REPUBLIC OF NAMIBIA

National Policy Roadmap

Draft

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

Draft Version

Basel Agency for Sustainable Energy (BASE)

International Copper Association (ICA)

Southern African Development Community's (SADC) Centre for Renewable Energy and Energy Efficiency (SACREEE)

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List of Abbreviations

AEC	allowable energy consumption
AU	African Union
BUR	Biennial Update Reports
CC	Contestable Customers
CO_2	Carbon Dioxide
CTCN	Climate Technology Centre & Network
DFI	Development Finance Institutions
DIF	Development Investment Fund
DSM	Demand Side Management
DT	Distribution Transformer
EACREEE	East Africa Centre of Excellence for Renewable Energy and Energy Efficiency
ECB	Electricity Control Board
EE	Energy Efficiency
EEI	Energy Efficiency Index
EE&C	Energy Efficiency and Conservation
EELA	Energy Efficient Lighting and Appliance
EIF	Environmental Investment Fund
EPCs	Energy Performance Contracts
ESCO	Energy Service Company
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GHG	Greenhouse gases
GWh	Gigawatt hour
GWP	Global Warming Potential
HC	Hydrocarbon
HFC	HydroFluorocarbons
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
INDC	Intended Nationally Determined Contributions

IPP	Independent Power Producer
MEFT	Ministry of Environment, Forestry and Tourism
MEPS	Minimum Energy Performance Standards
MIT	Ministry of Industrialisation and Trade
MME	Ministry of Mines and Energy
MOF	Ministry of Finance
MV&E	Monitoring, Verification, and Enforcement
MW	Megawatt
NamPower	Namibia Power Corporation
NamRA	Namibia Revenue Agency
NCCI	Namibia Chamber of Commerce and Industry
NDC	National Determined Contributions
NDP	National Development Plans
NEF	National Energy Fund
NEI	Namibia Energy Institute
NENA	Namibia Electricity Network Asset
NEP	National Energy Policy
NERA	Namibia Energy Regulatory Authority
NMA	Namibia Manufacturer Association
NOU	National Ozone Unit
NPC	National Planning Commission
NQA	Namibia Qualifications Authority
NREP	National Renewable Energy Policy
NRM	National Roadmap
NSA	Namibia Statistics Agency
NSC	Namibian Standards Council
NSI	Namibian Standards Institution
NUST	Namibia University of Science and Technology
NWRA	Namibia Wholesale and Retailers Association
PCB	Polychlorinated Biphenyl
PPA	Power Purchase Agreements

PRS	Product Registration System
PWG	Policy Working Group
REDs	Regional Electricity Distributors
SACREEE	SADC Centre for Renewable Energy and Energy Efficiency
SADC	Southern African Development Community
SADCSTAN	SADC Cooperation in Standards
SAPP	Southern Africa Power Pool
S&L	Standard and Labelling
TC	Technical Committees
TCO	Total Cost of Ownership
U4E	United for Efficiency
UN	United Nations
UNEP	United Nations Environment Programmes
UNFCCC	United Nations Framework Convention on Climate Change

1 Background

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

1.1 Country Background and International Commitments

Namibia ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 1995 as a Non-Annex I Party and became obligated to prepare and submit National Communications (NC), Biennial Updates Reports (BUR) and National Determined Contributions (NDC).[1] Namibia also ratified the Paris Agreement in 2016. As a signatory to the convention, the country has prepared and submitted three NCs and three BURs. In addition, Namibia prepared and submitted its updated Nationally Determined Contributions in 2021.[2]

Various measures contributing to the mitigation of climate change in different sectors were identified in the Intended Nationally Determined Contributions (INDCs). Through INDCs to the UNFCCC, Namibia commits the country to increasing energy efficiency (EE) and demand side measures. For the energy sector in the updated NDC, the national sustainable energy strategy of Namibia looks to introduce new emissions-reducing technologies and encourage healthier practices that are more energy efficient. Furthermore, the updated NDC includes climate-friendly and energy efficient refrigeration and room air conditioners (RAC). Low Global Warming Potential technology options, particularly technology with natural refrigerants, exist as an alternative to hydrofluorocarbons (HFCs) for almost any RAC appliance (Ministry of Environment, Forestry & Tourism, 2021).

A review of the potential for implementation of EE policies and strategies was conducted in Namibia by U4E Country Savings Assessments (CSA) in 2020. The appliances and equipment that were identified include lighting, residential refrigerators, room air conditioners,

[1] Ministry of Environment, Forestry & Tourism (2015). Intended Nationally Determined Contributions (INDC) of The Republic of Namibia to the United Nations Framework Convention on Climate Change. Windhoek. Available: Intended Nationally Determined Contributions (INDC) of Namibia to the UNFCCC 2015.pdf (gov.na)

[2] Ministry of Environment, Forestry & Tourism (2021). Namibia's NDC Update. https://unfccc.int/NDCREG

transformers, and industrial electric motors. Assuming a successful implementation of the various energy efficiency strategies, the targeted cumulative savings from the five appliances and equipment are expected to reduce electricity use by over 2.06 TWh, worth 186 million (NAD 2,604), by 2030, while CO_2 emissions are expected to be reduced by 2.92 million tonnes in the same period.[3]

Since 2019, Namibia has been part of the Energy Efficient Lighting and Appliances (EELA) project which is being implemented across Eastern Africa and Southern Africa to develop harmonised cost-effective, mandatory regulations on lighting, that was found to be the largest contributor to the annual electricity savings of 49% by 2030. Savings from distribution transformers will amount to 18%, while residential refrigerators are expected to contribute 9%.[4]

