Monitoring, Verification and Evaluation Report for Refrigerators

MV&E Refrigerators Report - Eswatini

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UN environment programme

U4E United for Efficiency

GREEN CLIMATE FUND

CTCN UN Climate Technology Centre & Network UNFCCC Technology Mechanism

PEGASYS CHANGING LIVES CHANGING WORLDS

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ABBREVIATIONS

AfDB	African Development Bank
DoE	Department of Energy
EEC	Eswatini Electricity Company
ERS	Eswatini Revenue Services
ESERA	Eswatini Energy Regulatory Authority
EU	European Union
GCF	Green Climate Fund
GWP	Global Warming Potential
HEPS	Higher Energy Performance Standard
IMF	International Monetary Fund
LED	Light emitting diode
MDG	Millennium Development Goals
MEPS	Minimum Energy Performance Standard
MNRE	Ministry of Natural Resources and Energy
MV&E	Monitoring, Verification and Enforcement
ODS	Ozone Depleting Substances
PWG	Policy Working Group
SADC	Southern African Development Community
SWASA	Eswatini Standards Authority
SZL	Eswatini Lilangeni
TBD	To Be Determined
UA	Units of Account
U4E	United for Efficiency

1 Introduction

The 'Leapfrogging to Energy Efficient Appliances and Equipment in Eswatini (Refrigerators and Distribution Transformers)' project is delivered by the UN Climate Technology Centre and Network with funding from the Green Climate Fund (GCF) and being implemented under the guidance of the government of the Kingdom of Eswatini (Eswatini). The project is also being implemented simultaneously within 7 other countries of the Southern African Development Community (SADC) region, namely Botswana, Zimbabwe, Namibia, Malawi, Lesotho, Zambia and Tanzania. Eswatini has no independent access to the coast/sea. Therefore, it is heavily reliant on use of South African ports for the import of essential commodities, including electricity, which is purchased from Eskom, the state-owned utility in South Africa. The electrification rate in Eswatini is currently around 84% with universal access to electricity projected by the end of 2022 [1] The government of Eswatini has embarked on a drive to improve its electricity generation capacity to diminish its dependence on imported power from South Africa and to provide greater security of supply. A National Energy Policy was developed in 2018 to facilitate this process. An Independent Power Producer (IPP) Policy was established under the Ministry of Natural Resources and Energy (MNRE) to increase the utilisation of solar and biomass generation plants. The Lavumisa 10 MW solar plant project is nearing completion while there are 40 MW solar and 40 MW biomass generation plants planned for construction in 2021 [1]. The expansion of the grid will result in an increase of transformers on the network. Any improvement in the technical losses present on distribution transformers will have an immediate impact on energy efficiency improvements for the entire network and has direct cost savings for the country. Refrigeration appliances, in particular household refrigerators are also a major contributor to technical electrical losses. Refrigeration appliances are always operating and therefore consume electrical energy constantly. Therefore, energy efficiency improvements in these appliances have a continuous impact on energy efficiency improvements for the country.

The electrification campaign listed above and the drive towards energy efficiency align with the Eswatini National Energy Policy of 2018. The main objectives of the Eswatini National Energy Policy are to enhance energy security and self-sufficiency. The focus of the energy policy is to meet the country's demands for electricity in a sustainable manner. Therefore, one can reach these objectives through the two processes listed below:

1. To minimise losses in energy processes

2. To reduce energy imports in meeting demand

Through the development and the subsequent implementation of this project some of the objectives of the energy policy can thus be met. The aim of the project was 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), Higher Energy Performance Standards (HEPS) as well as an energy labelling scheme for refrigerators. In order to successfully

implement the national standard, which includes the MEPS and HEPS and the labelling scheme for refrigerators, a Monitoring, Verification and Enforcement (MV&E) plan has been developed.

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 Eswatini for future development of related standards and legislation. Furthermore, the project investigated possible financing mechanisms available to assist implementation. The following were the key components of the project:

1. Development of the Eswatini National Standard on energy efficiency in refrigerators (including MEPS and HEPS)
2. Development of the Eswatini Energy Label
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
6. Development of the National Policy Roadmap (NPR)

This report outlines the MV&E plan and its various components. These include the institutional and regulatory framework within Eswatini important for the implementation of the MV&E plan as well as the actual MV&E plan components, their importance and an outline of implementation. Furthermore, this report calculates an implementation budget for the MV&E plan.

