per all of the requirements of IEC 62552:2015, although it does not have the necessary accreditation for that standard due to lack of demand for testing to the new version of the standard as yet. It has however committed to obtaining the required accreditation (by the end of 2022) and as soon as the standards are adopted to allowing

external manufacturers to test in its laboratory (under pre-defined conditions of impartiality and confidentiality), which is highly encouraging for the region.

3.2 RECOMMENDATIONS

The Regional Standard has been finalised and it is based on the new version (2015) of the IEC 62552 standard. Lesotho has decided to align with the Regional Standard and is thus in an excellent position to improve energy efficiency of refrigerators within the country if the standard is implemented correctly. The Lesotho National Standard is explained in more detail in the next section followed by the implementation guidelines, which are key to the National Policy Roadmap.

As indicated previously, Lesotho has decided to align with the regional standard in terms of the MEPS and HEPS, in its Lesotho National Standard. Therefore, the R value for the MEPS is 1 from 2023 until 2026 and will increase to $R = 1.25$ as a minimum from 2026.

Additionally, Lesotho has aligned with the 4 levels of the HEPS outlined in the regional standard and presented in Table 2 above. Some countries within the region decided to include an additional HEPS level that is above $R = 2$. However, this was primarily done to encourage local manufacturers to strive for even greater efficiencies. As Lesotho has no local manufacturing the decision was made to align with the regional standard completely in terms of the MEPS and the HEPS. Importantly, the levels of MEPS in particular are attainable by the regional manufacturers. Throughout the project and the regional project extensive discussions have been had with the regional manufacturers. These are primarily manufacturers based in South Africa and Eswatini. The manufactures in these countries have indicated that they are able to produce refrigerators with an R value of greater than 1 presently. They have also indicated that they are either able to reach the updated $R = 1.25$ value by 2026 or are even able to reach that value currently. The transition period is important for 2 reasons. The period of 3 years will allow the public to get used to the energy efficiency standard and most importantly the energy label. It will also allow the manufacturers time to prepare both in terms of manufacturing and testing as well as the logistics of compliance with the standard and the label requirements. Furthermore, it is important as it shows that the energy efficiency requirements are going to increase. Therefore, this is not just a once off for the manufacturers but that there is a drive to improved energy efficiency and that this should be embedded in manufacturing methodologies and techniques. This period will also allow the relevant authorities time to perfect their entry point controls and market surveillance methods.

The Lesotho National standard was thus drafted during the Technical Committee Meetings, under the guidance of the Lesotho Standards Institute (LSI). The final version of the standard was decided upon in June 2022. The standard was then sent for public comment. The aim was for this process to take 1 month. However, through the requirement to reach more of the public through various means this process was extended by the LSI to 2 months. The final comments were due to be received on the 11th of October 2022. So far no comments have been received. There has been no final update from the LSI but the expectation is that the national standard

will be published in early 2023. There is therefore a strong likelihood that the Lesotho National Standard will be adopted as it was drafted in October or November 2022. If there are any comments the Technical Committee will be reconvened to assess these comments, make decisions on whether to adopt or reject them and then finalise the standard. This will therefore provide Lesotho with its national standard on energy efficiency for refrigerators. The standard itself is voluntary and has no regulatory powers or functions at this stage. The regulation will be drawn up separately to refer to the standard and this is outlined in the next section, dealing with implementation actions.

3.3 ACTIONS

As mentioned above the Lesotho National Standard has been drafted. The standard is currently in the process of receiving public comments. The public consultation phase ends on the 11th of October 2022. The final update has not yet been received from the LSI but the expectation is that the standard will be published in early 2023. Once the final comments are received (if there are any comments) a meeting of the TC will be convened. At this meeting the comments will be discussed and decisions made as to whether these comments should be included in the final Lesotho National Standard or whether the comments are to be discarded. At the end of this meeting the final national standard for Lesotho can be adopted. The Lesotho National Standard will then be referred to by the relevant Lesotho regulation related to energy efficiency of refrigerators. The regulation will be developed as part of the implementation of this project and the development of the regulation will be driven by the DoE. Therefore, the regulation will be developed such that it outlines the following:

- Scope of the regulation to align with the scope of the Lesotho National Standard
- Definitions – again aligned with the standard
- Compliance requirements (at this stage reference will be made to the Lesotho National Standard and also the process of the application will be outlined)
- Evidence of conformity – in this section the proof of conformity will be explained, related to accredited test reports and certification as well as the market surveillance process
- Non-compliance – in this section actions against offenders for non-compliance to the regulation will be outlined

The Ministry of Energy and Meteorology and specifically the Department of Energy (DoE) has undertaken the responsibility of driving the regulatory process. The list of actions with responsibilities is listed in Table 8 below. The LSI will be the owner and administrator of the national standard. The regulation that will be drafted will refer to the standard. This is a very important separation. The two main entities driving the standard and related regulation are therefore the LSI and the DoE. The DoE has already been successful in delivering a new regulation related to rural electrification. Based on this regulation they are rolling out the rural electrification programme at the moment. The regulation took 6 months to be finalised. This is an extremely quick turnaround time. The DoE explained that this was possible as it was aligned with the national energy policy. Therefore, there was a relatively quick method of passing the regulation through the governmental processes. They have

indicated that energy efficiency is also strongly aligned with the national energy policy and that they will be able to follow the same route. This will mean that the regulation related to the standard that has been developed can be finalised in a relatively short time. The LSI is responsible for the administrative tasks related to the national standard. This means the organizing of technical committees, the review of the standard, the formalisation of specific working groups, if required, to assess certain aspects of the standard (for example if a specific test method within the standard requires review or another technical aspect) the LSI through the technical committee will organise a working group with specific skills related to the problem that will be reviewed and discussed and a decision made, which is taken to the technical committee for voting. It is therefore very important to distinguish between the standard and the regulation. The standard is a technical document. It is a document that is reviewed and maintained by technical experts. Therefore, it relates to technical matters such as testing methodologies, the energy efficiency requirements – such as MEPS and HEPS, etc. The regulation is a legal document and as it is related to energy matters under the responsibility of the DoE. It will be implemented and maintained by the relevant regulator, LEWA. The regulation refers to the national standard but covers other legal aspects, such as requirements for compliance, penalties for non-compliance, etc. The regulation is thus maintained by the regulator and the standard by the technical committee.

Table 8. Actions and Responsibilities related to the Lesotho National Standard

Action	Responsibility	Timeline
Gather comments from the public consultations	LSI	October 2022
Organise final TC meeting	LSI	October/November 2022
Publish final national standard	LSI	November 2022
Prepare the regulatory framework for EE regulation	DoE	November – January 2022/2023
Draft regulation (including internal governmental processes and consultations)	DoE	January – April 2023
Send regulation for public comment	DoE	April 2023
Review public comments	DoE	May 2023
Publish final regulation	DoE	June 2023
Maintain standard	LSI	Ongoing
Maintain regulation	DoE	Ongoing

The gathering of comments from the public consultations will be completed by the LSI once the process is finalised. As mentioned, the public consultations were due to finish in September, which was extended to October 2022. At the time of writing this report there were no comments received from the public on the national standard. If any comments are received, then the LSI will organise a final TC meeting to discuss the comments and adopt the final standard. The standard will then be published by the LSI. The LSI will then be tasked with maintaining the standard which includes an annual review of the standard, arranging TC meetings if necessary and addressing any potential changes that may occur in standards that the Lesotho national standard refers to. The DoE will drive the regulatory process. This will be done through the regulatory process aligned with the national energy policy. The draft regulation will be made by the DoE's regulatory committee/panel. This will be presented to the DoE and subsequently to the parliamentary regulatory committee. Once the regulation has been finalised through the parliamentary committee the draft regulation will be sent for public comment. Based on the public comments, the regulatory committee will meet and finalise the regulation before publishing. From

there the task of maintaining the regulation will be the responsibility of the regulator LEWA. LEWA will sit on the TC of the national standard and will also be aligned with industry needs. In parallel LEWA will monitor the country's energy efficiency needs and will align the regulation depending on these needs and the impact of the implementation of the regulation. This will be done through the regulatory processes of Lesotho and in consultation with the DoE and the regulatory parliamentary committee.

4 Energy Label

4.1 CONTEXT

The fact that the Lesotho National Standard is aligned with the regional standard would effectively mean that it would be easy for Lesotho to implement the standard in the knowledge that the region is also predominantly using the same standard or the same key metrics and methodologies as Lesotho. This would mean that manufacturers would be able to perform one set of tests per refrigerator type and then use those results to obtain permission to sell refrigerators within the region. The most important aspect that the public will encounter is the energy label that will be placed on refrigerators entering Lesotho. This will be the Lesotho specific energy label. As mentioned in the previous chapter the regional standard has guidelines as to the content of the energy label. The Lesotho National Label has been drafted according to those guidelines. Many label designs have been undertaken in the world. The details of labelling schemes and the choices for the Regional and Lesotho label are outlined in a report specific to labelling that can be found in Appendix A.

Therefore, various experiences from around the world were considered both during the development of the regional label and the development of the Lesotho national energy efficiency label for refrigerators.

The main option for the design was the choice between a dial and a bar type label. Some of the known labels that are either of the bar or dial type are presented below:



Figure 6. Chinese energy efficiency label – bar type

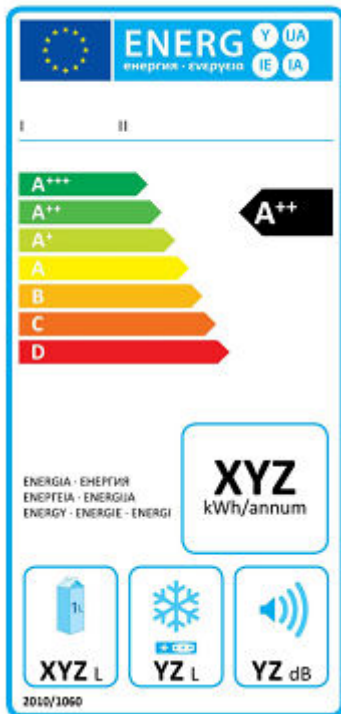


Figure 7. European energy efficiency label – bar type

Some of the dial type labels used in countries around the world are presented below:

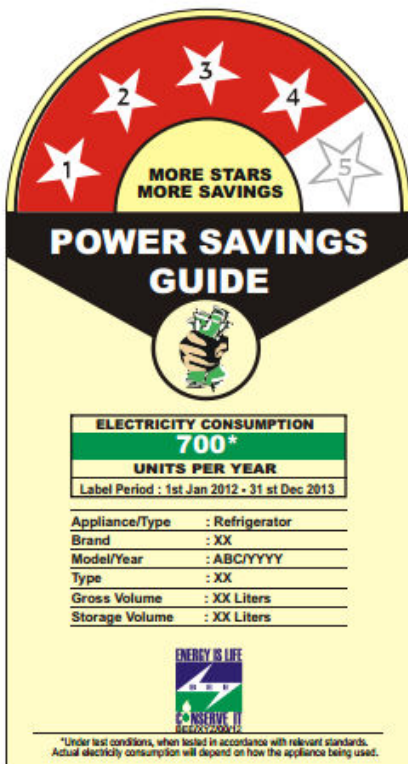


Figure 8. Example of a dial type energy efficiency label

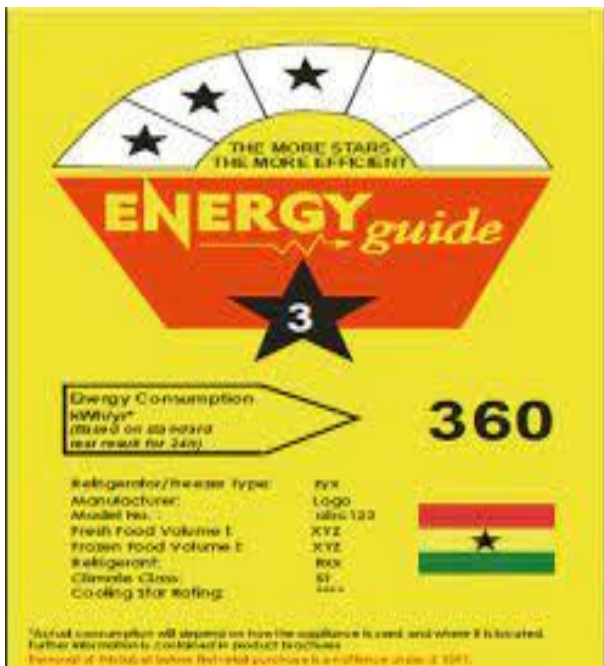


Figure 9. Example of a dial type energy efficiency label used in Ghana

Importantly, in South Africa, during the development of the energy efficiency project the alignment was with the bar label for several reasons. The development of the energy efficiency labels in South Africa was not started with only refrigerators. There were a number of appliances that were included in the project, such as ovens, washing machines, etc. As such research was done on the labels that the South African public had interaction with. There were certain European suppliers that exported appliances to South Africa with the European energy label. Therefore, this was the label type that the South African public had most interaction with. Additionally, the majority of the international consultants that were assisting South Africa with its energy efficiency MEPS, HEPS and labelling programme were from Europe. Thus, they had experience with the European/bar type label and thus the obvious choice for South Africa was to adopt the bar type label.