Namibia has made an additional regional effort in contributing to the harmonization of MEPS on residential refrigerators and air conditioners since 2020. The countries of the East African Community (EAC) and SADC are working together with the project partners SADC Centre for Renewable Energy and Energy Efficiency (SACREEE), East Africa Centre of Excellence for Renewable Energy and Energy Efficiency (EACREEE), and UNEP-U4E to develop harmonized Minimum Efficiency Performance Standards (MEPS) and labelling. The project is particularly noteworthy in this context as it focuses on the same appliance as the national project for Namibia, namely on energy efficient refrigerators. The regional MEPS for refrigerating appliances has been drafted and is currently undergoing the voting process by Member States (MS), as required by the SADC Cooperation in Standardisation (SADCSTAN). Anteriorly, the project has also conducted a regional market assessment across both regions and developed technical notes that included technical recommendations on the MEPS development.[5]

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

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

[3] https://united4efficiency.org/country-assessments/namibia/

[4] Climate Technology Centre & Network, 2018, Technical Market Review, Country Profile: Namibia, Pg 36. Available at : https://www.ctc-n.org/system/files/dossier/3b/country_profile_-_namibia.pdf

[5] https://united4efficiency.org/country-regional-activities/eac-sadc/

1.1.1 Electricity Context in Namibia

Over the past two decades, Namibia's electricity sector has undergone numerous important developments and changes, including improvements in the institutional and regulatory framework, electricity generating capacity addition, network expansion, and cross-border power interconnection (with South Africa and Zambia).

The sector has a well-developed regulatory framework with a mandate for oversight of the responsibility of the regulator, the Electricity Control Board (ECB). The Ministry of Mines and Energy (MME) has a key role to develop sectoral policies, strategies, and plans including implementing the Government's rural electrification program (grid and off-grid) and monitoring electrification progress.

The main operating entities are the Namibia Power Corporation (NamPower), responsible for generation, transmission, import, export, trading, and power supply as well as distribution for most of the Central and Southern regions of Namibia. Electricity distribution is also the responsibility of three Regional Electricity Distributors (REDs) – Nored, Cenored, and Erongo red, in their respective service areas. There are several local authorities and municipality distributors responsible for distribution and supply to certain end-consumers. In addition, several Independent Power Producers (IPPs) have come on board as generators of renewable energy.

1.1.2 Electricity Demand

According to the NamPower Strategic plan of 2019, power demand is expected to increase further over the next five years, up to 755 MW in 2022. NamPower anticipates that future growth demand of customers will be driven by Regional Electricity Distributors (REDs) and Mines.

Namibia is a net importer to meet the electricity demand at all times, NamPower supplements its energy requirements with power from the region through the Southern African Power Pool (SAPP) long-term power purchase agreements (PPAs) and short-term trade markets. According to the NamPower annual report (2020), 59% of electricity was imported into the country. NamPower currently has three bilateral agreements (PPAs).

- 200 MW with ESKOM (South Africa)
- 100 MW with ZESCO (Zambia)
- 80 MW with ZPC (Zimbabwe)

Namibia's installed power capacity is about 639 MW (hydro 54%, coal 14%, diesel 3.5%, and solar and wind 28%) in 2019. This includes NamPower power stations and IPPs, while the peak demand is 632 MW (excl. Skorpion Zinc mine which is connected to the NamPower grid but gets supplied power directly from Eskom, with a peak demand of 52 MW).

1.1.3 Access to Electricity

The electrification rate for Namibia is around 50% with a rate of 72 % in urban areas and 21 % in rural areas, leaving over 300,000 households without a connection in 2020.

Namibia is one of the highest electricity tariffs in Southern Africa, with an average of 0.11 USD/kWh (N$1.9153) for the period 2022/2023[6]. Higher efficiency equipment, including refrigerators and distribution transformers, will play a crucial role in the reduction of electricity distribution losses (which average between 5.6% and 11%), and pressure on the country's grid and lessen the burden on the governments' budgets hampering the country's electrification potential. The government does not subsidize electricity costs in Namibia, cross-subsidization exists whereby business tariffs are higher than domestic tariffs.

1.2 National Policies on Energy, Energy Efficiency, and Conservation

Namibia developed an *Energy Policy White Paper (1998)*[7] to formulate a comprehensive and integrated energy policy for all energy sub-sectors, which has set out a specific energy policy in the area of Energy Efficiency and Conservation (EE&C). Particularly, this EE&C policy will be promoted through an EE appliance labelling program in the household sector and the application of EE&C measures in the industry and commerce sector.

In keeping with *Vision 2030*'s national long-term sustainable development goals launched in 2004[8], the *National Energy Policy (NEP 2017)*[9] has been developed within the overall framework of sustainable development, and jointly set the direction and determine the targets for Namibia's long-term energy-related development aspirations. According to the *NEP 2017*, one of the main goals is to promote the efficient use of all forms of energy and its strategies are to be achieved through the active promotion and regulation of demand side measures, as well as EE approaches across the different elements of the energy sector's value chains.

In addition, the *National Renewable Energy Policy (NREP 2017)*[10] has set out core policy statements, which cover demand side management (DSM) & EE improvements including research on energy end-use data and public education campaigns promoting the efficient use of energy. Table 1-1 indicates the priority areas for EE in the *NREP 2017*.