2 Monitoring, Verification and Enforcement

There are therefore 3 aspects to the MV&E plan which are equally important with their own role within the framework. These are monitoring, verification and enforcement. Each of these is described in more detail in this section.

Monitoring –The monitoring that forms part of the MV&E plan relates to the checking of the 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.

Furthermore, the standards developed as well as the energy label and the resulting regulation are critical components that are important to the MV&E plan as they provide the framework that outlines what should be monitored and verified and how it should be enforced..

Standards - Standards are effectively a formula that can be used to describe the best way of doing something or making something. Standards are compiled through engagements with industry experts and through technical committees where the issues related to the standard development are discussed at length using related multi-disciplinary institutional knowledge [2].

Quoting ISO [2]: ”Standards are the distilled wisdom of people with expertise in their subject matter and who know the needs of the organizations they represent – people such as manufacturers, sellers, buyers, customers, trade associations, users or regulators.”

Labelling - Energy labels are a key component of an energy efficiency programme. They are a visual indicator of the energy performance of the appliance. A well designed energy label provides a clear and concise visual representation of energy efficiency and provides information on the annual energy consumption of the appliance when used a pre-defined settings. The energy label enables the consumer to choose a more efficient product through simple means [3]. Simultaneously, if the energy label is well known to the consumers and impacts their

purchasing decision the energy label also drives the manufacturers to improved efficiency through market competition.

Regulation - As indicated standards alone are merely guidelines or a formula to obtaining the required product or service. However, in order to implement them and make them mandatory often regulation is required. Regulation is defined as a rule prescribed by an authority [4]. Therefore, the standard is then often referred to by the regulation and is the “rule” part of the definition. The respective regulator is then the authority that is prescribing the regulation and is responsible for enforcing it. Regulation is often the most effective way in enforcing important standards that have a great impact on society and the environment.

In order to be able to effectively implement the MEPS and the labelling a Product Registration System (PRS) is highly useful.

Product Registration System (PRS)

The PRS is one of the terms used to refer to a system which enables regulators to enforce the regulations on products entering the country and those manufactured in the country. Eswatini has a manufacturer of refrigerators (Palfridge). The PRS will therefore be appliable to both imported refrigerators and to refrigerators manufactured in Eswatini. The PRS acts as a first port for compliance when products are entering the country or entering the market (having been manufactured internally). It is a system whereby the specific product is registered and the information required for compliance with the relevant regulation can be submitted. A system such as this allows the products to be reviewed prior to arrival at the port or the market and for a permit allowing imports or sales to be issued to the manufacturer/importer/reseller. The majority of the refrigerators in the Eswatini market are still imported, even with the local manufacturer. The PRS process will therefore reduce the amount of work that is required to be performed at the border. A system such as this, if effectively set up, can also serve as a good database of the imports of the specific product, the types of appliances that are being imported and trends related to non-compliant applicants, etc. It can also serve as a good database for all products being sold in the Eswatini market.

Objectives of the MV&E system

A well-established MV&E system has several objectives to fulfil. It is the primary system for compliance with the MEPS. Of course the main objective of the MV&E system is to enable compliance with the MEPS and through this process to improve the energy efficiency of the country. Through the improvement of energy efficiency there are other benefits such as the reduction of electricity costs for households, reduction of electricity imports for Eswatini, reduction of greenhouse gases in the atmosphere resulting from reduction in electricity generation from fossil fuels (as is primarily the case in Eswatini). Some of the key objectives are:

- Ensure that Eswatini meets the energy efficiency targets
- Drive away cheap alternative refrigerators (that are less efficient)

- Provide a vehicle through which the local manufacturer can strive to increased energy efficiency and attract a target market in the high efficiency sector
- Provide a measure of success for the various stakeholders – allowing a re-assessment of approach at various intervals
- To provide an avenue through which products can comply with the regulation
- Success of this project can be the launch pad for other energy efficient projects and can open funding for such
- Successful policies, such as the PRS and the labelling scheme can be used as an example/template and implemented in other appliances

Having an effective MV&E plan shows the level of success of implementation of the system and the level of compliance of the importers and manufacturers. In turn having a measured level of success is an enabler of the country being able to portray its effectiveness and to use such a similar system in other commodities and appliances that it chooses to target in the next steps towards improved energy efficiency.

Requirements for the MV&E system

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. Each of the requirements is explained in a more detail below:

1. The PRS system

The product registration system 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 certification, 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. Eswatini is fortunate that Palfridge already has an accredited laboratory that is capable of performing the energy efficiency testing.