Since the majority of refrigerators in Lesotho are imported from South Africa and travel through South Africa to Lesotho they also possess the South African Energy Labels. As per the market assessment performed over 97% of refrigerators entering Lesotho come via South Africa. Lesotho is a land locked country that is entirely surrounded by South Africa and this is therefore not surprising. However, the situation is similar (although not as extreme as in Lesotho) in many of the countries in the region. The South African label has therefore become known in the region and the public has had interaction with it. This was also confirmed in Lesotho during the market assessment study, whereby the public indicated that the only energy label they have seen related to refrigerators is the South African one.

The South African energy label for refrigerators is shown in Figure 10 below.

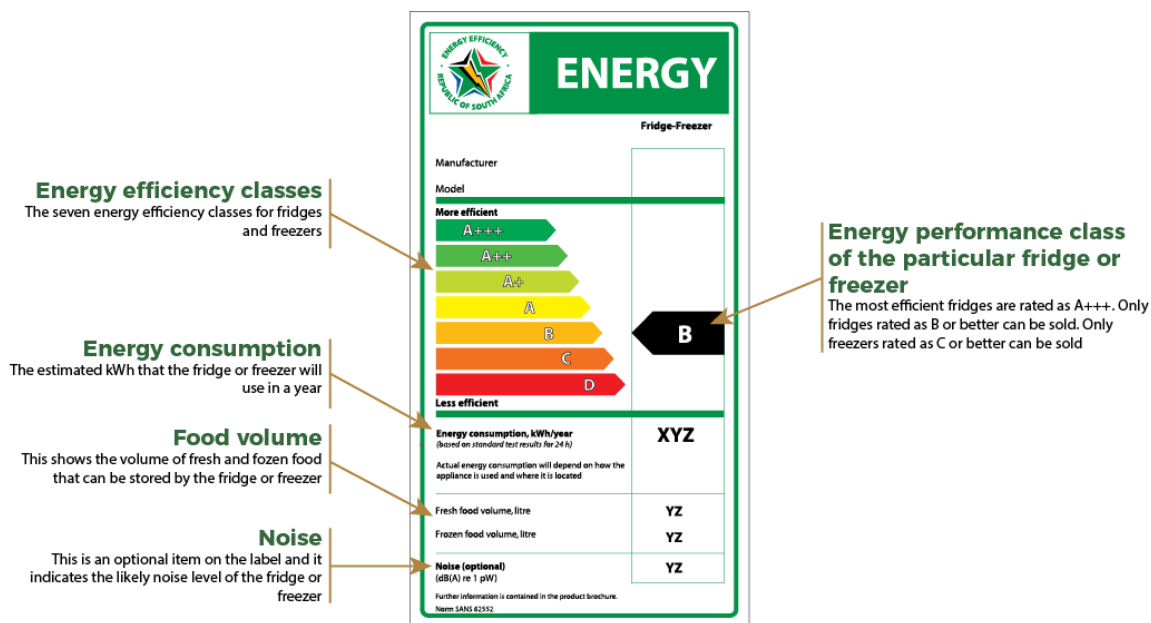


Figure 10. South African energy label for refrigerators – with explanations

4.2 RECOMMENDATIONS

The regional project therefore decided to align with the South African label in terms of design and the majority of the content, and to display the MEPS and HEPS of the regional standard on the label. These were the guidelines provided to the national committees in relation to the label. As mentioned the rationale was to align with the label design that is already known in the region. This would add to the existing knowledge of energy labels on refrigerators and would further assist in the label awareness programmes within the SADC region as there would be uniform in country labels that would be easier to associate with and learn how to use by the public, than if there were several different designs of labels in the region.

In summary therefore, the Lesotho National Label aligns with the guidelines of the regional label as listed previously. It uses the HEPS as adopted in the Lesotho National Standard and it portrays the information required.

The Department of Energy in Lesotho will be the custodian of the label as was decided in the Policy Working Group meetings. The draft label has been designed and discussed at the various stakeholder engagements in Lesotho. Based on the feedback the current proposed label is shown in Figure 11 below. As mentioned this label design is currently the final one and will be placed in the regulation. At the time the Department of Energy may make adjustments but has committed to maintaining the regional label guidelines.

Energy

Refrigerator	
Manufacturer Country of manufacture Model	
More efficient 	
Less efficient	
Energy consumption, kWh/year (referenced to 24° C) <small>This is an indicative value, and not representative of actual annual energy consumption in all situations</small>	
Fresh food volume, litre Frozen food volume, litre	
Refrigerant and foam-blowing designation	

Figure 11. Draft energy label for Lesotho

4.3 ACTIONS

The draft label has been developed and discussed at several meetings with the national stakeholders in Lesotho. These included the PWG meetings and the National Policy Roadmap workshop. During the meetings the first draft of the label was presented. Based on feedback several changes have been made. The colours of the bars and the letters on the bars have been amended to make them more clearly visible. Additionally, the first draft of the label had the Lesotho National flag in the top right corner. This has subsequently been replaced by a Lesotho National Energy Efficiency logo. This logo is in draft format and will be further discussed during the implementation stages by the Lesotho Department of Energy (DoE) and the relevant parties. Once the final label has been discussed and adopted it will be implemented into regulation, or will be referred to in the regulation as described in the previous section. Thereafter, it will also be promoted as part of the consumer awareness campaign.

The decision has already been made that the main parts of the recommended label be adopted and the changes are therefore more cosmetic in nature. The key aspects of the label that are aligned with the regional standard will remain, such as the MEPS and HEPS values displayed in the bars on the label. The general label design and dimensions that are aligned with the regional label (and the South African label), the key information such as annual energy consumption and compartment volumes, etc., will remain. As mentioned this will be under the custodianship of the DoE and will be implemented as part of the consumer awareness campaign.

The action plan for the implementation of the energy label is thus as presented in Table 9.

Table 9. Action plan of implementation for the Lesotho Energy Label

Action	Responsibility	Timeline
Review the draft energy label	DoE	December 2022 - January 2023
Finalise label design	DoE	February 2023
Align final label with the regulation	DoE	March 2023
Align final label with the national standard	DoE/LSI	March 2023
Provide energy label for the consumer awareness campaign	DoE	April 2023
Maintain Energy Label and perform annual reviews	DoE	Ongoing

The draft energy label has already been discussed during the PWG meetings in Lesotho and the national consultations and workshops. The current label design has been accepted thus far. The remaining actions include the final review of the draft label. It has been decided during the PWG meetings that the DoE will be the custodian of the energy label and as such the DoE will perform the final review of the design. Once the final design is accepted, the final label will be referred to in the national standard and the regulation. This final energy label design will also be provided to the respective implementers of the consumer awareness campaign. The DoE is tasked with the maintenance of the energy label. The energy label will be discussed at the TC of the

national standard. If there are any technical changes (e.g. changes in the MEPS or HEPS) these will be communicated to the DoE (the DoE is also a part of the TC). These changes will then be made to the energy label (for example the transition to new MEPS in 2026). Furthermore, any design changes or updates will be the responsibility of the DoE. The DoE is also responsible for the distribution of the energy label for advertising/marketing purposes and other regulatory requirements (e.g. ensuring that the RSL and LEWA have the correct “master copy” of the energy label for use when doing border or market surveillance).

5 MV&E – Key Implementation Points

5.1 CONTEXT

In order for the future Lesotho National Standard and energy label to be done effectively, a well-planned, supported, systematic Monitoring, Verification and Enforcement (MV&E) framework is required. A separate report on the MV&E framework has been developed as part of this project and is available in Appendix A.

The proposed MV&E plan in Lesotho is regulating the implementation and enforcement of the MEPS and the energy label. This will create a framework for compliance and ensure that all players in the market are subjected to the same requirements. It will also provide mechanisms for market surveillance and for handling non-compliances. Through having such structures, it is likely that there will be substantial levels of compliance in the market. Having such a system is often beneficial for those market players that are looking to comply and that aim to sell energy efficient products. It is therefore beneficial to such companies and as long as the MV&E structures are implemented it is primarily a negative to the non-compliant companies and those that are looking to bring in inefficient, cheap alternatives. For such a reason the market becomes partly self-governing in such a setup as it is suited to compliance. Once such a system is established it also lends itself to continuous improvement. The MEPS in Lesotho are set to increase in 2026, as are those of the regional standard. Furthermore, through public awareness (the implementation of which is part of the MV&E plan) the average consumer will demand higher efficiencies and market forces dictate that these will come as a result of manufacturer's improvements and will eventually lead to increased efficiencies and quality of refrigerator at reduced prices.

There are therefore 3 aspects to the MV&E plan which are equally important with their own role within the framework.

Monitoring –The monitoring that forms part of the MV&E plan relates to the checking of energy efficiency of refrigerators. This includes the monitoring of the number of refrigerators that are compliant to the MEPS that have been established and that have the compliant label and of course the number of non-compliant refrigerators and the reasons for non-compliance or rather the type of non-compliance.

Verification – this is the process of checking whether the product in question, a refrigerator in this case, performs as it is required by the standard and the regulation. This includes several processes within the overall procedure. The first is the testing of the refrigerators at the laboratories. Secondly, certain manufacturers may carry product certification for their refrigerator range and this would be another verification process. Finally, the processes of verifying the compliance to the regulations at the border and during market surveillance are also a part of such a process.

Enforcement – this is the process of ensuring that there is compliance with the regulations that will be developed and that there are actions taken against those that are non-compliant. Effectively, it is important to set up the rules of operations and to set up structures for these rules to be implemented but it is equally critical for the rules to be enforced and for the consequences of not complying with those rules to also be enforced.

Therefore, the next sections outline the final recommendations for the MV&E plan and from the discussions within the PWG and with the Lesotho National Stakeholders an action plan has been developed, with responsibilities for implementation assigned to various entities. Additionally, a preliminary budget for implementation for the next 3 year period has been developed and can be found in the final section of this chapter.

5.2 GOALS AND OBJECTIVES

During the development of the national standard and the process of developing the project many discussions were held related to the implementation of the standard and the project in its entirety. Decisions were made on the most important aspects related to the successful implementation of the project. The following items were discussed in detail and are key to the successful implementation of the project in Lesotho:

- Regulation related to the MEPS and Label
- Development of an energy efficiency label
- Defining the process of compliance with the regulation in terms of country imports
- Defining the process of market surveillance related to the regulation and non-compliance
- Outlining the budget and the financial support required for successful implementation
- Assigning roles and responsibilities amongst the various entities (primarily state owned entities)
- Ensuring an efficient and effective communication amongst the various implementation entities
- Designing and implementing an effective consumer awareness campaign
- Establishing and implementing an effective MV&E plan

In order for the MV&E system to be effective it requires certain general components that are common and applicable to most situations/projects. They would certainly be applicable to the refrigeration MV&E system required for this particular project and the MEPS and labelling scheme. From the items above the most important ones related to a general MV&E plan are summarised below.