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6 https://www.ecb.org.na/images/docs/Tariffs/220503%20Tariff%20Increase%2022_23%20Signed.pdf

7 https://www.mme.gov.na/files/publications/1e3_energy_policy_whitepaper.pdf

8 https://www.npc.gov.na/national-plans/vision-2030/

9 https://www.mme.gov.na/files/publications/fd8_National%20Energy%20Policy%20-%20July%202017.pdf

10 https://www.mme.gov.na/files/publications/03f_National%20Renewable%20Energy%20Policy%20-%20July%202017.pdf

Table 1-1: Priority Areas for Energy Efficiency Policy in the NREP, 2017

Energy Efficiency Priority Areas	Examples of international policies and measures
Building and homes	Building codes and performance ratings for existing and new buildings
Appliances and Equipment	Minimum energy performance standards (MEPS) and labelling
Lighting	Efficient lighting requirements for retail sales and street light installations
Transport	Vehicle fuel-efficiency standards, support for electric vehicles, transport system efficiency
Industry and mining	Energy management protocols such as ISO 50001 and MEPS for energy intensive equipment (e.g., motors)
Other sectors and cross-cutting areas	Utility efficiency requirements and targets, price signals, data collection, monitoring and verification, enforcement, public awareness, and education

Although the Government is committed to developing an EE and DSM policy that supports the development of MEPS, relevant government officials interviewed indicated that there are currently no regulations promoting the uptake of energy efficient refrigerators and distribution transformers. Furthermore, there are currently no local standards and labelling available for residential refrigerators.

Other relevant energy regulations include:

National Integrated Resource Plan (NIRP): the electricity supply sector's development plan for the next 20 years. It projects significant growth and estimates that an investment in the range of NAD 90-97 billion (USD 6-7 billion) will be needed over the next 20 years.[11] NIRP is currently under review and is expected to be available in the third quarter of 2021.

National Independent Power Producer (IPP) Policy: the IPP Policy outlines the key provisions of the Government's commitment to encouraging private investment in Namibia's power sector and outlines the power market model, pricing regime, procurement approach, and the requirements for the IPPs to develop power generation projects and seek licenses for implementing the projects. Several IPPs have commenced operations, and more are due to commence operations very shortly.

Electricity Act of 2007: This is the main law regulating electricity in Namibia. It establishes the ECB as the sector's regulator and introduces licensing of all electricity supply-side activities and regulation of electricity tariffs. This will be replaced by the Energy Regulatory Bill and Electricity Bill currently under development.

11 https://www.ecb.org.na/images/docs/Noticeboard/ELECTRICITY%20SECTOR%20NATIONAL%20INTEGRATED%20RESOURCE%20PLAN%20(NIRP)%202016%20Version%201.pdf

Energy Regulatory Authority Bill (under development): this Bill focuses on provisions regarding the establishment and operation of the to-be-established Namibian Energy Regulatory Authority (NERA). The Bill describes NERA's roles and responsibilities, which include the regulation of the electricity sector, downstream gas including gas pipelines and storage facilities, renewable energy, and energy efficiency activities.

Electricity Bill: this Bill aims to create a more formalised *foundation* for the electricity sector's market reform and market structure initiatives, to pave a way for the systematic modernisation of the country's electricity supply industry (ESI).

- Establishes a market operator and a system operator, which are currently exercised by NamPower, a state-owned utility.
- Introduces regulatory oversight of Power Purchase Agreements (PPAs)
- Makes specific provisions regarding local authority and regional council royalties, as well as levies payable by customers.

There are no electricity subsidies in the tariff structure. Tariffs are fixed at cost-recovery levels, with businesses' time of use and peak demand tariffs which cross-subsidize the non-commercial tariff. Customers have the option to be either billed through pre-paid or post-paid meters.

Modified Single Buyers (MSB) Model: A new market framework, which is an incremental modification of the older Single Buyer (SB) model that only allowed NamPower to procure electricity supply from SAPP utilities or IPPs. The MSB model allows identified Contestable Customers (CC) and Eligible Sellers (ES) to transact with each other directly for the supply of electricity of up to 30 % of the customer's energy requirement as identified and licensed by the ECB. The MSB model also aims to allow private generators to build new generation capacity in Namibia for export purposes.

1.3 Key institutions & Recommended Roles

The key institutions that are expected to play a significant role in the promotion of energy efficient refrigerators and distribution transformers in Namibia are summarised in Table 1-2.

Table 1-2: Key Institutions in Namibia

Main Organisation	Description /Role
Department of Environmental Affairs (DEA), Ministry of Environment and Tourism (MEFT)	The functions of DEA, under the MEFT, are to promote and support the implementation of all environmental policies and legislations related to climate change; and to advise decision-makers accordingly on all matters related to climate change-related programmes, plans, and projects. DEA is the National Designated Entity (NDE) for the CTCN. MEFT is the National Designated Agency (NDA) for the Green Climate Fund (GCF) and the DEA acts as the National Focal Point for GCF.

Main Organisation	Description /Role
Directorate of Energy, Ministry of Mines and Energy (MME)	The Directorate of Energy, under MME, develops and implements energy sector policies, strategies, and plans. It is mandated to formulate, coordinate, promote and implement energy policies and planning (MEPS and labelling program).
Electricity Control Board (ECB)	ECB has a statutory responsibility to advise the Minister of MME on electricity matters and it is instrumental in developing subordinate legislation such as regulations, codes, standards, guidelines, et, The core mandate of the ECB is to exercise control over the electricity supply industry with the main responsibility of regulating electricity generation, transmission, distribution, supply, import, and export in Namibia through setting tariffs and issuance of generation and transmission licenses. The NERA Bill is currently being drafted. Under this Bill, the ECB will be transformed into the Namibia Energy Regulatory Authority (NERA). ECB is the potential regulator for energy efficient refrigerating appliances and distribution transformers.
Directorate of Commerce, Ministry of Industrialisation and Trade (MIT)	The Directorate of Commerce, under MIT, is functioned to promote and protect consumer rights through regular inspections and enforcement of product standards, weights, and measures at retail levels as well as consumer awareness campaigns; and to promote and enhance nationally and internationally competitive industrial and product quality and standards at factory levels (Standards Act, 2005). Regulating imported and sold electrical appliances
Namibia Power Corporation (NamPower)	NamPower is a state-owned national utility responsible for electricity generation, transmission, trading, and importing and exporting of electricity in the country. The utility owns and operates the major power stations in the country as well as the transmission grid, and it is involved in the distribution of electricity where other suitable suppliers are unavailable. Supporting implementation of MEPS and labelling programs and financial instruments (e.g., on-bill financing/repayment)
Regional Electricity Distributors (REDs)	REDs are responsible for the transmission and distribution of electricity in their areas of jurisdiction. There are three REDs currently fully operational in Namibia; NORED (accounting for 35.3 % of the market share), CENORED (11.6 %), and ERONGO RED (14.4 %)
Namibia Energy Institute (NEI)	NEI is a joint venture initiative between the Namibia University of Science and Technology (NUST) and the Ministry of Mines and Energy. Its mandate is to research and disseminate information on conventional energy, renewable energy, and energy efficiency technologies and practices.
Namibian Standards Institution (NSI)	NSI is governed by the Namibian Standards Council (NSC). NSI's roles and responsibilities include. • Managing and coordinating the implementation of the National Quality Policy