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 in 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. 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. Buy in from the importers, manufacturers and wholesalers makes the process much smoother. The majority of the compliant importers and manufactures 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 an 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.

3 Institutional and Regulatory Framework

3.1 INSTITUTIONAL FRAMEWORK FOR REFRIGERATORS IN ESWATINI

In order to effectively implement the MV&E system related to refrigerators it is important to understand the current institutional framework of the country. This is important as it outlines the best way to understand the various roles and responsibilities of departments and other governmental entities that are involved in the refrigeration aspect of the project. They are important to understand the following:

- Standardisation processes within the country. This includes the framework for standard development and standard maintenance.
- Regulatory framework. The effective implementation of MEPS usually requires accompanying regulation. Importantly, this regulation needs to be implementable once developed.

Dedicated financing is often a barrier to the implementation of energy efficiency policies and programmes. At the moment there are no dedicated financing mechanisms in Eswatini for the funding of such policies and programmes. This particular project has been funded by the CTCN and is assisting in the establishment of structures that will enable support for such policies to be implemented. A number of institutional stakeholders exist within Eswatini that are key to the successful development and implementation of this project. Eswatini possesses a regulator in this environment namely the Eswatini Energy Regulatory Authority (ESERA). Additionally, the Eswatini Standards Authority (SWASA) is well established and has structures in place to develop and maintain standards.

The other key institutions and/or ministries related to this project are: Ministry of Natural Resources and Energy, Ministry of Tourism and Environmental Affairs, the Eswatini Electricity Company, the Eswatini Revenue Service (ERS), the Eswatini Environmental Authority, and the Eswatini Central Bank.

In Table 1 below is a list of the entities listed above and their importance/role in the development and implementation of MEPS.

Table 1. Entities and roles in development of MV&E in Eswatini

Organisation	Role
Ministry of Natural Resources and Energy	Driver of the MEPS development and implementation. Formation of energy related initiatives
Ministry of Tourism and Environmental Affairs	The support ministry to the Ministry of Energy in this project. Can facilitate governmental support for legislation and implementation support
Eswatini Electricity Company	The main buyer and user of distribution transformers. Also, the importer and seller of electricity and as such a key to the implementation of the project and one of the project's biggest beneficiaries
Eswatini Energy Regulatory Authority	Energy regulator and as such governs the operations of the EEC and is key to the implementation of energy efficiency initiatives and possible legislation implementation.
Eswatini 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
Eswatini Environmental Authority	Regulator of environmental affairs and heavily involved in refrigeration technician training
Eswatini Standards Authority	National body responsible for standards development and administration
Eswatini Revenue Service	Amongst other functions it governs the imports and exports into the country and will be key, especially for refrigerator movement and assessment of the labelling scheme at the border

There are also other important stakeholders that are going to be involved in the implementation of the MEPS, the energy label and the MV&E plan overall, or will have an influence on the project. These include:

- Ubombo Sugar and Royal Swazi Sugar (biggest owners of distribution transformers after the EEC)
- The University of Eswatini (in particular the Centre for Sustainable Energy Research)
- Palfridge (the local refrigerator manufacturer and owner of an accredited test laboratory_
- The retailers (both local and large international organisations)
- Repair centres and technicians
- Financial institutions (specifically the banks as possible lenders supporting the implementation of energy efficient appliances)

3.2 POLICY FRAMEWORK FOR REFRIGERATORS IN ESWATINI

In recent times Eswatini has been involved in energy efficiency projects. It is participating in the Energy Efficient Lighting and Appliances project in the SADC region. This project is aimed at supporting markets for energy

efficient lighting and appliances in east and southern Africa [5]. This is done through various initiatives, such as, market incentives (including financial incentives and technical assistance to the supply chain participants), development of policies and regulations such as MEPS, increasing awareness through consumer awareness campaigns and capacity building of governmental institutions (including laboratories and other conformity assessment bodies). This is critical as these elements are key aspects of this project and thus support for the implementation of the project is available. Additionally, Eswatini is the signatory to the Montreal Protocol and the ratification of the Kigali Amendment.

Eswatini has issued a National Energy Policy in 2018 and the National Climate Change Policy in 2016. In the National Energy Plan the Eswatini government and in particular the Ministry of Natural Resources and Energy is committed to energy efficiency and energy conservation as important policies of the country [1]. Cooling and heating appliances have been identified as major sources of energy inefficiency. The National Energy Policy also indicates the desire to draft standards and related labelling to ensure high efficiency products enter the country. There is particular mention of heating, ventilation and air conditioning, building energy management systems, hot water generation, lighting and appliances. Furthermore, the National Energy Policy, although not explicitly listing specific appliances, mentions that Eswatini Government will encourage development of an energy appliance labelling programme at a regional level. The MNRE is also committed in this policy to initiate, in co-operation with the local manufacturers and SWASA, a programme for labelling their products as a way of encouraging a regional programme.