1. The PRS system

The product registration system (PRS) is a very useful tool for the establishment of an effective MV&E system. The PRS allows importers to register their products and for the products to be reviewed by a regulatory authority prior to arrival at the port.

2. Ability to perform/review conformity assessment

The PRS allows for applications to be made as per the requirements of the relevant MEPS/national standards/regulation. It is therefore key for the country to have the ability to review the conformity assessment aspect of the application (test reports and/or certification). For the review aspect, experts are required with experience in the actual testing standards as well as experience in conformity assessment in order to understand accreditation, types of certifications, etc. In terms of self-testing (country testing) the test laboratory is a requirement. This can either be its own laboratory or a relationship with a laboratory within the region that can be used for testing products from the market during surveillance or even at application.

3. Market surveillance

Market surveillance is one of the key aspects of an MV&E scheme. The products that enter the market, especially those that are sold to the public, such as refrigerators, require constant monitoring. The monitoring is most effective at sales points (e.g. wholesalers, appliance resellers, etc.). The personnel performing the market surveillance require training on the permits, the labelling and the standard and relevant regulation.

4. Governmental support

The MV&E scheme often requires various governmental entities to be involved and to cooperate on various aspects of its implementation. This could be the collaboration between the standards institute and the regulatory authority in reviewing applications of the PRS, or the market surveillance that may be conducted by the revenue authority and the regulator. Additionally, the PRS applications and permits are required by the revenue authorities at the ports. Therefore, governmental integration and communication is essential. Furthermore, since regulation is required in order to have an effective MV&E plan to implement, governmental support for the driving of the development of such a regulation is necessary.

5. Financial support

Implementation of the MV&E programme requires certain finances. The financial estimates required for the implementation of this project are presented in the remainder of this document.

6. Alignment with the regional movement

In this particular project there is a regional drive towards energy efficiency, and this is underpinned by the regional project referred to in the first sections of the NPR. This aids the implementation of the MV&E system as certain aspects of the system, for example the PRS process and the related software system, can be shared to reduce costs. Furthermore, it allows ease of trade within the region and entices more international suppliers as compliance is only required as a once-off for the entire region.

7. Education of the users of the PRS

The education of the importers, manufacturers and wholesalers of the PRS and the application process in particular is critical. Furthermore, it is important that the wholesalers in particular understand the market surveillance process. The buy-in from the importers, manufacturers and wholesalers makes the process much smoother. The majority of the compliant importers and manufacturers are usually keen to participate in an MV&E scheme as it helps them in their battle against cheap, non-efficient imports.

8. Feasible/attainable and measurable goals

It is also critical that the goals in the evaluation aspects are measurable. An evaluation and monitoring component requires surveillance of the key components of the project in order to understand whether the MV&E system is successful or whether it requires adaptations. For this to be possible it is critical that the goals that are set are reasonable. They need to be attainable but tough and also need to be measurable. They thus need to be specific enough so that they can be clearly measured through a pre-defined method (e.g. survey of households). The ability to prove that the campaign is successful is a strong marketing tool and has the ability to further drive momentum within the public. Additionally, it shows that the implementation was well planned and executed and that the system works, which can provide further funding for other, similar projects in energy efficiency. If the results are less than satisfactory and goals are not met the accurate evaluation of performance allows for specific targeted improvements to be made, which are most effective.

Non-compliance

Even though the compliance methodology is set up through the various policies and regulation, it is also key to the success of the MEPS and labelling, and hence the overall impact on energy savings, that non-compliance with the processes is dealt with. Non-compliance can occur in different forms. It can be unintentional through the loss of the label, for example at the store and hence for it not to be available at the refrigerator, or for the labels to be swapped between refrigerators. It can also be intentional, for example the printing of a new label with a higher efficiency rating by the store in order to try and sell their product as more energy efficient.

The regulation that is related to the MEPS needs to enable implementation of penalties for non-compliance. It also needs to establish non-compliance penalties. These are often risk based approaches and severity of penalties depending on intention of non-compliance, the impact it has and the repeatability. For example, unintentional swapping or loss of energy labels at the store can lead to a warning. Intentional forging of the label can lead to monetary penalties and repeat offences of the same nature can lead to suspension of the trading license combined with monetary penalties.

The actual process of compliance in Lesotho is explained in further detail in the next sub-section. Furthermore, the abovementioned activities do require a budget and as such a budget for implementation of an MV&E plan for a 3 year period is also presented in the next sub-section of this report.

5.3 MEASURES AND ACTIONS

In order for the future Lesotho National Standard and energy label to be effective, a well-planned, supported, systematic MV&E framework is required. Therefore, the next section outlines the final recommendations for the MV&E plan and from the discussions within the PWG and with the Lesotho National Stakeholders an action plan has been developed, with responsibilities for implementation assigned to various entities. Additionally, a preliminary budget for implementation for the next 3-year period has been developed and can be found in the final section of this chapter. The main, general components of the MV&E plan have been outlined in the previous section and the specific details related to implementation in Lesotho are described in more detail below.

5.3.1 COMPLIANCE PROCESS

In order for the implementation of the project to be successful there are several steps that are required. Once the regulation is passed the compliance process will need to be adopted by all importers, manufacturers and wholesalers of refrigerators in Lesotho. This section outlines the process that was chosen for Lesotho. It must be stressed that this process is not currently implemented in Lesotho and that this is the proposed process, discussed during the PWG meetings that is going to be implemented in the near future. The breakdown of the steps to be undertaken are as follows:

- Application (effectively the application is part of the PRS)
- Application review (this is the review of compliance)
- Issue of permit (or rejection of application)
- Submission of permit and label by manufacturer at the port
- Checking of permit against the goods at the port
- Market surveillance of goods at the sales points for compliance (label and permit)
- Dealing with non-compliances

The breakdown of each of the processes above is as follows:

5.3.1.1 Application

The application is performed by either the manufacturer or the importer of the refrigerators into Lesotho. As stated, there are currently no manufacturers in Lesotho but if they do open they will be required to undertake the same process and would fall under the same regulation. The application is performed on the specific Lesotho governmental internal platform. This is an existing platform in Lesotho which allows access to the information to be shared between various departments. Lesotho does have the PRS that is currently used for other commodities, primarily food and water. They have a system whereby applications are made and the information is shared between the regulator (LEWA) and the RSL. The RSL can then retrieve the application information through this online information sharing platform and have it available at the ports. The RSL therefore has the ability to retrieve the information at the ports and use it to process its border controls. The system however requires modification. The current system is such that only LEWA sees the application and then only after approval is the information visible to the RSL. For this application purpose the application would be sent to LEWA. The information would also be visible to the Department of Energy (in case there is a need to oversee the process in the future) and to the RSL. The information that the manufacturer/importer needs to supply is the basic information related to their company (name, contact details, address) and information related to the refrigerator (model, type, volumes, etc). In addition, the applicant needs to supply the proof of compliance (test report or certification and a test report) for the refrigerator in question as well as a sample of the label that will be used. All of these documents can be submitted electronically on the platform. The review would be performed as below and the information for the review will also be available to the LSI for assistance with the proof of compliance.

5.3.1.2 Application Review

The LEWA assessor then receives the application and checks the following:

- That the test report and/or certification is from an accredited facility
- Checks the energy consumption on the test report and compares it to the energy consumption on the label
- Checks the R value as per the outcome of the test report and compares it to the level (bar) of energy efficiency on the label
- Checks that all of the information related to the refrigerator is correctly listed on the label (e.g. model, type, volumes, etc.)
- Checks that the energy label contains all of the required information (consumption, model, manufacturer, volumes, etc.)

The LEWA assessors would be trained in the assessment process. The LEWA representatives were involved in the workshops and the training in this project and would be able to further disseminate the training within their organisation.

5.3.1.3 Issue of permit

If all of the information and all of the checks listed above are positive, the assessor then issues the permit to the applicant. If not a rejection (with reasons) is sent to the applicant. The applicant is then allowed to resolve the issues and re-apply. The successful applicant then has the permit that they would need to submit to the RSL prior to the arrival of the refrigerators at the border. The successful permit is also loaded onto the system by the LEWA official and the RSL now also has access to this permit on the system (and can access it remotely/electronically).

5.3.1.4 Submission of permit and label

The applicant (manufacturer or importer) is now in possession of a permit. The importer usually submits documentation to the RSL prior to the shipment arriving at the port. These are clearance documents, etc. With these documents they are also required to submit the permit received and the label design. They are also informed that it is good practice for the transporter to also have copies of these documents with them when

arriving at the border post. Therefore, the permit and the label will be on the system and the transporter will also have the documentation with them when arriving at the border post for inspection.

5.3.1.5 Inspection at the border

The RSL officials inspecting the shipment would have a task of verifying the information against the physical evidence. The aim of the process described above was to enable the RSL inspectors to be able to carry out this task with efficiency and simplicity. They therefore do not need to check the test reports or deal with technical matters related to energy efficiency of refrigerators. They would receive the permit from the importer (and can also verify this permit against the one on the system if they decide to). They need to check the following:

- That the physical refrigerator model and manufacturer match the one on the permit and the one on the label
- That the permit is still valid and that it is compliant (that the R value on the permit is above 1.00 – MEPS has been reached)
- That the R value on the permit matched the HEPS level on the label (e.g. if the permit indicates an R value of 1.3 that they confirm that the label indicates a C class refrigerator)
- That the rest of the information on the label matches the permit and is on the actual label (e.g. volumes, energy consumption)

If the above checks are successful, the shipment is allowed to proceed. If they are not the shipment is detained until either the error is rectified (if it is a small error – e.g. small error on the label, which can be resolved quickly) or the shipment is returned to the sender for rectification. The RSL has its own well-established set of rules of dealing with these situations, including quarantine areas at border posts, etc. Therefore, these actions related to post inspection are not to be altered and the usual RSL processes will follow.

5.3.1.6 Market Surveillance

The above outlined system is likely to create a situation whereby a significant number of refrigerators within Lesotho are compliant with the regulation. However, there are still areas and methods through which non-compliant refrigerators and labels may find themselves on the shop floors and in people's houses. Some of these could be:

- Passing of certain non-compliant refrigerators through the border. The intention is for the RSL to inspect as many refrigerator shipments as possible. They also have a system whereby certain flagged commodities are highlighted for more stringent and regular inspection. The RSL have indicated that they will flag refrigerators for such inspections, especially in the first 6 months after the passing of the regulation – and that this will be assessed thereafter. However, even with all such systems and with the efforts of the border post personnel certain refrigerators will make it through the border that are non-compliant, as no system is 100% effective.
- The replacement of energy labels at the points of sales or warehouses. The refrigerators may pass through all of the checks with the correct labels and these labels may match the requirements and the refrigerator. However, the labels may be replaced by more efficient ones in order to increase the probability of sale. For example, a refrigerator may have an R value of 1.1. It would thus have a D level of energy efficiency on the energy label. Once in the shop the label may be replaced by a B level one, with all other parameters on the label being kept the same, in order to increase the possibility of sale and to enable the retailer to increase the sale price of the product.
- The mistaken or erroneous loss of label or misplacement of the label. In this instance the label on the shop floor or in the warehouse may be placed on the incorrect refrigerator (for example the labels of two refrigerators may be swapped by mistake). Additionally, the label may get lost during transport or during the moving and positioning within the store or warehouse.