Main Organisation	Description /Role
	• Developing, adopting, and publishing standards that meet World Trade Organisation requirements • Certifying products and management systems through the Marks of Conformity NSI develops standards to support regulations on both safety and minimum energy aspects in collaboration with stakeholders.
Namibia Revenue Agency (NamRA), Ministry of Finance	NamRA, under the Ministry of Finance (MOF), is functioned to provide customs and excise services. NamRA-Customs monitors the entry of electrical appliances and carry out compliance checks on imported products under the MEPS and labelling program.
National Ozone Unit (NOU), Directorate of Industrial Development	The Ozone Unit is a national body that oversees matters related to the compliance and implementation of the Montreal Protocol. NOU, under the Directorate of Industrial Development of MIT, is at the forefront of phasing out HCFCs and promoting environmentally friendly and energy efficient products.
Namibia Statistics Agency (NSA)	NSA is the main government department responsible for the collection and dissemination of official statistics. Data information for refrigeration and distribution transformers can be obtained from NSA.
Financial Institutions (FIs) and Microfinance Institutions (MFIs)	It includes local banking or microfinance institutions, which will play a key role in developing, implementing, financing, and promoting the mechanism.
Namibia Chamber of Commerce and Industry (NCCI)	Networking and outreach to importers and distributors of refrigerators and other electrical appliance products.
Namibia Manufacturers Association (NMA)	Networking and outreach to manufacturers of electrical appliances and DT products
Namibia Wholesale and Retailers Association (NWRA)	Networking and outreach to wholesalers and retailers of refrigerators and other electrical appliance products.
Importers, and distributors/ suppliers	Providing energy performance information of their refrigerator and DT products. Manufacturing/importing/distributing and marketing refrigerator and DT products that meet or exceed a specified efficiency level.

Main Organisation	Description /Role
Wholesalers and Retailers	Promoting and sharing information to customers about the importance and benefits of buying more energy-efficient appliance products.

2 About the National Policy Roadmap

2.1 Scope

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

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

2.1.1 Roadmap Development Process

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

Policy Working Group

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

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

The list of institutions and members represented in the Policy Working Group is found in ANNEX A – Members of the Policy Work Group.

Technical Committee

The objective and mandate of the technical committees were to support the development of the NPR (led by the PWG) by reviewing MEPS and testing standards to be adopted for distribution transformers and refrigerating appliances. The list of institutions and members represented in the technical committee is found in ANNEX B – Members of the Technical Committee for Refrigerating Appliances and ANNEX C – Members of the Technical Committee for Distribution Transformers.

2.2 Energy Efficiency Implementation Ecosystem

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

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

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

3 Refrigerators

Namibia does not manufacture any refrigeration appliances. According to 2020 Annual International Trade Statistics by Country, published by TrendEconomy, Namibia's imports of refrigerators, freezers, other refrigerating equipment, and heat pumps, were mostly from South Africa, with a market share of 82% (USD 16 million in value). Other imports came from China (7.78%, with USD 1.51 million in value) and the remaining 10% were from European countries.[12]

The household survey conducted in 2021[13] showed that 61.7% of the refrigeration appliance owned is refrigerator-freezer type, 26.3% is of the freezer type, and 12% accounted for the refrigerator type. The refrigerating appliance ownership varied significantly amongst household respondents as shown in Table 3-1.

Table 3-1: Refrigerating appliance ownership summary

Appliance	Number Owned	Percentage amongst respondents
refrigerator-freezer	1	66.8%
	2	5.4%
	3	0.5%
	None	27.3%
Freezer	1	30.7%
	2	1%
	None	68.3%
Refrigerator	1	14.9%
	None	85.1%

The most used refrigerator technologies were refrigerator-non-inverter and refrigerator-freezers-non-inverter, at 25%, followed by the refrigerator–inverter at 20%. Frost-free technology was most favoured for refrigerating appliances with a response rate of 93.1% and 60%, respectively. Most of the appliances were rated "A" including 55.6% of refrigerators, 65.2 % of refrigerator-freezers, and 56% of freezers.

The most common refrigerant used in most refrigerators, refrigerator-freezers, and freezers is R600a with 93.3 %, 84% and 77 % respectively. R134a was the second highest refrigerant equipped in most refrigerators, refrigerator-freezers, and freezers. R134a is a hydrofluorocarbons (HFC) refrigerant, with the highest percentage of 13.9% in refrigerator-freezers, which are mostly used by middle income consumers.

The market size of residential refrigerators is shown in Figure 3-1. The estimated lifespan of a refrigerator-freezer in Namibia of between 10 and 15 years. With an average price of USD 459

[12] https://trendeconomy.com/data/h2/Namibia/8418#:~:text=million%20in%202019)-,Imports%20of%20commodity%20group%208418%20%22Refrigerators%2C%20freezers%20and%20other%20refrigerating,amounted%20to%20%24%206.82%20billion).