The National Climate Change Policy, issued in 2016, aims to provide the enabling policy framework to guide Eswatini to address the challenge posed by climate change [6]. Climate change has already had a profound negative impact on the Eswatini agriculture and food security. The Climate Change Policy outlines the aim to support economic development through access to electricity whilst at the same time reducing the intensity of energy use through energy efficiency programmes. One of the plans is to collaborate with IPP to provide more renewable energy into the Eswatini energy mix.

There are also a number of acts that govern the operation and formation of key state-owned entities related to electricity supply. These are:

- Eswatini Public Procurement Act 2011. This act governs the manner in which state-owned companies, such as the EEC purchase equipment, e.g., transformers. Through this Act the state-owned enterprises in Eswatini are given directives with regard to purchasing mechanisms. The Act also governs the rules that state owned enterprises have to follow when purchasing items. This is designed in order to prevent corruption, ensure purchase of adequate equipment, enable purchase of equipment at competitive prices and in order to support local manufacturers. The purchase of transformers by the EEC would therefore be governed by this Act.
- Swaziland Electricity Company Act 2007. This is a key act as it established the EEC as the electricity generation, transmission and distribution monopoly in Eswatini
- The Electricity Act 2007. This act in combination with the Swaziland Electricity Company Act paved the way for the formation of the EEC and their mandate of electricity supply

- The Energy Regulatory Authority Act 2007. This act enabled the establishment of the Eswatini Energy Regulatory Authority (ESERA).
- The Public Enterprises (Control and Monitoring) Act, 1989. This act enabled the establishment of various public enterprises and their responsibilities to the various ministries that they report to.

3.3 MINIMUM ENERGY PERFORMANCE STANDARD AND THE ENERGY LABEL

As part of this project and through the efforts of the various national stakeholders involved an Eswatini MEPS and energy label have been developed. The MEPS forms part of the national standard for refrigerators. The national standard is undergoing finalisation of the public commenting process and will be published by SWASA thereafter. The energy label has been drafted through a consultative process with the PWG members, and is mostly aligned with the current guidelines of the draft regional label. The Eswatini National Technical Committee for Refrigeration decided to align with the MEPS of the regional standard. The Eswatini MEPS are shown in Table 2 below. They also decided to add one more level in the HEPS. The HEPS for Eswatini is therefore shown in Table 3 below. The reason for this was to encourage manufacturers to pursue higher energy efficiencies. It effectively gives manufacturers a higher target to achieve and to be able to distinguish themselves in a higher sector of energy efficiency. This is particularly important to Eswatini because of its local manufacturer, Palfridge, who will aim to be the first SADC manufacturer to reach the target of R>2.

Table 2. Eswatini MEPS for refrigerators

Product Category	R (2023)	R (2026)
Refrigerator	1.00	1.25
Refrigerator/freezer	1.00	1.25
Freezer	1.00	1.25

Table 3. Eswatini HEPS for refrigerators

Product Category	Low	Intermediate 1	Intermediate 2	Intermediate 3	High
Refrigerator	$1.00 \leq R < 1.25$	$1.25 \leq R < 1.50$	$1.50 \leq R < 1.75$	$1.75 < R \leq 2.00$	$2.00 \leq R$
Refrigerator/freezer	$1.00 \leq R < 1.25$	$1.25 \leq R < 1.50$	$1.50 \leq R < 1.75$	$1.75 < R \leq 2.00$	$2.00 \leq R$
Freezer	$1.00 \leq R < 1.25$	$1.25 \leq R < 1.50$	$1.50 \leq R < 1.75$	$1.75 < R \leq 2.00$	$2.00 \leq R$

The draft energy label is presented in Figure 1 below.