These are the main possibilities of non-compliance at a store or warehouse, although some other mechanisms could exist. Importantly, there will be instances where there is non-compliance at the stores. For this reason, it is imperative that there is market surveillance performed to reduce this risk and mitigate for its impact on the consumer and the consumer trust in the process. If there is no market surveillance the system gets abused in a very short time. As mentioned, once the process of bringing the refrigerators into Lesotho has been completed, they would either be stored in warehouses or shop floors awaiting purchase. During this time market surveillance would be performed. The market surveillance would be performed by LEWA inspectors. However, the RSL would also be available to assist with this task. Between them (and through coordination of information and resources) market surveillance would be conducted. The assigned inspector would go to the specific warehouse or store and randomly inspect the refrigerators. The inspection would not consist of all of the refrigerators in that particular location but rather a random sample size (typically 2 to 3 refrigerators per site). The inspector may choose to extend their sample size, especially if anomalies or non-compliances are discovered. The inspectors would perform checks that are very similar to those performed at the border posts by the RSL personnel. Therefore, the inspectors would check that the refrigerator on the shop floor or in the warehouse has the correct permit and energy label, and that it aligns with the permit and energy label. Hence, the inspector would check:

- That the physical refrigerator model and manufacturer match the one on the permit and the one on the label

- That the permit is still valid and that it is compliant (that the R value on the permit is above 1.00 – MEPS has been reached)
- That the R value on the permit matched the HEPS level on the label
- That the rest of the information on the label matches the permit and is on the actual label (e.g. volumes, energy consumption)

As long as these market surveillance exercises are performed regularly, the probability of non-compliance decreases drastically. This is because the possible offenders are aware that inspection is possible and probable and are less likely to attempt to manipulate the system, especially if there are repercussions. This infers that the manner in which non-compliance is dealt with is also critical.

5.3.1.7 Dealing with non-compliances

In order to have a successful implementation of the project there is a need for the Lesotho governmental entities to be able to deal with non-compliances and with offenders. Having all of the systems in place to check compliance at points of entry and at the market is completely necessary and an excellent practice. However, it is not very useful if the regulation does not allow for punitive measures to be taken against offenders. Many measures were discussed during the project, at PWG meetings and NPR workshops on the 14th, 15th, 20th and 21st of September. The decision for implementation in Lesotho was that of a phased approach of measures to be taken against offenders. These measures would depend on the severity of the offence and the number of offences caused by the specific entity. Therefore, repeat offenders would be punished more severely. The approach is to have the following system of measures in place:

- Warnings: These would be given as a first step in the punitive process. The warnings would typically be given to first-time offenders and to less severe offences (e.g. lost label as opposed to a counterfeit label)
- Fines: Fines would be imposed in stages on repeat offenders. Fines would vary per criteria such as frequency of offences and severity of offences. The exact fines have not been decided on as yet and will be decided on during the finalisation of the regulation.
- Quarantine of product: This option would be used as one that would occur in very severe circumstances. It would only be used for repeat offenders and for extremely serious offences. Under this measure the section of the shop or warehouse that houses and sells refrigerators would be sectioned off and would be prevented from operating. The remaining shop or warehouse would be able to continue operating as usual. The quarantine would last until the problem is resolved.

- Suspension of operation: this would be used as a final resort only. It would mean that the particular operator would be suspended from operating its business until the problem is rectified or for a specific period of time as punishment for extreme repeat offenses.

In order for the above-mentioned recommendations to be put into practice a clear plan with set areas of responsibilities is required.

The following is the current outline of responsibilities within the Lesotho state owned entities:

- RSL – Inspection of refrigerators at ports, assistance to LEWA in terms of inspection of resellers/dealers/wholesalers as well as confiscation of non-compliant products
- DoE – Drive the development of the regulation and ensure alignment with the National Energy Policy
- LEWA – Drive the development of mechanisms to enforce the regulation that will be developed. Regulatory aspect of compliance –therefore the application process handling, issuing of permits and verification of compliance. Additionally, the market surveillance process would be the responsibility of LEWA
- LSI – Development and maintenance of the national standard and assistance with the verification of conformance of the application/product

These are the roles and responsibilities related to the main processes that are required to be implemented as listed above. Therefore, in order for the full MV&E process to be successfully implemented there are 2 main phases of implementation and action. The first is the development of the system of implementation and the second is related to the responsibilities of ongoing implementation and monitoring.

The implementation actions have been discussed in the previous sub-section. The monitoring process is also critical to the long-term successful implementation of the project. The monitoring process methodology is as follows:

- Define what needs to be monitored
- Define goals
- Define timelines
- Define monitoring processes for each main section with responsibilities

Therefore, following from the outline above, the following process is to be followed as part of the monitoring aspect of the MV&E plan.

Aspects that require monitoring:

1. Implementation of the application IT System
2. Training of relevant personnel
3. Purchases of refrigerators above the MEPS value of energy efficiency (C and above)
4. Energy consumption savings in households

Goals

1. Implement the IT system for the application process by May 2023
2. Finalise employment of additional resources if necessary within LEWA and the RSL by June 2023
3. Train at least 5 resources at LEWA in application reviews and market surveillance by May 2023
4. Increase in purchases of energy efficient refrigerators by 30% in year 2
5. Increase in energy efficiency savings in households by 5% in year 2

From the outline above, the actions, with responsibilities, timelines and verification methods are listed in Table 10 below.

Table 10. Actions, responsibilities and timelines of an MV&E Plan

Action	Responsibility	Timeline	Method of verification
Development of the application system – linking it with Lesotho national IT system and enabling it for usage for market surveillance	LEWA	January 2023	Check of IT system by another party (RSL)
Assessing whether additional resources will be required for the processing of applications and making necessary appointments	LEWA	December 2023	Payroll and organogram
Training of personnel on the processing of applications	LEWA	March 2023	Training certificates, register of attendance
Training of personnel on the border controls	RSL	March 2023	Training certificates, register of attendance
Training of personnel on the market surveillance procedure	LEWA	March 2023	Training certificates, register of attendance
Energy efficient purchases of refrigerators	June 2025	Surveys at shops, consumers	LEWA
Energy savings of 5% for consumers	June 2025	Consumer surveys	LEWA

An overall budget for the implementation of the project has been developed. This budget includes the MV&E plan and its activities and is presented in section 8 of this report.

6 Consumer Awareness

6.1 CONTEXT

Even though MEPS will be regulated, the main driver of the improvement in energy efficiency is the consumer (especially in capitalist economies such as Lesotho). Therefore, the introduction of MEPS into regulation will ensure the minimum level of energy efficiency that has to be met but full buy-in to the concept of energy efficiency from the public through consumer awareness campaigns will ensure that the market forces continuously demand higher energy efficiency. This is the aspect which will drive the improvement of energy efficiency in refrigerators and will increase the HEPS levels of average refrigerators being sold in the shops.

In order for the consumer to be able to drive energy efficiency in the manner described above they first need to completely understand the benefits of energy efficiency. In terms of consumers there are 2 main aspects of energy efficiency of refrigerators that they are concerned with. These are:

- Cost saving
- Improvement of environmental effects

Therefore, if a consumer awareness campaign can highlight how buying energy efficient refrigerators can assist with the 2 points above there is an excellent chance that the consumer behaviour will significantly change towards the purchasing of energy efficient refrigerators.

The detailed consumer awareness campaign outline/plan and report has been compiled separately and is also available in Appendix A of this report. The consumer awareness report is critical to the success of the project.

This is because successful implementations globally require an implementation of both supply-side and demand-side interventions where the latter focus on educating a consumer and changing both purchase and energy usage behaviour. This is why setting of MEPS is advised to be accompanied by, among others, introduction of energy efficiency labels and broader educating campaigns, as is the case in this project (CTCN, n.d.) [12].

The purpose of communication activities is usually to increase consumer awareness on the differences in energy consumption, costs, and benefits between appliances on the market; while educating activities usually aim to educate consumers about the characteristics, costs, and benefits of the energy-efficient product [12]. All of these pursue one purpose – to change the purchase behaviour of the consumer in favour of a more energy efficient appliance.

An example of an effective awareness campaign and the steps required is presented in Figure 12 below.

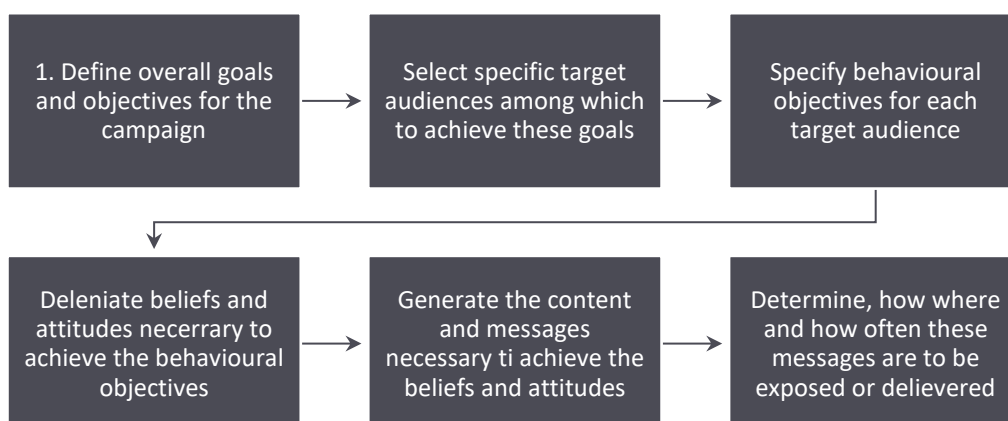


Figure 12. Awareness raising campaign planning process (adapted from [13])

Based on the processes outlined above and the successes of the consumer awareness campaign implemented in South Africa and the lessons learnt, the main process of a consumer awareness campaign development and implementation is proposed as such:

1. Stakeholder analysis
2. Development/identification of targeted audiences
3. Identification of objectives of the consumer awareness campaign
4. Development of messages for the targeted audiences
5. Identification of communication tools to be used for the specific audiences
6. The implementation plan of the consumer awareness campaign
7. The monitoring and evaluation plan of the consumer awareness campaign
8. The overall draft budget for the consumer awareness campaign

Based on the process described above the following recommendations are prepared for Lesotho.

6.2 RECOMMENDATIONS

Stakeholder analysis

Based on the market assessment the following entities have been identified as the most important stakeholders in Lesotho in relation to refrigeration.

Table 11. Key stakeholders for the consumer awareness campaign for refrigeration in Lesotho

Entity	Role in relation to the MEPS project	Responsibility
Ministry of Energy and Meteorology	Driver of the MEPS development and implementation Formation of energy related initiatives	Campaign champion (provision of vision and action plan, coordination of work of all entities involved)
Ministry of Communications, Science and Technology	The support ministry to the Ministry of Energy in this project Can facilitate governmental support for legislation and implementation support	Relevant departments: Department of Information, Postal Services; Lesotho national Broadcasting Services (radio and TV) Develop and maintain printed materials for the campaign. The ministry will work together with local consultant for development and implementation of messages and infomercials Develop radio and TV advertisements and infomercials
Lesotho Central Bank	Responsible for the governance of the financial sector and would be able to support initiatives that finance the implementation of the project from a regulatory perspective	Provision of funding for the campaign Acting as an advisor in matters of financing
Lesotho Revenue Authority	Inspection/approval of imports of refrigerators and transformers into the country	Targeted audience for knowledge on refrigerator MEPS Targeted audience for knowledge on transformer MEPS
Lesotho Standards Institute	Information on standards of refrigerators and transformers	Provision of information and fact on MEPS for refrigerators and transformers Development of training material in partnership with Energy Research Centre Conducting training workshops for sales personnel and repairers in partnership with Energy Research Centre
The University of Lesotho (in particular the Energy Research Centre)	Perform relevant research that informs national energy policy for sustainable development	Provision of technical support in Monitoring and Evaluation of the campaign Collecting data during and after campaign Analysis of key metrics to inform further changes required to the campaign Development of training material in partnership with Lesotho Institute Standards Conducting training workshops for sales personnel and repairers in partnership with Lesotho Institute Standards

It is then important to identify the target audiences as related to refrigerators MEPS, HEPS and Energy Label. These are presented in Table 12 below.