[13] Market Assessment Report on Residential Refrigerators and Distribution Transformers, UNEP-CTCN GCF Readiness Project on "National framework for leapfrogging to Energy Efficient Appliances and Equipment in Namibia (Refrigerators and Distribution Transformers) through regulatory and financing mechanism", August 2021

per appliance, the estimated total market value for residential refrigerators was USD 12,919,696 in 2021. According to the Namibia Statistics Agency, around 576,383 units were imported into the country in 2020 of which 35% of the units were a combination of refrigerator and freezer as indicated. Market projection using the economic model forecasts a growth in the refrigeration equipment market size by 38.44% by 2030. The stock level, market size, and market value of residential refrigerators is expected to grow to 346,000, 39,000, and USD 17.9 million by 2030, respectively. Finally, it is expected that inverter-type refrigerators and refrigerator-freezers would become the norm in the near future.

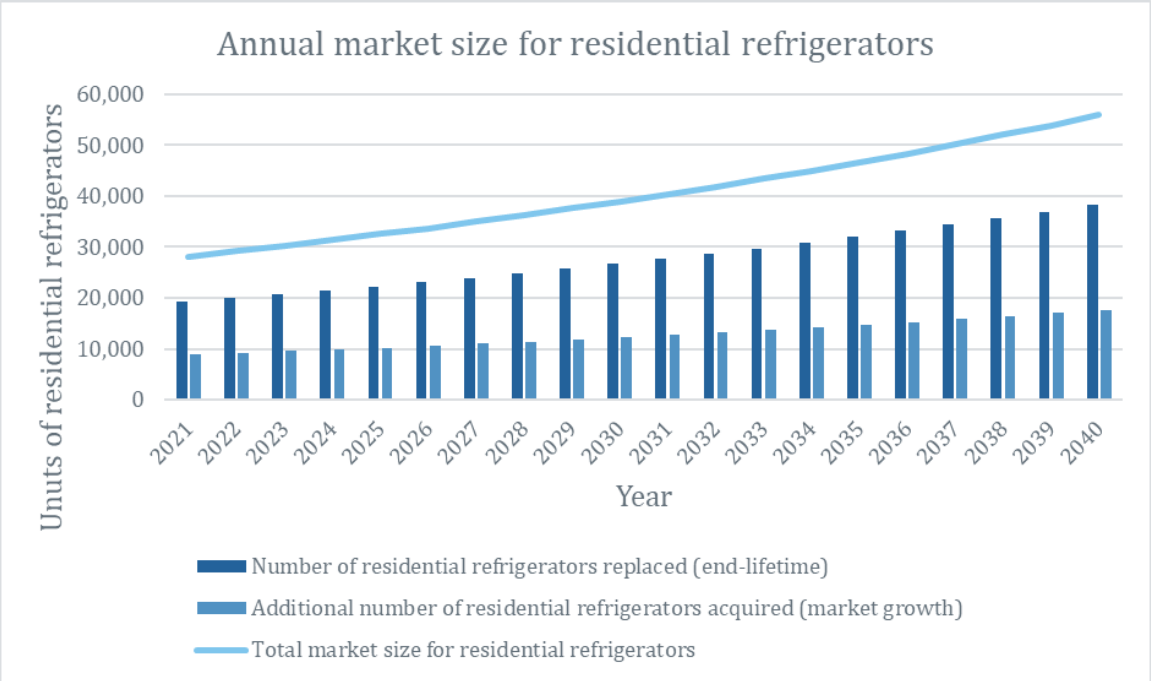

Figure 3-1: Projected number of residential refrigerator-freezers acquired and replaced in Namibia (Eco Fin Analysis, CTCN Namibia Refrigerators, 2021)

3.1 Minimum Energy Performance Standards

3.1.1 Current Situation

To date, Namibia has neither specific regulations about energy efficient refrigerator products nor national performance standards for refrigerators. The National Ozone Unit (NOU), under the Directorate of Industrial Development of MIT, together with NSI has just established recently a Technical Committee, responsible for developing refrigeration and air conditioning safety standards.

Since South Africa is considered the major trade partner with 82% of residential refrigerators market share in Namibia, and more than half of imported products from South Africa into the Namibia market were “A” rated appliances. Therefore, Namibia will consider the South African MEPS level to be the baseline energy efficiency level.

The imported units from South Africa are generally tested according to the South African test standard SANS 62552-2008. The SANS 62552-2008 standards contain both the test method

and the labels for South Africa, based on the IEC 62552-2007. The remaining units are imported from China and Europe, which are typically tested according to IEC 62552-2015.

In South Africa, the VC9008 Regulation sets the MEPS rating at the Label Class B (55 ≤EEI<75) and Class C (75≤EEI<90) for refrigerators-freezer and freezers, respectively. Energy Efficiency Index (EEI) is the energy consumption ratio for an individual product as measured by the test method over the reference for the product size and category. The official test method for the performance of refrigerators is cited in SANS 62552/IEC 62552 – Household Refrigerating Appliances – Characteristic and Test Methods.[14] The existing MEPS of South Africa is currently under revision; it plans to adopt IEC 62552:2015 which will advance to A+ in 2022 for refrigerators products, and the C label intends to advance to A in 2022 and A+ in 2026 for freezers. Most of the refrigeration appliances available to the consumer in the South Africa market were rated as Class ''A'' per the South African regulation.