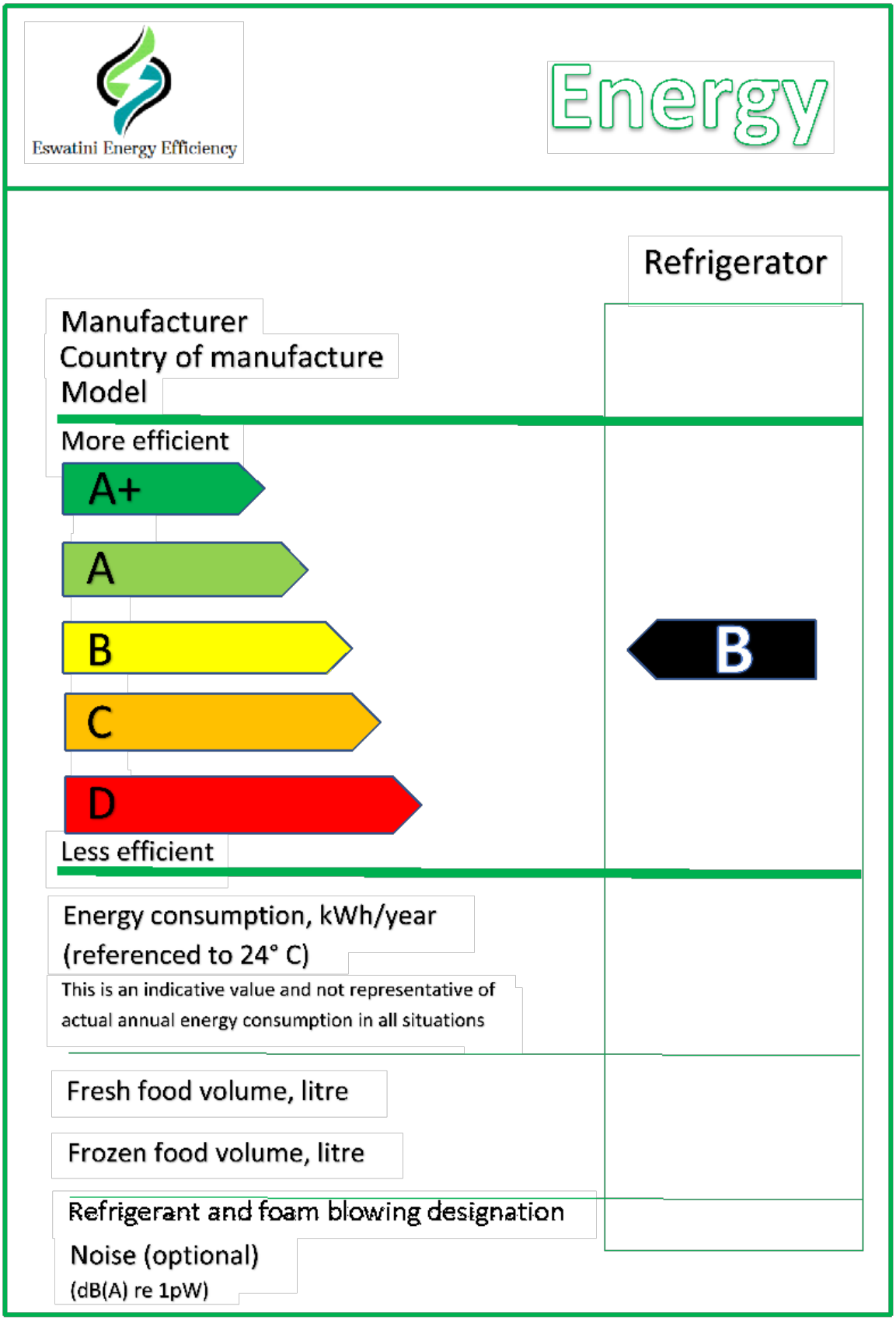

Figure 1. Draft Eswatini Energy Label for Refrigerators

4 Requirements for successful implementation in Eswatini

In section 2 a number of elements required for a successful general MV&E plan implementation were listed. In order for the MV&E plan to be implemented successfully in Eswatini a number of these elements listed above are key and require particular attention. They are therefore explained in more detail below.

1. The setup of the software system to manage the PRS

The software system needs to be developed so that it can handle the application process. Thereafter the applications should be directed to the governmental department for processing. The processing includes verification of conformance and verification of the remaining administrative aspects of the application (e.g. contact details, name and make of refrigerator, etc.). It is proposed that this process be conducted by ESERA with assistance related to confirming authenticity of reports supported by SWASA. Therefore, the system needs to be such that it allows access to various pre-defined personnel from different departments and so that information can be shared amongst departments. A software system already exists (Acequoia World) within the Eswatini governmental agencies that will be updated to incorporate the requirements of the application and review processes of the PRS. This system requires flexibility as some of the fields may require adaptation after implementation as lessons are learnt. This adaptation of the system should be simple to do, otherwise it may require outsourcing to experts and will add costs to the project.