Target Audiences

Table 12. Target audiences for the Lesotho refrigeration consumer awareness campaign

Entity	Role in relation to the MEPS project	Responsibility in relation to the awareness raising
Households	Users of refrigerators	Targeted audience for change in purchase and use behaviour of refrigerators
Small businesses operating from residential premises	Users of refrigerators	Targeted audience for change in purchase and use behaviour of refrigerators
Retailers (local and large international)	Resellers of refrigerators	Targeted audience for knowledge about refrigerator MEPS Means of communicating the information/educating end-users
Regional buyers for large international corporations (South Africa-based)	Procurement of refrigerators for international corporations operating in the country	Targeted audience for MEPS requirements for refrigerators
Repair centres and technicians	Repairers and resellers of second-hand refrigerators	Targeted audience for knowledge about refrigerator MEPS Means of communicating the information/educating end-users
Financial Institutions	Lenders supporting the implementing of energy efficient appliances	Targeted audience for knowledge about refrigerator MEPS
Lesotho Revenue Authority	Inspection/approval of imports of refrigerators into the country	Targeted audience for knowledge on refrigerator MEPS and customs approvals

Objectives and Goals

The objectives of the public awareness campaign for refrigerators are to educate the target audiences listed above as to the importance of energy efficiency and its application to refrigerators in Lesotho.

Considering the above general objectives, Table 13 below outlines the targeted audiences and the key objectives of the public awareness campaign that reflect the change desired to be achieved through it.

Table 13. Targeted audiences and objectives of refrigerator awareness campaign

Targeted audience	Key objectives and desired changes
Households	Change the attitude towards energy saving among all households Achieve a high level (>66%) of awareness regarding new energy efficient standard for refrigerators among electrified households Achieve a high level (>66%) of knowledge and understanding of energy label for refrigerators among electrified households

Targeted audience	Key objectives and desired changes
	Achieve a high level (>66%) of initiative when purchasing refrigerators in favour of more energy efficient appliances
Small businesses operating from residential premises	Change the attitude towards energy saving among all households Achieve a high level (>66%) of awareness regarding new energy efficient standard for refrigerators among electrified households Achieve a high level (>66%) of knowledge and understanding of energy label for refrigerators among electrified households Achieve a high level (>66%) of initiative when purchasing refrigerators in favour of more energy efficient appliances
Retailers: sales personnel	Change the attitude towards energy saving Impart knowledge regarding new energy efficient standard for refrigerators on consumers Educate consumers on energy label for refrigerators Educate consumers on long-term benefits of purchasing more energy efficient refrigerators
Repair services/second-hand shops	Change the attitude towards energy saving Impart knowledge regarding new energy efficient standard for refrigerators on consumers Educate consumers on energy label for refrigerators Educate consumers on long-term benefits of purchasing more energy efficient refrigerators

Messages for the targeted audiences

Given the different objectives outlined in the previous section, the following table list the messages that should be promoted to achieve the desired change in knowledge and behaviour among various groups of stakeholders:

Table 14. Key objectives and associated messages for refrigerator awareness campaign

Key objectives and desired changes	Messages
Change the attitude towards energy efficiency among all households	Energy is scarce resource that needs to be conserved Lesotho consumers are under pressure – lets reduce our energy costs by becoming more energy efficient Saving energy today will ensure it is available to future generations Being energy efficient is easy – just make a right choice
Achieve a high level (>66%) of awareness regarding new energy efficient standard for refrigerators among electrified households	The new energy efficient standard protects against energy waste
Achieve a high level (>66%) of knowledge and understanding of energy label for refrigerators among electrified households	The energy label makes choosing the more energy efficient refrigerator easy Look for an energy label on a refrigerator and empower yourself to manage the costs associated with refrigerator usage
Achieve a high level (>66%) of initiative when purchasing refrigerators in favour of more energy efficient appliances	Save money in short and long-term by buying a more energy efficient refrigerator Reduce your electricity bill by buying a more energy efficient refrigerator
Impart knowledge regarding new energy efficient standard on consumers	“Can I help save you more money on a refrigerator today?” “Can I give you advice on saving energy?”
Educate consumers on energy label	“Have you seen the new energy labels that refrigerators come with?” “Do you know the higher the rating means the greater savings on electricity bill?”

Key objectives and desired changes	Messages
Educate consumers on long-term benefits of purchasing more energy efficient refrigerators	“Do you know how to reduce your monthly electricity bill by buying a more energy efficient refrigerator?”

Communication Tools

Given that we have identified the target audiences for the various messages I enables us to identify specific communication tools to effectively reach those audiences. These tools are shown in Table 15 below.

Table 15. Targeted audiences and communication tools for refrigerator awareness campaign

Targeted audience	Communication tools
Households	Radio broadcasting (through Lesotho National Broadcasting Services) TV infomercials (through Lesotho National Broadcasting Services) Posters (distributed by Department of Information and at various retailers, Postal Services) Article and infomercials in the national newspaper (through Department of Information) Website page Social media
Small businesses operating from residential premises	Radio broadcasting (through Lesotho National Broadcasting Services) TV infomercials (through Lesotho National Broadcasting Services) Posters (distributed by Department of Information and at various retailers, Postal Services) Article and infomercials in the national newspaper (through Department of Information) Website page Social media
Retailers: sales personnel	Training on energy labels and standards for refrigerators Posters
Repair services/second-hand shops	Training on energy labels and standards for refrigerators Posters

In addition to the above general communication channels and means, the efficiency of the public awareness campaign could be enhanced by introducing a competition with an award programme that can encourage and motivate households and small businesses operating from residential premises to accelerate their knowledge uptake and change in purchase behaviour. Some of the ideas for such competitions include:

- Lottery with a monetary reward or a voucher for those who have purchase an energy efficient refrigerator during a specific period;
- Lottery among those who have registered on a mobile app and provided their information on the current usage (has to run for a specific period of time);
- Competition among schools on topics of energy efficiency and costs savings with monetary or voucher reward.

Since the recommendations have been outlined the following section identifies the actions that are to be taken to implement the consumer awareness campaign and outlines the responsibilities for implementation.

6.3 MEASURES AND ACTION

Table 16 outlines the key actions required for the implementation of the campaign and the associated timeframes. The timeframes for implementation and the parties responsible have been outlined in Table 16. The specific actions are further explained below.

1. Securing funding. This is a role of the PWG members that will be assigned to the consumer awareness campaign and any other members that will be co-opted for this task. The funding will be obtained as part of the funding for the overall implementation of the project. Approaches will be made to Lesotho's governmental institutions, including the DoE as well as international bodies such as the GCF.
2. Establishing a baseline. The majority of this task have been completed during the market assessment study. However, a review of the gathered data will be performed and any additional data gathered if gaps are identified or if a larger sample is required for specific data.
3. The Project Steering Committee (PSC) will be established in order to implement certain tasks and ensure the consumer awareness project plan is followed.
4. Research specific to the messages of the consumer awareness campaign will be conducted. In this process the best way of presenting these messages will be discussed.
5. The messages that have been developed will then be discussed within the PSC and refined until final agreement. This is important as the messages that go to the public need to be fully agreed upon as changes to the messages during the awareness campaign can cause confusion and distrust.
6. The development of the final material will include all of the final editing, printing, recording, etc. It will also include the translation of the material into the languages decided upon for roll out within the different regions.
7. Once the material has been developed discussions will be held with the relevant authorities related to the material to get buy in. this will include communications regulators as well as relevant ministries and consumer protection agencies.
8. The sales personnel and repairers will be trained on several aspects. These will include energy efficiency, the Lesotho national standard and the related MEPS and HEPS as well as the Lesotho energy label. They will also be trained on the importance of energy efficiency in terms of environmental impact and the cost savings on electricity that can be accrued by the consumer purchasing more efficient refrigerators.

9. The roll out of communication material will be done. This is an integral part of the consumer awareness campaign and includes the publishing of all of the print material and its distribution. The roll out of TV and radio commercials, the issuing of brochures and the posting of posters and other marketing material.
10. The monitoring of the consumer awareness campaign's success is highly important in order to understand its impact and effectiveness. This will also provide insight into whether modifications to the consumer awareness campaign are required. The details of the monitoring are presented further in this section.
11. Based on the results of the monitoring certain aspects of the consumer awareness campaign may need to be updated. For example, a younger segment of the population may not be as aware of the energy efficiency impact and the energy label for refrigerators whereas the over 50's segment may be very well aware. This could point to a successful print media campaign but a less than successful social media campaign, which may require updating.
12. The consumer awareness campaign is a lengthy process with several stages. After the first implementation an evaluation of impact will be performed and then a revised campaign implemented in all likelihood. Since this process is lengthy it requires management and maintenance and this is responsibility of the DoE, working with the PSC.

Table 16. Targeted audiences and communication tools for refrigerator awareness campaign

	Action	Timeframe	Responsible Party
1	Secure funding for the public awareness campaign	January – February 2023	Ministry of Energy and Meteorology
2	Establishing a baseline (collect additional data to the one gathered for the study)	February – March 2023	The University of Lesotho (in particular the Energy Research Centre)
3	Set up a Project Steering Committee (PSC) comprising of relevant stakeholder groups and develop Terms of Reference for it	January 2023	Ministry of Energy and Meteorology
4	Undertake informative research to inform the development of awareness and education materials	March – April 2023	Ministry of Energy and Meteorology
5	Workshopping messages within the PSC	April – May 2023	Ministry of Energy and Meteorology
6	Development of communication material, including: <ul style="list-style-type: none"> • pre-launch testing • translating these into the required languages 	May – July 2023	Project PSC
7	Engaging with relevant authorities and entities to obtain their buy-in for the roll out of the communication campaign	June – August 2023	Project PSC

8	Training sales personnel and repairers	August – September 2023	Contracted party
9	Roll out communication material – TV, radio broadcasts, newspapers, competitions, posters, website page	September 2023 – June 2024	Ministry of Energy and Meteorology
10	Monitor and evaluate the success of the campaign	July – December 2024	Ministry of Energy and Meteorology
11	Adapt the messages and communication means based on feedback received from evaluation	January – February 2025	Project PSC
12	Develop a maintenance plan	February 2025	Ministry of Energy and Meteorology

Monitoring and Evaluation is an integral part of any project, programme or campaign for that matter. It aims to provide an insight into whether the campaign is on course to achieve objectives, which in turn allows one to adapt its execution if any gaps or challenges are identified. Table 17 provides a list of indicators that could be used to monitor the progress of the campaign and to evaluate its success after its completion.

Table 17. Monitoring and evaluation indicators for refrigerator awareness campaign

Measured output/outcome	Means of gathering data / tools	Frequency of data gathering	Sample
Attitude towards energy saving	Survey (in person / telephonic)	Every quarter of the campaign starting from just before the campaign for baseline	Households – different income group and in rural and urban areas Sales personnel at retail stores Repairers
Awareness regarding new energy efficient standard	Survey (in person / telephonic)	Every quarter of the campaign starting from just before the campaign for baseline	Households – different income group and in rural and urban areas Sales personnel at retail stores Repairers
Knowledge and understanding of energy label	Survey (in person / telephonic)	Every month of the campaign starting from just before the campaign for baseline	Households – different income group and in rural and urban areas Sales personnel at retail stores Repairers
Change in purchase behaviour / purchase (sale) of refrigerators by energy efficient label and trend	Survey	Every month of the campaign starting from just before the campaign for baseline	Households – different income group and in rural and urban areas Sales personnel at retail stores Repairers
	Retailers' data	Every month of the campaign starting from just before the campaign for baseline	Local and international retailers
Savings derived by a household from purchasing a more energy efficient refrigerator	Case studies	Every quarter since the start of the campaign	3-5 households at a time
Energy consumption by the residential sector	National statistics / annual reports	One a year	Ministry of Energy and Meteorology

7 Financial Mechanisms

7.1 CONTEXT

Based on the market assessment there are several key aspects that need to be considered as related to the financing mechanisms for refrigerators, which will assist in making the implementation possible. The consumers of refrigerators are the general public. In order for them to participate in the drive for higher energy efficient refrigerators the higher initial cost of the products must be acknowledged and considered within the Lesotho environment. For this reason, there are several aspects of the market assessment that provide key insight into the type of financial support required and also the type of consumer patterns that are existing in Lesotho at the moment.