3.1.2 Recommended MEPS

Currently, Namibia does not have a mandatory MEPS as described earlier, it projects that successful MEPS can improve efficiency by 30% compared with new equipment currently sold in the market. This would result in over 27 GWh per year of savings in the year 2030. Based on UNEP-U4E projection, the residential refrigerators in Namibia have the potential to produce 20.9 GWh of annual energy savings in 2030, which is equivalent to 30,000 tonnes of CO_2eq emissions avoided and 1.86 million USD savings in energy bills. The initial MEPS recommendations for domestic refrigerators, should therefore proceed, especially considering a phased implementation approach, starting voluntarily, with SADC harmonized MEPS and then moving to a mandatory MEPS.

The SADC Cooling Project developed a harmonized MEPS for refrigeration appliances based on the IEC 62552-2015, 1,2,3 test standard with progressive maximum allowable energy consumption (AEC_{max}) with an ambient reference temperature of 24°C.

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

By 2023: Phase 1 of implementation, R = 1.0

By 2026: Phase 2 of 25% more stringent, R = 1.25

AEC_{Max} is calculated for the different equipment classes, as shown in Table 3-2.

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

Table 3-2: Maximum Annual Energy Consumption for a Reference Ambient Temperature of 24°C.

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

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

Table 3-3: Minimum R Requirements for Refrigerating Appliances

Product Category	R Requirement (Phase 1: by 2023)	R Requirement (Phase 2: by 2026)
Refrigerators	1.0	1.25
Refrigerator-Freezer	1.0	1.25
Freezers	1.0	1.25

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

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

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

Testing Standard

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

Energy efficiency standards and labels (S&L) are based on energy consumption values obtained from test standards. At the same time, the standard for measuring refrigerator energy consumption is broadly similar across countries. Many countries adopt or refer to IEC 62252 standards; for example, Brazil, China, the European Union (EU) 2009 regulation, South

Korea, and South Africa had/have their standards based on IEC 62552:2007, which use an ambient temperature of 25°C.

IEC 62552:2015 for household refrigerators was recently developed to harmonize international residential refrigeration testing and efficiency metrics. This standard enables manufacturers to derive fair and comparable figures for annual energy consumption (kWh/year) and make suitable calculations for local climate conditions and policy needs based on two tests (one at 16°C and one at 32°C ambient).

IEC 62552: 2015 is favoured because it includes flexibility for adaptation of results to suit local climate and internal storage temperatures but ensures comparability of results between economies. Economies that are recommended to consider basing their policies on IEC 62552: 2015. China, Chinese Taipei, the EU, Indonesia, Japan, Kenya, Malaysia, and Thailand have already moved to, or are planning to, adopt the IEC 62552-2015 that measures energy consumption at both 16°C and 32°C, enabling improved information on the likely field performance of refrigerating appliances.[15]

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

3.1.3 Actions & Timeframe

According to UNEP-U4E[16], the MEPS development process involves several steps as shown in Figure 3-2. The overall responsibility of the NPR implementation and MEPS regulation lies with the MME to establish a legal framework and guidance on policy and execution for household refrigerators. MME will also have the function of coordinating and involving relevant Ministries and Agencies in this effort. Other key government agencies that will support the implementation of the National Policy Roadmap within the scope identified by their mandate and relevant policies include the Electricity Control Board (ECB)/ Namibia Energy Regulatory Authority (NERA), Namibian Standards Institution (NSI), and the Namibia Revenue Agency (NamRA). NSI is mandated to develop and adopt standards to support minimum energy efficiency and safety in collaboration with MME, ECB/NERA, and NamRA. The ECB/NERA is in charge of enforcing the standards.

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

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

PWG members

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

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

Trade industry representatives

Consumer representatives

Namibia Chamber of Commerce and Industry

In collaboration with the MME, the focal agency (ECB/NERA) will play a leading role in developing and implementing the MEPS standards and labelling. NSI will facilitate the identification and engagement of other necessary government agencies and key stakeholders and coordinate their effort and inputs.

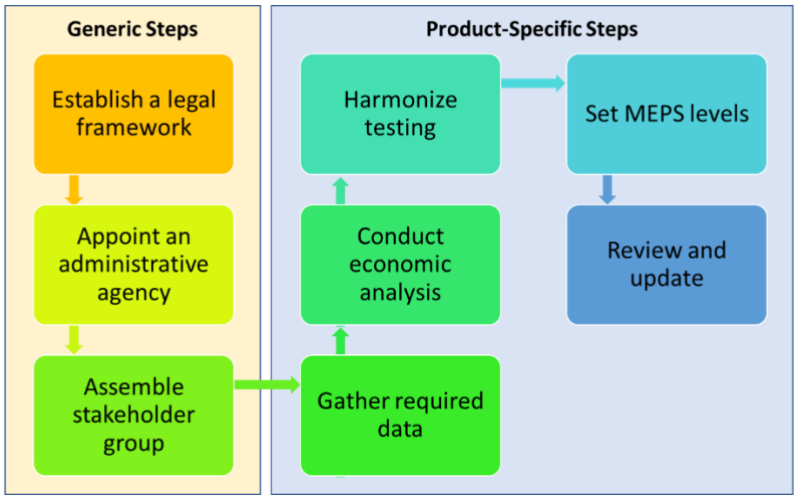

Figure 3-2: MEPS Development Framework

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

Table 3-4 lists actions for the development of mandatory MEPS. It also includes country-specific activities that will support the future decision for MME and NSI to harmonize MEPS and testing methods with the SADC harmonised MEPS.[17]

Table 3-4: Action Plan for Development of Mandatory MEPS and Harmonization of Testing Methods

Action	Lead Agency & Other Stakeholders	Timeframe
1. Develop an implementation plan on the national policy roadmap	MME, NSI, and International/ national advisor	2023
2. Finalise the draft MEPS for voluntary implementation	NSI	2023