2. The training of internal personnel at ERS, SWASA, ESERA and other departments that undertake various responsibilities within the MV&E scheme

The training programmes have been developed as part of the implementation of the Project. The training referred to in this section specifically relates to the capability of the ERS personnel to assess compliance of the product at the border (border inspections). Specific training has been presented to the ERS personnel as part of this project and the training will be further implemented within the ERS and to their personnel at the various border posts performing the inspections. The training has been aligned with the application and approval process described in this MV&E plan.

The other aspect of the training is to review the application as part of the PRS. The review of the application is effectively the verification of compliance and this aspect has been trained in the train the trainer programmes as part of the project. The training will then be implemented further within the ERS. Furthermore, SWASA will also assist in this regard as they are a conformity assessment specialist body and as such the training will also be performed within their organisation. SWASA is well established with significant expertise in conformity assessment and will therefore be able to assist ESERA greatly in this regard and will be able to ascertain

compliance and conformity assessment proof during this process. ESERA will be implementing the application review process and the training will also be implemented throughout its organisation to the dedicated inspectors that will be performing the PRS application review and market surveillance processes.

3. The interdepartmental communication, information and knowledge sharing

As can be seen from all of the activities that have been outlined in the MV&E plan it is critical for the departments and state owned entities to share information and knowledge in order to implement the MV&E plan effectively. For example the application platform needs to be shared between SWASA. ERS and ESERA. The permit, once approved by ESERA also needs to be shared with the ERS. The results of the market surveillance and the results of applications need to be shared by ESERA with the DoE and possibly other departments responsible for trade, etc. Therefore, a large amount of information sharing is required and openness within the governmental entities is critical.

4. Governmental support and drive to establish the required regulation

The regulation development process is not necessarily part of the MV&E plan. The MV&E plan however relies on regulation, which makes the MEPS and the labelling mandatory within Eswatini. Therefore it is a critical step. The DoE will drive this process. The DoE will thus pursue the development of the regulation related to energy efficiency through the same channels as it also aligns with the same Eswatini National Energy Policy.

5. Overall budget and implementation

In order to enable the implementation of the outlines MV&E system a budget will have to be financed as related to execution. The budget is outlined in Table 4 and amounts to approximately SZL 15 million (approximately $860 thousand). From the activities within the budget it is evident not all of the finance is required to be obtained at once and that some of the activities can start immediately. The training for example will be budgeted for by the individual departments or state owned organisations. The important first steps are the training and the implementation of the software system to enable the PRS. The software already exists and only requires an upgrade rather than the implementation of a new system. Equally important is the budget for the market surveillance system. The requirement is for personnel to carry out the surveillance inspections and for them to be trained prior to the start of the process. Furthermore, if a decision is made to perform certain testing of refrigerators sampled from the stores then the cost of the purchase of that refrigerator and the cost of testing should be catered for. The majority of the costs will therefore be required for the processing of the PRS and the related market surveillance. These costs can be financed through application fees and levies on products. During the discussions within the PWG the initial feelings were that the application fee will be charged for the PRS but that levies on imports will not be charged.

This is to be reviewed through the implementation stages. The initial estimate is that there is a requirement for 4 additional persons at ESERA in order to implement the PRS and the market surveillance. At present the ERS and SWASA seem to have an adequate number of persons to implement its responsibilities related to this project but this will be re-assessed after 1 year of implementation. The number of personnel required is likely to double once the programme is rolled out completely. It is estimated that SZL 7 million will be required for the annual implementation (beyond the initial setup budget) of the PRS and thus a levy for applicants should be considered in the future. This levy can be a set fee per number of units imported and the South African model of levies imposed by the National Regulator for Compulsory Specifications can be considered.

5 Proposed MV&E plan for Eswatini

In order for the future Eswatini National Standard and energy label to be effective, a well-planned, supported, systematic MV&E framework is required. In Eswatini regulation will be developed that will make compliance with the MEPS and the energy labelling mandatory. 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 Eswatini 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 project) 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.