In order to ascertain which financial supporting mechanisms are most important it is key to understand certain aspects of the Lesotho consumer. Some of these are:

- Disposable income
- Cost of electricity and monthly spend on electricity
- Cost of refrigerators most commonly sold in Lesotho
- Cost difference between refrigerators of similar volume and functionality but differing energy efficiencies
- Number of refrigerators sold per year in Lesotho
- Average age of refrigerators currently in usage in Lesotho

From this information one can understand approximately how many refrigerators are expected to be sold in Lesotho each year. Also, one can understand how much households can save per month on electricity by purchasing more efficient refrigerators. Additionally, one can understand the price difference between similar refrigerators with differing efficiency levels. This information will provide the amount of financial support required and the type of support that would be most effective to implement. This information was gathered during the market assessment phase of the project with approximately 20 000 refrigerators being purchased per year in Lesotho being used as the market size figure.

7.1.1 FINANCIAL BARRIERS TO EFFICIENCY

Therefore, in order to enable effective implementation of the project there is a need to overcome some of the main financial barriers to energy efficiency. Some of the main barriers are:

7.1.1.1 High initial cost of purchase or installation

The increase in energy efficiency in most refrigerators comes through the use of better materials and through the use of more insulation. These improvements increase energy efficiency and also in most cases increase the quality of the refrigerator. The increase in quality however comes with an increase in cost and hence an increase in the initial selling price. This ultimately means that a refrigerator that is more energy efficient than another model of the same size/volume and with the same features, will be more expensive. This increase in the initial selling price of the refrigerator is usually offset by the electricity savings that are made during the lifetime of the refrigerator due to its lower energy consumption. However, the extra capital required for the initial purchase can be a restricting factor for families to participate in the increase energy efficiency drive. This can be especially difficult for lower and middle class income families. As mentioned in the Lesotho market assessment report the median income of a Lesotho family falls in the lower to middle class category. Therefore, for such income households, paying a higher initial cost for an energy efficient refrigerator may not be feasible.

7.1.1.2 Lack of access to finance/financial support

As mentioned, the majority of households in Lesotho would be vary of spending more money than necessary on the initial, higher cost of more energy efficient refrigerators. Therefore, this is a critical aspect of the project, as many willing buyers and effective participants in the energy efficiency drive could be turned away due to the lack of access to funds.

7.1.1.3 Energy prices

At times the energy prices in countries are extremely low. This was the case in South Africa in the past, specifically in the 1980s and 1990s. This was due to the strategic decision by the government of the time to drive economic growth through cheap, bulk power to assist in powering electricity heavy industries such as mining and aluminium smelting, etc. It is also the case for example in Kazakhstan, which benefits from the nuclear power installed during the Soviet era, that remained within its control after the breakup of the Soviet

Union. Therefore, the initial cost of establishment was shared but the current benefit is for Kazakhstan, enabling low electricity prices (until the maintenance on the ageing plants becomes increasingly expensive).

In situations such as these the low cost of electrical energy can be a detrimental factor as the financial savings are minimised. Therefore, the impact of improved energy efficiency on the consumer spending is also minimised and as such the incentive to purchase more energy efficient refrigerators at a greater initial cost is diminished.

Lesotho also benefited from cheap electricity supply from South Africa. However, this landscape has drastically changed. South Africa has been experiencing a declining electrical utility without the ability to maintain its ageing infrastructure (generation plants and distribution network in particular). This has resulted in increases in electricity prices and a substantial reduction in availability of electrical energy. The impact has been felt by Lesotho. The electricity prices of imports from South Africa have increased and the reliability of supply has decreased. South Africa has experienced what has been termed as load shedding, which means the switching off of electrical supply to customers for a certain period (e.g. 4 hours or 2.5 hours) in a rolling blackout manner. Lesotho has also thus experienced stages where the supply of import electricity is unavailable due to shortages of supply.

7.1.1.4 Lack of awareness of benefits of Energy Efficiency

As there have been no previous campaigns related to energy efficiency of refrigerators aimed at the public in Lesotho, the general consumer is unaware of the benefits (financial or otherwise) of energy efficiency. The limited exposure that there has been to energy efficiency is through the South African label seen on most refrigerators in stores. The public is however unaware of the financial and environmental benefits of improved energy efficiency. As such a targeted and well-presented consumer awareness campaign can be a substantial asset to this project and is in fact one of the key implementation elements. The price differences between old refrigerators and ones with improved energy efficiency have been reducing. Thus if the public can be aware of the financial savings it can make on their monthly electricity bills, far more people will opt for more efficient refrigerators, as the savings over the lifetime of the product are substantial.

7.1.2 POSSIBLE SUPPORTING FINANCIAL MECHANISMS IN LESOTHO

Given the general challenges to the purchasing of energy efficient appliances, outlined in the previous section, possible financing mechanisms that are applicable to refrigerator purchasing are outlined below. These financing mechanisms were discussed at numerous meetings of the PWG. The general description of the various financial mechanisms relevant to refrigerators and the advantages and disadvantages of each have been described in more detail below.

7.1.2.1 Bank Loans

These are typically standard bank loans that are available to most persons owning a bank account and qualifying for a loan. The pre-requirements for a loan are typically not high but the loan amount can be limited. These are not loans that are specific to energy efficient technology and are standard bank loans.

Advantages

The biggest advantage of bank loans is that they are easily accessible. In order to qualify people generally just need a bank account and to have certain funds or a certain track record of loan repayment.

Disadvantages

One of the disadvantages of bank loans is that they are not designed for energy efficient projects. They are therefore standard loans and the interest rates are typically high. Also, persons without a bank account are unable to qualify for the loan and the loan amount is generally small – thus limiting the impact of such loans.

7.1.2.2 On-Bill Financing

On-bill financing is a support mechanism whereby an initial amount is provided to the consumers for the purchase of the energy efficient refrigerator by the electrical utility/electricity service provider. The consumer then repays the loan through the pre-defined monthly repayment through the electricity bill. The additional amount is added to the monthly electricity bill effectively. This type of financing mechanism is suited for the purchase of refrigerators as it is geared for the general consumer rather than large organisations, which typically purchase distribution transformers.

Advantages

The main advantage is that this is a very efficient way to reach the refrigerator buying public. The repayment can be controlled through the electricity bill and most importantly consumers can see the benefit of energy efficient appliances directly. For example, if they usually spent LSL 300 on electricity and they bought a new refrigerator (that is more efficient than their previous one) for which they took out a loan of LSL500, and for which they need to repay LSL50 per month for 12 months, they would expect to pay $LSL300 + LSL50 = LSL350$ per month. But with the more efficient refrigerator their monthly saving may be LSL20 and hence the electricity bill may be LSL330, a saving which they can directly see.

Disadvantages

The main disadvantage is that the risk in this type of financing is carried by the consumer. The electricity company can simply switch off the electricity supply if the loan is not repaid and they can impose penalties on the electricity bill thereafter (e.g. for re-connection).

7.1.2.3 On-wage Financing

On-wage financing is similar to on-bill financing, except the loan amount is provided by specific employers of the consumer. Therefore, an employee would go through qualifying criteria within its place of employment. The employer would then approve the employee for a loan related to the purchase of energy efficient appliances. In this case this type of financing is suited to the purchase of refrigerators. The employee would thus receive financial support, perhaps in the form of a voucher, which could be redeemed at the time of purchase of an energy efficient appliance (refrigerator). The value of the loan (voucher) would then need to be repaid by the employee to the employer as per the agreement. This would usually be deducted from the monthly salary of the employee for several months until the loan is repaid. Interest could be charged on the loan by the employer and this would be decided at the loan stage through agreement of terms with the employee.

Advantages

The advantage is that this type of finance is typically relatively easily accessible to most. If the employer has a loan for the financing then the risk is also shared between the employer, consumer and financial loan provider.

Disadvantages

The main disadvantage is that this type of finance is not available to the non-employed. Additionally, some employers are not ready to take on such a risk without added benefits.

7.1.2.4 Tax rebates

Tax rebates and tax benefits are mechanisms whereby the organisation that provides the loans or funding is able to receive certain tax benefits for this. For example, a company may spend money on investing in energy efficient equipment. If this is pre-agreed with the revenue authority that company can get tax offsets for this

spend or it can get tax benefits in terms of accelerated depreciation of the equipment purchased and thus a greater reduction in tax spend.

Advantages

One of the main advantages of tax rebates or tax benefits is that it drives similar behaviour within the organisation. For example if a company received accelerated depreciation benefits for purchasing more efficient refrigerators or transformers it can then see the direct benefit of energy efficiency. As such in the next possible instance it may seek the same benefit (for example changing all of its lighting in its offices into more efficient/LED lighting).

Disadvantages

The main disadvantage, apart from requiring buy in from the tax authority, is that the consumer or the beneficiary requires a large tax base from which to offset such a benefit. It is therefore not really suitable to individual persons but rather to substantially sized organisations.

7.2 RECOMMENDATION

The financial mechanisms below are the ones that are most likely to be implemented within Lesotho, based on the discussions during the financial mechanisms workshop and the PWG meetings. These include:

- On-bill financing
- On-wage financing
- Tax benefits

There is also an option of combining some of the mechanisms listed above. The one option discussed was the combination of on-wage financing and the tax benefits for those companies that choose to participate in the programme.

Before understanding the best mechanisms to implement it is important to understand the amount of funding required for these purchases.

There are approximately 87 000 refrigerators that are imported in Lesotho annually [4]. There are no local manufacturers so all of the imported refrigerators also account for all of the refrigerators on the shop floors.

Since the number of imports would closely match demand in a small market this would mean that between 60 000 and 80 000 refrigerators would be sold in Lesotho per year. Additionally, 34% of refrigerators in Lesotho are 8 years or older as shown in the background section.

Generally refrigerators are replaced after 10-12 years. However, 78% of respondent in the market assessment surveys indicated that they would purchase new refrigerators. It is therefore probable that approximately 68 000 new refrigerators will be purchased in Lesotho in the next year. The import figures do correspond as the number of refrigerators in the market is an estimate that the resellers make and it is usual for resellers to budget for slightly higher number of refrigerators so that they have additional stock on the shop floor.

If the MEPS are implemented that means that the majority of refrigerators are going to be purchased at a level D (as per the Lesotho National Standard with the R value between 1 and 1.25) from analysis of prices both in Lesotho and in Eswatini and in discussions with the Palfridge the increase in price per increase in energy efficiency level (as per the South African energy label and although it is not an exact correlation with the different standards) is approximately 8% - 10%. This is a comparison of (as closely as possible) 2 refrigerators that have the same volume are from the same manufacturer and have the same functionality but the one is more efficient than the other model by one energy level (one HEPS level). Therefore, if the aim of the project in year one is to encourage the majority of persons to purchase a refrigerator of level C and above then the difference in price is 10%. The average price of a common fridge/freezer combo in Lesotho is between 5000 and 7000. Therefore, it is safe to assume that the difference in price is 6%.

Also, it is important to note that the people that are going to be buying a refrigerator next year would be buying one if there was the new standard or not as per the calculations above. They therefore have funds to purchase a new refrigerator in most cases. If we assume that the MEPS are implemented and the lowest class available is D and that all of the buyers would want to purchase a level D refrigerator, then we need to consider subsidizing the initial difference of purchase to a level C refrigerator. Therefore, the amount of funding required for this transition is:

$70\,000$ (estimate of new refrigerators purchased next year) \times 600 (cost difference from D to C energy class) = LSL42 000 000. This equates to approximately \$2 333 333.