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

3. Establish/designate the Authority (preferably ECB/NERA or NOU) to regulate refrigerating appliances	MME & ECB/NERA or NOU	2023
4. Develop and implement a capacity building and training program for ECB/NERA to effectively regulate the refrigerating products	MME & International Partners	2024
5. Conduct public consultation on the voluntary MEPS to become mandatory	Regulator (ECB/NERA) designated to regulate the refrigerating appliances	2024
6. Develop regulatory mechanisms to enforce mandatory MEPS and testing methods	MME & ECB/NERA	2025
7. Promulgate the mandatory MEPS regulation	ECB/NERA, MME, Cabinet, and Parliament	2025
8. Enforce the mandatory MEPS	ECB/NERA, MME	2025
9. Review and adjust the MEPS level based on the analysis of statistical data collected and the regional harmonisation trend	NSI, ECB/NERA, MME	Every 5 years

3.2 Energy Labelling

3.2.1 Current Situation

As mentioned, Namibia has no mandatory MEPS regulation and the local manufacturer of residential refrigeration appliances, and most of the refrigerators (82%) sold in Namibia are imported from South Africa. To this, the market is already familiar with the South Africa refrigeration appliance energy label. The South Africa label is shown in Figure 3-3.

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

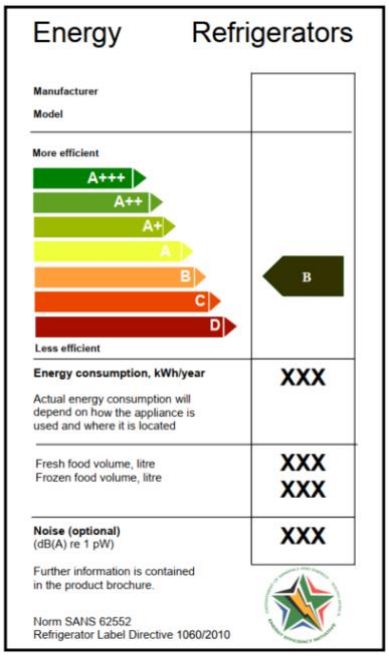

Figure 3-3: South African Residential Refrigerator Energy Efficiency Label

In the South Africa label, Energy Efficiency Index (I) is used to determine the energy label class for refrigerators and freezers, where "*I*" is the ratio of the annual energy consumption (AEC) to the max allowable annual energy consumption (AEC_{max}) multiplied by 100. Energy efficiency level in the South African label is designed on 7 levels, with D being the least efficient and A+++ being the most efficient on the market. The annual energy consumption of each refrigerator model is tested according to SANS 62552:2008 test standard and presented in unit kWh/yr. Note that the current MEPS in South Africa is set a level "B" for refrigerators and refrigerator-freezers and level "C" for freezers. The correlation between energy efficiency index and energy efficiency level is shown in Table 3-5.

Table 3-5: Correlation between Energy Efficiency Index and Energy Efficiency Level

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

3.2.2 Recommended Energy Labelling

Energy efficiency rating and labelling have been key contributors to the market transformation of household appliances towards more energy-efficient models. Labelling is

an effective tool to inform the consumer about the energy consumption of the electrical good. Labels provide a mechanism for customers to understand the relative performance of the appliance or equipment against other technologies on the market. The label's design is critical in its ability to convey the message clearly and simply to consumers to help them with their purchase decision. It is critical that consumers can understand the information provided on the label in a way that encourages them to purchase the most efficient refrigerator.

In general, designing comparative labels and energy labels requires a lengthy and costly step-by-step approach to ensure that the correct information is displayed, the messages are clearly understandable, and that consumers widely accept the label. The design of such labels should consider international alignment opportunities or further consider aligning with regional harmonization with the major trade partner.[18] Such alignment would bring significant benefits, including:

Avoiding or reducing the cost of developing a new label.

Reducing compliance cost for manufacturers and importers.

Facilitating market verification and enforcement.

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

Phase 1: accept South Africa as is with an optional Namibia/SADC specific label

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

Phase 2: adopt Namibia/SADC Specific Label

It is essential to ensure that Namibia's labelling requirement is harmonized regionally and between SADC countries (including Namibia) and South Africa for the medium to long term. The SADC/EAC MEPS document suggests the use of 4 levels for energy efficiency levels[19] corresponding to the value of the energy consumption index, $R = AEC_{max}/AEC$, as follows:

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

Table 3-6: Labeling Requirements for Refrigerating Appliances

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

[18] UNEP/U4E: Energy labelling guidance for lighting and appliances. Available at: https://united4efficiency.org/resources/

[19] Additional levels of energy labelling requirement could also be incorporated in the future.

Refrigerator-Freezers	1.00 ≤ R < 1.25	1.25 ≤ R < 1.50	1.50 ≤ R < 1.75	1.75 ≤ R
Freezers	1.00 ≤ R < 1.25	1.25 ≤ R < 1.50	1.50 ≤ R < 1.75	1.75 ≤ R

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

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

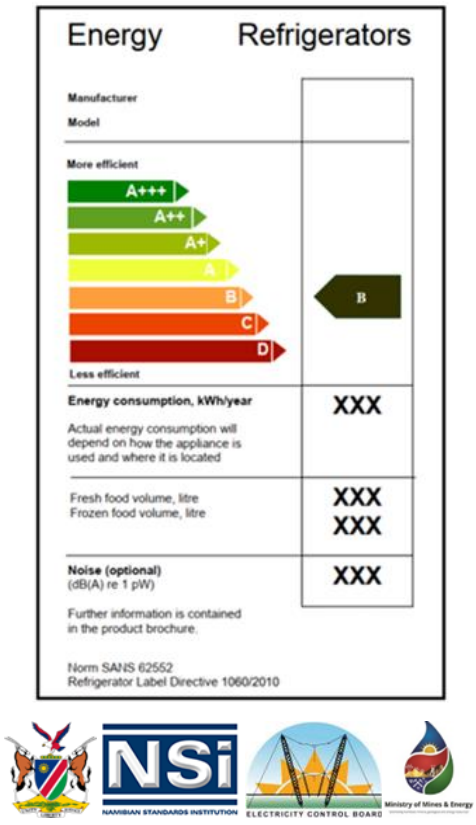

Figure 3-4: Namibia Specific Label carrying the Proper Seal of the Namibian Authorities

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

Model name / serial number.