Therefore, the next sections outline the final recommendations for the MV&E plan and from the discussions within the Policy Working Group (PWG) and with the Eswatini 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 component of the MV&E plan have been outlined in the previous section and the specific details related to implementation in Eswatini are described in more detail below

5.1 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 undertaken by all importers, manufacturers and wholesalers of refrigerators in Eswatini. This section outlines the process that was chosen for Eswatini. It must be stressed that this process is not currently implemented in Eswatini 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:

5.1.1 APPLICATION

The application is performed by either the manufacturer or the importer of the refrigerators into Eswatini or the Eswatini based manufacturer. The application is performed on the specific Eswatini governmental internal platform. This is an existing platform in Eswatini (Asequoia World), which allows access to the information to be shared between various departments. Eswatini does have the PRS that is currently used for other commodities, primarily water. The ERS is able to access the required information in this case off the system and use it for port inspections. The ERS therefore has the ability to retrieve the information at the ports and use it to process its border controls. The system however requires modification. For this application purpose the application would be sent to ESERA. 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 ERS. 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 SWASA for assistance with the proof of compliance.

5.1.2 APPLICATION REVIEW

The SWASA and LEWA assessors then receive the application and check the following:

- That the test report and/or certification is from an accredited facility (SWASA to perform)
- Checks the energy consumption on the test report and compares it to the energy consumption on the label (ESERA and SWASA to perform)

- 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 (ESERA and SWASA to perform)
- Checks that all of the information related to the refrigerator is correctly listed on the label (e.g. model, type, volumes, etc.) (ESERA and SWASA to perform)
- Checks that the energy label contains all of the required information (consumption, model, manufacturer, volumes, etc.) (ESERA and SWASA to perform)

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

5.1.3 ISSUE OF PERMIT

If all of the information and all of the checks listed above are positive, the ESERA 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 ERS prior to the arrival of the refrigerators at the border or prior to releasing the refrigerators into the market in the case of Palfridge (and any other local manufacturers in the future). The successful permit is also loaded onto the system by the ESERA official and the ERS now also has access to this permit on the system (and can access it remotely/electronically).

5.1.4 SUBMISSION OF PERMIT AND LABEL

The applicant (manufacturer or importer) is now in possession of a permit. The importer usually submits documentation to the ERS prior to the shipment arriving at the port. In the case of Palfridge they send the permit to the retailer that will be selling their refrigerators. 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. Similarly, Palfridge would supply the reseller the permit and the label and relevant documentation.

5.1.5 INSPECTION AT THE BORDER

The ERS 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 ERS 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 ERS 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 ERS processes will follow.

5.1.6 MARKET SURVEILLANCE

The above outlined system is likely to create a situation whereby a significant number of refrigerators within Eswatini are complaint 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 ERS 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 ERS have indicated that they will flag refrigerators for such inspections, especially in the first 12 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 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 Eswatini has been completed they would either be stored in warehouses or shop floors awaiting purchase. During this time market surveillance would be performed. Market surveillance would also be performed on Palfridge refrigerators that are stored at the factory prior to release to the market. The market surveillance would be performed by ESERA inspectors. However, the ERS 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 ERS 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. So 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.

5.1.7 DEALING WITH NON-COMPLIANCES

In order to have a successful implementation of the project there is a need for the Eswatini 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 12th, 13th, 14th, 17th, 19th and 20th of October. The decision for implementation in Eswatini 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 Eswatini state owed entities:

- ERS – Inspection of refrigerators at ports, assistance to ESERA in terms of inspection of manufacturer/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
- ESERA – 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 ESERA with support from the ERS
- SWASA – 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 ESERA and the ERS by June 2023

3. Train at least 5 resources at ESERA 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, he actions, with responsibilities, timelines and verification methods are listed in Table 4 below.

Table 4. Actions, responsibilities and timelines

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

In addition to the above plans an implementation budget has been developed. This implementation budget has been broken down per key activity and is presented in Table 5 below. The budget considers the cost of implementation and monitoring for the period of 3 years.