Therefore, one then needs to consider the financing mechanisms in this context of approximately \$2.4 million offending required for the first year of implementation. It must be noted that this would be in the form of loans and not funding that is in the form of a grant. This is the lowest level of financing support required. If consumers wish to purchase refrigerators that are level B or level A they would need additional support. The same principle would apply as the cost of initial purchase would just increase by LSL1 200 or LSL1 800. The consumers would still be able to apply for financing for the greater amount that they require to purchase the more efficient refrigerator. For simplicity of calculation the case of purchase of refrigerators with one level higher energy efficiency is used.

The **on-bill financing** would work as follows:

- A potential purchaser of the refrigerator would apply for a voucher of LSL600 for the purchase of a new refrigerator with the LEC
- The LEC would have a pre-determined set of qualifying shops where the voucher can be used. The voucher can only be used for purchases of refrigerators that are level C and above as per the energy label
- The successful applicant would purchase the new refrigerator and use the voucher.
- The LEC would be notified of that customers name, surname and ID number
- The LEC would then add the amount of LSL600 to the electricity bill (split on a pre-determined number of months, e.g. LSL60 per month for 10 months or 12 months if the LEC decides to charge interest)

In order for the above to be implemented there are several aspects that need to be considered, specifically related to lending risk. In order to mitigate the risk to the utility, certain pre-qualifying criteria of lenders need to be applied. These can often be linked to criteria that the general banks in Lesotho apply. The banking sector in Lesotho is well established and is comprised of large South African based banks and some local banks. The criteria qualifying the public consumers for a loan could then be used in order to qualify for a loan/voucher related to on-bill financing of refrigerators.

From the discussions however, it was indicated that the LEC does not have the funds to support on-bill financing at this stage. They have invested heavily in the electrification programme and as such the funds are not available for such a project. However, on-bill financing is something that should not be discarded in Lesotho. There is a possibility that the LEC does have funding available in the near future or that another institution is willing to fund such a programme through the use of the LEC's billing mechanisms. The payment of the loan through the electricity bill is very easily set up and is easily implemented/recovered. As such it remains a very attractive mechanism. One possibility is for a loan to be taken by the LEC for the issuing of individual loans to consumers. This overall loan taken by the LEC could originate from an international funding mechanism or from one of the national financial institutions. Governmental guarantees can be issued for this loan and hence the LEC would have a smaller interest rate on the bulk loan than it can charge on individual loans to consumers. This is required as the LEC needs to take into account a certain percentage of loan defaults. The loan amount can also be offset by allowing consumers to bring in their old refrigerators. These refrigerators could then be recycled, and the consumer could receive the recycling value in terms of a voucher to contribute to the purchase of a new, efficient refrigerator.

However, the on-wage financing was further discussed, given the value of funding required. It was noted that the majority of persons purchasing a refrigerator are employed. Additionally, it may be easier to break the problem into smaller portions (in terms of the organisations issuing the loans) and obtain funding in this manner.

As such the process of on-wage financing would be very similar:

- A potential purchaser of the refrigerator would apply for a voucher of LSL600 for the purchase of a new refrigerator with their employer

- The employer would have a pre-determined set of qualifying shops where the voucher can be used. The voucher can only be used for purchases of refrigerators that are level C and above as per the energy label
- The successful applicant would purchase the new refrigerator and use the voucher.
- The employer would be notified of that customers name, surname and ID number
- The employer would then add the amount of LSL600 to the salary deductions (split on a pre-determined number of months, e.g. LSL60 deduction per month for 10 months or 12 months if the employer decides to charge interest)

However, there is another additional possibility of implementing this scheme. In order for the employers to benefit they could have a tax benefit offset for the amount that they have subsidized to their employees. This could therefore be very lucrative for the employers and could offset some of the risk that they would have on employees who would leave their employment prior to the finalisation of the payback of the loan. The specifics are to be decided upon by the RSL through follow up discussions within the PWG. However, a specific example would operate as follows: the employer would provide loans for its employees. In order to qualify for the loan, the employees would need to fulfil several criteria. The criteria could be similar to applying for a loan from a commercial bank. Their income and credit record would be taken into account and the income versus the size of the loan would also be considered. Once the loan is issued by the employer the total amount lent would be taken into account by the RSL. For example, if a company has 1 000 employees and out of those 900 qualify for the loans and the average loan size is LSL1 000 (the value discussed is LSL600 per level of energy efficiency but some might apply for LSL1 200 or LSL1 800 to buy level B or level A refrigerators), then the total value of the loan is LSL900 000 undertaken by the employer. This employer would then be afforded tax benefits related to this amount. One possibility is the reduction of its tax bill to the RSL by LSL900 000 or a percentage of the amount (or example 50% of it may be tax deductible). The other option is for the assets (refrigerators purchased by the employees) to become assets of the employer until the loans are repaid and for the depreciation of the assets to be accelerated, hence providing tax benefits through accelerated depreciation.

7.3 ACTIONS

In terms of funding in support of the consumer the primary implementation plan is to attempt to enable on-wage financing mechanisms. Therefore, the plan is to engage with various institutions to understand their willingness to participate in such a plan. A task team will be set up to implement this. Prior to that however, discussions will be held within the RSL to understand the possibility of tax benefits for participating companies.

Therefore, the implementation plan is shown in Table 18 below.

Table 18. Implementation plan for On-wage financing

Action	Responsible	Timeline
Decide on possible tax benefits for companies participating in on-wage financing	RSL	End November 2022
Set up a task team to approach companies regarding participation	DoE	End November 2022
Engage companies and ascertain which are interested	Task team	End March 2023
Engage retailers to understand which will participate	Task team	End May 2023
Create legal/contractual framework	Task team and RSL	End June 2023
Print vouchers	Task team	Mid-July 2023
Advertise on-wage campaign (can be an addition to the consumer awareness campaign)	DoE and participating companies	June – July 2023
Implement roll-out of the campaign	Participating companies	July 2023 – July 2024
Monitor impact	Task team, DoE and participating companies	July 2024 – September 2024

As shown, the impact of the roll-out will be monitored. The monitoring will effectively occur throughout the programme as the participation will be verified and correlated with participating companies and participating retailers (in terms of vouchers issued vs vouchers spent). However, after one year of roll-out, a further monitoring campaign will be carried out to understand how many employees of participating companies knew about the campaign. Additionally, the ease of utilization and experience will be assessed through interviews with certain consumers that participated in the programme. Furthermore, the companies will also be engaged to assess their experience with the programme, the repayment rates will be monitored and, if implemented, the success of the tax benefits scheme.

8 Action Plan and Implementation budget

Throughout this report various aspects of the project have been outlined. This includes the work that has already been completed, the current status, and the action plans outlined for future implementation. In this section, a summary is made of all of the actions related to the various aspects of the project. In addition, the action plan in this section also outlines some of the activities required to support project implementation. For example, this includes the financing required to support project implementation. In terms of obtaining the required funding for project implementation there are 2 main possibilities that have been discussed and explored. The one is the grant for implementation from the government. This, however, may be extremely difficult and lengthy to implement. The DoE wanted to have internal discussions and include international consultants with decision makers within its department to ascertain whether there is budget to fund some of the implementation. The government is of course in favour of the energy efficiency project. The elections in Lesotho took place in October 2022. There is a new prime minister and the new government structure is being implemented. It is unknown what the direction will be at present and thus the obtaining of grants may be a lengthy process. This is one of the mechanisms that will be explored by the DoE but that is likely to be used as a later stage. If obtained it can be used for implementation in years 2 and 3 of the project.

The second possibility is obtaining funding from direct funding agencies, particularly those dealing with green energy projects. There are a number of organisations that provide such funding like international organisations such as the World Bank or the GCF or regional organisations such as the IDC located in South Africa. Furthermore, several of the large banks that operate in Lesotho have specific mechanisms to fund “green” projects. One such bank is Nedbank (A South African bank with a Lesotho entity).

If such an undertaking is going to be pursued, then the DoE has also indicated that there is a possibility of obtaining financial guarantees on a loan from a commercial bank such as Nedbank. This can lead to significantly lower interest rates and to a better chance of securing the loan due to the reduced risk to the lender.

The action plan for project implementation is presented in Table 19 below. In the action plan the entities responsible for each of the actions have been outlined. Furthermore, an estimated budget has been made for each of the activities in order to enable the implementers to ascertain the level of support and financial budget required for each of the activities. The Lesotho PWG and the national stakeholders have decided to formulate a Project Steering Committee (PSC) in the immediate aftermath of the project. This PSC will oversee the implementation of the project and will delegate certain responsibilities to various institutions. The table below will thus directly assist the PSC with its project implementation plan and budget. Of course, this plan set out below can be altered as the implementation progresses and certain experiences are gathered; and is meant to be a starting point of an action plan for project implementation.

Table 19. Overall Project Action Plan

MEPS, Standard and Regulation Activities		
Action	Responsibility	Timeline
Gather comments from the public consultations	LSI	January 2023
Organise final TC meeting	LSI	February 2023
Publish final national standard	LSI	February 2023
Prepare the regulatory framework for EE regulation	DoE	January - March 2023
Draft regulation (including internal governmental processes and consultations)	DoE	April - May 2023
Send regulation for public comment	DoE	May - June 2023
Review public comments	DoE	July 2023
Publish final regulation	DoE	August 2023
Maintain standard	LSI	Ongoing
Maintain regulation	DoE	Ongoing
Energy Label Development Activities		
Action	Responsibility	Timeline
Review the draft energy label	DoE	December 2022 - January 2023
Finalise label design	DoE	February 2023
Align final label with the regulation	DoE	March 2023
Align final label with the national standard	DoE/LSI	March 2023
Provide energy label for the consumer awareness campaign	DoE	April 2023
Maintain Energy Label and perform annual reviews	DoE	Ongoing
MV&E Implementation Actions		
Action	Responsibility	Timeline
Development of the application system – linking it with Lesotho national IT system and enabling it for usage for market surveillance	LEWA	January 2023
Assessing whether additional resources will be required for the processing of applications and making necessary appointments	LEWA	December 2023
Training of personnel on the processing of applications	LEWA	March 2023
Training of personnel on the border controls	RSL	March 2023
Training of personnel on the market surveillance procedure	LEWA	March 2023
Energy efficient purchases of refrigerators - Surveys at shops, consumers	LEWA/DoE	June 2025
Energy savings of 5% for consumers - Consumer surveys	LEWA/DoE	June 2025

Consumer Awareness Campaign Actions

Action	Responsibility	Timeline
Secure funding for the public awareness campaign	Ministry of Energy and Meteorology	January – February 2023
Establishing a baseline (collect additional data to the one gathered for the study)	The University of Lesotho (in particular the Energy Research Centre)	February – March 2023
Set up a Project Steering Committee (PSC) comprising of relevant stakeholder groups and develop Terms of Reference for it	Ministry of Energy and Meteorology	January 2023
Undertake informative research to inform the development of awareness and education materials	Ministry of Energy and Meteorology	March – April 2023
Workshopping messages within the PSC	Ministry of Energy and Meteorology	April – May 2023
Development of communication material, including: <ul style="list-style-type: none"> pre-launch testing translating these into the required languages 	Project PSC	May – July 2023
Engaging with relevant authorities and entities to obtain their buy-in for the roll out of the communication campaign	Project PSC	June – August 2023
Training sales personnel and repairers	Contracted party	August – September 2023
Roll out communication material – TV, radio broadcasts, newspapers, competitions, posters, website page	Ministry of Energy and Meteorology	September 2023 – June 2024
Monitor and evaluate the success of the campaign – Detailed actions below	Ministry of Energy and Meteorology	July – December 2024
Adapt the messages and communication means based on feedback received from evaluation	Project PSC	January – February 2025
Develop a maintenance plan	Ministry of Energy and Meteorology	February 2025

Financing Mechanisms – Supporting purchases of Energy Efficiency Refrigerators		
Action	Responsible	Timeline
Decide on possible tax benefits for companies participating in on-wage financing	RSL	January 2023
Set up a task team to approach companies regarding participation	DoE	February 2023
Engage companies and ascertain which are interested	Task team	End March 2023
Engage retailers to understand which will participate	Task team	End May 2023

Create legal/contractual framework	Task team and RSL	End June 2023
Print vouchers	Task team	Mid-July 2023
Advertise on-wage campaign (can be an addition to the consumer awareness campaign)	DoE and participating companies	June – July 2023
Implement roll-out of the campaign	Participating companies	August 2023 – July 2024
Monitor impact	Task team, DoE and participating companies	July 2024 – September 2024
Financing Actions – Project Implementation		
Action	Responsible	Timeline
Set up task team to perform functions for obtaining financing	DoE	January 2023
Identify exact entities to approach	Task Team	February 2023
Prepare proposals for each entity that will be approached	Task Team	March 2023
Make initial approaches to each entity identified	Task Team	March - April 2023
Prepare the DoE for the follow up discussions with specific entities	Task Team	May 2023
Engage in follow up discussions with specific entities	DoE/Task Team	June 2023
Further contractual discussions and finalisation of funding	DoE/Task Team	July - August 2023

The budget for the implementation is presented in Table 20 below. Certain activities that will be performed are part of the daily activities of the particular entity and therefore no additional costs are catered for those activities as noted below.