Table 5. Budget Estimate for the implementation of the MV&E in Eswatini

Activity	Cost SZL	Comment/assumptions
Standard Distribution	20,000.00	Administrative costs and legal costs of distribution of standards to key stakeholders
Internal training	1,200,000.00	Cost of training personnel and training facilities. From costs of meetings it is estimated at SZL40 000 per training session with an estimate of 30 sessions.
IT system for application processing	2,000,000.00	IT personnel costs for system upgrade at scale of similar projects based on experience from South Africa (3 month project – taking into account complexity)
ERS inspectors at borders	2,240,000.00	Additional equipment. Taking into account border posts that accept goods, the estimate is for no additional persons in year 1 and for 2 additional resources to be employed in year 2 and 3 (roaming between border posts) at SZL 360 000 per person year x 2 x 2 years = SZL1 440 000 and the additional SZL800 000 is budgeted for tablets and scanners (additional IT infrastructure)
Surveillance inspectors	3,000,000.00	Similarly 2 additional surveillance inspectors budgeted for 3 years, amounting to SZL2 160 000 and the remaining SZL840 000 for surveillance equipment (tablets, etc.)
Dealing with non-compliance - legal	1,000,000.00	Cost of a legal person at 30% of time (contract as and when needed) for 3 years
Warehousing	500,000.00	Cost of additional warehousing at border posts. ERS has the premises available but the costs are for annual maintenance over 3 years
Administrative	458,700.00	Estimated at 10% of total budget
Miscellaneous	458,700.00	Estimated at 10% of total budget
Laboratory testing of samples	3,100,000.00	Cost of testing estimated at SZL60 000. 15 tests budgeted per year, therefore 45 for 3 years. This amounts to SZL2 700 000 and the remaining SZL400 000 budgeted for transport of samples to Palfridge
Monitoring	1,200,000.00	One additional resource budgeted at SZL30 000 per year for 3 years, amounting to SZL1 080 000 and the remaining cost is for the equipment required (tablet, computer, etc.)
Total (SZL)	**15,177,400.00**	
Total USD (Rate $1 = SZL 17.59)	**862,843**	

The above figures are estimates and certain assumptions were made to contribute to the figures. The monthly salary of personnel was averaged at SZL30 000. This is related to full time (40 hours per week) employment. Therefore, the implementation cost is approximately $860 thousand.

6 Conclusion

This report outlines the MV&E plan for refrigeration in Eswatini. The MV&E plan is important in order to define the monitoring, verification and enforcement of the energy efficiency of refrigerators in the country. The MEPS for Eswatini has been developed for refrigerators and is part of the new national standard that is being published. The energy label has also been drafted and will be enforced as part of the regulation that will be developed in Eswatini. In order to enforce the MEPS and the energy label and to monitor the impact on the number of more efficient refrigerators utilised in the country an MV&E plan has been developed as part of this report. The MV&E plan includes the PRS that will be implemented to process the applications of refrigerators entering the country. The full PRS has been outlined, combined with specific responsibilities within the governmental departments and regulators. Various other aspects of the MV&E plan have been detailed to enable the Eswatini national stakeholders to implement the plan and reach the objectives of improved energy efficiency of refrigerators in the country. These include the processing of applications, verification of conformity assessment, issuing of permits, border controls for compliance, market surveillance and dealing with non-compliances. The regulatory and policy framework within Eswatini in which the abovementioned tasks are to be implemented has been outlined, so that the implementation can be aligned with the current framework and so that the various responsibilities are aligned with the respective capabilities within the departments and entities. Finally the overall objectives of the MV&E plan have been outlined, which include the increase in energy efficient refrigerators in Eswatini, the increase in overall energy efficiency of energy consumption of the country and the implementation of the MEPS. The budget for the MV&E plan has also been outlined. From the MV&E plan presented the Eswatini national stakeholders have agreed to formulate a working group that will review the various aspects of the plan and begin the implementation tasks according to the outlined responsibilities and timelines.

7 References

[1] Eswatini Energy Regulator Authority, “ESERA 2019/2020 annual report”, May 2021.

[2] International Organization for Standardization, ISO standards are internationally agreed by experts, https://www.iso.org/standards.html#:~:text=ISO%20standards%20are%20internationally%20agreed,a%20huge%20range%20of%20activities, last accessed 20 October 2022.

[3] European Commission, About the energy label and ecodesign, https://ec.europa.eu/info/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/energy-label-and-ecodesign/about_en, last accessed 15 December 2022.

[4] Collins Dictionary, Regulation definition, https://www.collinsdictionary.com/dictionary/english/regulation, last accessed 12 October 2022.

[5] SACREE, “The Energy Efficient Lighting and Appliances (EELA) project aims to support the development of vibrant markets for energy efficient lighting and appliances across East and Southern Africa”, https://sacreee.org/sites/default/files/documents/files/FINAL%20EELA%20Flyer.pdf, last accessed 10 May 2022.

[6] MINISTRY OF TOURISM AND ENVIRONMENTAL AFFAIRS, “NATIONAL CLIMATE CHANGE POLICY, 2016”, https://info.undp.org/docs/pdc/Documents/SWZ/Swaziland%20Climate%20Change%20Policy%202016%20Final.pdf, last accessed 16 October 2022.