Table 20. Budget Estimate for the implementation of the project in Lesotho

Activity	Cost LSL	Comment/assumptions
Standards, MEPS and Regulation finalisation and distribution costs		
Gather comments from the public consultations	0	Internal process no cost
Organise final TC meeting	30,000	Organisation of a meeting for delegates = 30 000 from experience of PWG meetings
Publish final national standard	0	Internal process no cost
Prepare the regulatory framework for EE regulation	30,000	2 persons 50% of the time for 1 month
Draft regulation (including internal governmental processes and consultations)	210,000	2 persons 50% of the time for 7 month
Send regulation for public comment	30,000	1 person 50% of time for 2 months
Review public comments	30,000	2 persons 50% of the time for 1 month
Publish final regulation	30,000	1 person 50% of time for 2 months

Maintain standard	0	Internal process – no cost
Maintain regulation	0	Internal process – no cost
Standard Distribution	20,000	Administrative costs and legal costs of distribution of standards to key stakeholders
<i>Sub-total – Standard, MEPS and Regulation</i>	380,000	
Energy Label Development costs		
Review the draft energy label	60,000	2 persons 50% of the time for 2 months
Finalise label design	30,000	2 persons 50% of the time for 1 month
Align final label with the regulation	30,000	2 persons 50% of the time for 1 month
Align final label with the national standard	30,000	2 persons 50% of the time for 1 month
Provide energy label for the consumer awareness campaign		Internal activity – no cost
Maintain Energy Label and perform annual reviews		Internal activity - no cost
<i>Sub-total Energy label development</i>	150,000	
Consumer awareness campaign costs		
Secure funding	60,000	Establishment of a team to secure funding - 2 people, working half time for 2 months
Establish a baseline (additional information gathering)	60,000	2 months of work for 2 people, working 50% of the time
Project steering committee (PSC) establishment and meeting	30,000	Organisation of a meeting for delegates = 30 000 from experience of PWG meetings
Prepare messages within PSC - 2 meetings	75,000	2 meetings and half a month work for one person to gather information
Testing of materials - pre launch	90,000	2 people to carry out pre-launch testing, gather feedback for 4 months working 50% of the time
Translation of material into desired languages	60,000	2 months for 1 person
Training of sales personnel and repairers (10 training courses)	300,000	10 meetings effectively similar to PWG and other training meetings held
Social media campaign	300,000	Social media campaign rollout - as per estimates from South African companies
TV adverts	600,000	Development of advert material estimated at LSL400 000 and rollout at LSL200 000 (approximately LSL2 000 per advert slot on TV and radio)
Print media rollout	250,000	Development of material LSL100 000 and print media LSL3000 per advert, so budget for 50 adverts
Monitoring (surveys - in person or online, telephonic, case studies)	270,000	3 people for 6 months working 50% of time on this task
Review of impact and re-design and implementation if needed	60,000	2 people for 2 months working at 50% of time
<i>Sub-total – consumer awareness campaign</i>	2,155,000	
MV&E costs		

Internal training	1,100,000	Cost of training personnel and training facilities. From costs of meetings it is estimated at LSL39 285 per training session with an estimate of 28 sessions.
IT system for application processing	2,000,000	IT personnel costs for system upgrade at scale of similar projects based on experience from South Africa (3 month project – taking into account complexity)
RSL inspectors at borders	3,000,000	Additional personnel and equipment. Taking into account border posts that accept goods, the estimate is for 2 additional persons (roaming between border posts) at LSL 360 000 per person year x 2 x 3 years = LSL2 160 000 and the additional LSL840 000 is budgeted for tablets and scanners (additional IT infrastructure)
Surveillance inspectors	3,000,000	Similarly 2 additional surveillance inspectors budgeted for 3 years, amounting to LSL 2 160 000 and the remaining LSL840 000 for surveillance equipment (tablets, etc.)
Dealing with non-compliance - legal	1,000,000	Cost of a legal person at 30% of time (contract as and when needed) for 3 years
Warehousing	500,000	Cost of additional warehousing at border posts. RSL has the premises available but the costs are for annual maintenance over 3 years
Administrative	458,700	Estimated at 10% of total budget
Miscellaneous	458,700	Estimated at 10% of total budget
Laboratory testing of samples	3,500,000	Cost of testing estimated at LSL70 000. 15 tests budgeted per year, therefore 45 for 3 years. This amounts to LSL2 700 000 and the remaining LSL800 000 budgeted for transport of samples to Eswatini or South Africa
Monitoring	1,200,000	One additional resource budgeted at LSL30 000 per year for 3 years, amounting to LSL1 080 000 and the remaining cost is for the equipment required (tablet, computer, etc.)
<i>Sub-total – MV&E Plan</i>	16,217,400	
<i>Costs of setting up Financing Mechanisms for support of purchases of Energy Efficiency Refrigerators</i>		
Decide on possible tax benefits for companies participating in on-wage financing	0	Internal discussion – no cost
Set up a task team to approach companies regarding participation	0	Internal discussion – no cost
Engage companies and ascertain which are interested	30,000	1 month, 2 people at 50% of time
Engage retailers to understand which will participate	60,000	2 months, 2 people, working at 50% of the time
Create legal/contractual framework	100,000	Legal team costs
Print vouchers	26,000	1 person working 10% plus printing costs = 6 000 + 20 000
Advertise on-wage campaign (can be an addition to the consumer awareness campaign)	320,000	2 people 100% of time for 2 months plus advertising costs = 120 000 + 200 000

Implement roll-out of the campaign	360,000	2 people working 50% of the time for 12 months
Monitor impact	90,000	2 people working 50% of the time for 3 months
<i>Sub-total Financing mechanisms</i>	986,000	
<i>Costs of obtaining financing for project implementation</i>		
Set up task team to perform functions for obtaining financing		Internal action – no cost
Identify exact entities to approach	15,000	1 person 50% of the time
Prepare proposals for each entity that will be approached	30,000	2 persons 50% of the time for 1 month
Make initial approaches to each entity identified	60,000	2 persons 100% of the time for 1 month
Prepare the DoE for the follow up discussions with specific entities	30,000	2 persons 50% of the time for 1 month
Engage in follow up discussions with specific entities	60,000	2 persons 100% of the time for 1 month
Further contractual discussions and finalisation of funding	60,000	2 persons 50% of the time for 2 months
<i>Sub-total financing project implementation</i>	255,000	
Total (LSL)	20,143,400	
Total USD (Rate \$1 = LSL 18)	1,119,078	

The overall implementation budget for refrigerators in Lesotho is under \$1.2 million.

9 Conclusion

As has been shown in this report the Lesotho National Project related to energy efficiency of refrigerators has resulted in a number of key developments. Amongst these the most important is the development of the Lesotho National Standard on energy efficiency of refrigerators. This standard is very closely related to the regional standard developed within SADC. This standard outlines the MEPS and HEPS values for efficiency in Lesotho. Importantly the energy label has also been developed for Lesotho as part of the project and is aligned with the regional labelling requirements.

With the development of the national standard and the label, a number of implementation methodologies were developed. Regulation will be developed that will refer to the MEPS and the label and make both mandatory in Lesotho. This report outlines some of the other key points related to the implementation of the project. These include the consumer awareness campaign that has been developed in order to reach the various consumers and stakeholders of the project. Another important factor for the successful implementation of the project is the financing of energy efficient refrigerators and this report outlines some of the key financial mechanisms that can be exploited in Lesotho that would enable purchasing of more energy efficient refrigerators. Furthermore, the monitoring, verification and enforcement of the energy efficiency of refrigerators has been outlined in detail. All of these aspects are further detailed in the appendix of this document but the most important aspects to the successful implementation of the project in Lesotho are outlined in this report. Furthermore, the budget for the implementation of the project for the period of the next 3 years has been developed. The detailed action plan will allow the national PSC to implement the project according to a pre-defined process with milestones. The action plan can easily be transferred into a project plan and allows progress tracking. The budget for implementation is estimated at \$1.2 million and the budget breakdown also allows the PSC to source funding for specific tasks of the overall implementation in a phased approach, if necessary.

Therefore, this National Policy Roadmap summarises the development of the Lesotho National Standard and the energy label, their alignment with the regional standard and maps out plans for the implementation of the standard and accompanying regulations.

10 References

- [1] UNDP, Kingdom of Lesotho, “Sustainable Energy for All Investment Prospectus”, June 2016
- [2] US AID, Lesotho Power Africa Fact Sheet, <https://www.usaid.gov/powerafrica/lesotho>, last accessed 28 September 2022.
- [3] Trading Economics, Lesotho Imports from South Africa of Refrigerators, Freezers, Heat Pumps, <https://tradingeconomics.com/lesotho/imports/south-africa/refrigerators-freezers-heat-pumps>, last accessed 25 September 2022
- [4] Pegasys report for U4E, Market Assessment Report on Residential Refrigerators and Distribution Transformers in Lesotho, May 2022
- [5] Home Warranty of America, How Long Do Refrigerators Last? Signs it May Be Time for a Replacement, <https://www.hwahomewarranty.com/learning-center/homeowners/how-long-refrigerators-last#:~:text=According%20to%20the%20United%20States,it%20before%20it%20stops%20working.>, last accessed 26 September 2022.
- [6] SADC Regional Standard, Minimum Energy Performance Standards for Refrigerating Appliances, Draft 2, 26 July 2022
- [7] IEC 62552:2015 - Household refrigerating appliances - Characteristics and test methods
- [8] IEC 62552:2007 - Household refrigerating appliances - Characteristics and test methods
- [9] SANS 941:2020 (Ed. 1.02) - Energy efficiency of electrical and electronic apparatus
- [10] SANS 62552:2008 (Ed. 1.00) - Household refrigerating appliances - Characteristics and test methods
- [11] Eco Design Fridges, Report on the impact of global refrigeration standards, https://ecodesignfridges.eu/sites/ecodesignfridges.eu/files/CECED%20Report_15127_CE40_V2_ImpactGlobalStandard.pdf, last accessed 20 September 2022.
- [12] CTCN, n.d. *Energy efficient refrigerators*. [Online]
Available at: <https://www.ctc-n.org/technologies/energy-efficient-refrigerators>
[Accessed 30 September 2022].
- [13] Donovan & Henley, Analysis of Rossiter – Percy’s Six – Step Model of Communication, feeboocsummary.com