Type of unit [refrigerator, refrigerator-freezer, or freezer].

Country where the product was manufactured.

Volume of the different compartments and an indication of whether they are frost-free.

Rated performance grade (Low Efficiency, Intermediate, and High Efficiency).

Yearly energy consumption in kWh at ambient temperature in °C or °F.

Reference ambient temperature[s] used in performance rating.

Refrigerant and foam-blowing designation in accordance with ISO 817 or ASHRAE 34, including ODP and GWP.

3.2.3 Actions & Timeframe

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

Table 3-7 lists a matrix of the course of action for establishing and implementing the labelling program. It also includes future actions and measures supporting the MEPS and Labelling program.

Table 3-7: Action Plan for Establishing and Implementing Energy Labelling Program

Action	Lead Agency & Other Stakeholders	Timeframe
1. Phase 1- Conduct consultation workshops to discuss with the South African authorities and adopt the South African label with relevant modifications on the labels	ECB/NERA, MME, NSI	2023 to 2024
2. Phase 2-Develop a uniform energy performance labelling for all residential refrigerators sold in Namibia (In coordination with the mandatory MEPS regulation)	ECB/NERA, MME, NSI	2025
3. Formalize institutional frameworks for regular market data collection and analysis (as needed)	ECB/NERA, NSI, NAMRA	2024 to 2025
4. Develop a labelling regulation requiring all residential refrigerators imported to and sold in Namibia to be compliant with the mandatory labelling requirement	MME, ECB/NERA, NSI, NAMRA	2025

3.3 Communication Program

3.3.1 Current Situation

Namibia has seen little or no awareness campaigns encouraging citizens to invest in purchasing energy efficient appliances. Around 92.6% of surveyed households are found not aware of energy efficiency and labelling for electrical appliances and the technological and environmental benefits of purchasing energy efficient refrigerators.

3.3.2 Recommended Communication Plan

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

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

This can be facilitated by:

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

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

Error! Reference source not found. further outlines international best practices.

3.3.3 Actions & Timeframe

Table 3-8 lists key actions for implementing communication plan and consumer awareness and communication campaigns.

Table 3-8: Action Plan for Establishing Communication Plan and Consumer Awareness Campaign

Action	Lead Agency & Other Stakeholders	Timeframe
1. Develop awareness campaigns and capacity building programs on new MEPS and labelling regulations	MME, ECB/NERA	2023
2. Conduct a training program for ECB/NERA, MME and relevant government agencies staff on evaluation and revision of the MEPS and labelling requirements	International Advisor	2025
3. Conduct a training program for NamPower and REDs on managing and maintaining on-bill financing scheme	MME, ECB/NERA, International Advisor	2024
4. Conduct a training program for in-store salespersons on understanding energy label and educating customers on the label usage and value	MME	2025
5. Implement awareness campaigns for retailers/ wholesalers/ distributors on MEPS and labelling regulations to manage inventories	MME, ECB/NERA	2025
6. Conduct regular public awareness and educational campaigns for consumers, and develop communication tools (incl. website, brochures, media reports, TV, and radio broadcasts, etc.)	MME, ECB/NERA	Every year

3.4 Financing Mechanisms

3.4.1 Current Situation

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

Based on the survey, more than 76% reported that quality and functionality/practicality were key factors to consider when purchasing a refrigerator, refrigerator-freezer or freezer. Over 68% of the respondents indicated that the price of the equipment and warranty were highly important factors. Slightly above 50% of the respondents considered access to financing, and energy consumption, as important factors to consider when purchasing a refrigerator, refrigerator-freezer or freezer.

More than half of the respondents reported that they would consider buying an energy efficient refrigerator, refrigerator-freezer or freezer. However, from the analysis it was observed that affordability remained a deciding factor. Further, consumers have also

indicated of high preference for access to financing; 54% were willing to pay more for a 10% reduction in energy consumption, while 30% were willing for a 20 to 40% reduction

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

3.4.2 Recommended Financing Mechanism

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

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

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

Set up green credit facilities between partner local financial institutions (e.g., banking institutions, microfinance institutions, National Development Bank (NDB) such as the Development Bank of Namibia (DBN) and participating technology providers (e.g., local retailers, local distributors, international manufacturers, with support from international financial institutions such as Multilateral Development Banks (MDB) or green funds to ease access to concessional finance and help overcome the higher upfront cost barrier for end-users.

Structure low-risk repayment mechanisms between key local stakeholders such as partner financial institutions or DBN, the power utilities (e.g., regional electricity distributors (REDs), City of Windhoek, Oshakati Premier Electric, Local Authorities and Regional Councils, NamPower Distribution), as well as EE technology providers.

Address market barriers, align with the specific country context, and leverage local opportunities to maximize both options' technical and commercial feasibility (e.g., targeting salaried employees or prepaid metering customers, building on experience with consumer finance products, etc.)

Financing Mechanism Option

On-bill financing scheme is recommended to facilitate end-users in the residential sector.

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

The mechanism allows these households to repay green loans or credits obtained from partner financial institutions and participating vendors through the utility's post-paid or pre-paid metering systems. Operationalizing the On-bill financing mechanism requires significant support from the relevant partner electricity distributors or utilities (e.g., NamPower Distribution, REDs, City of Windhoek, Oshakati Premier Electric, Local Authorities and Regional Councils).

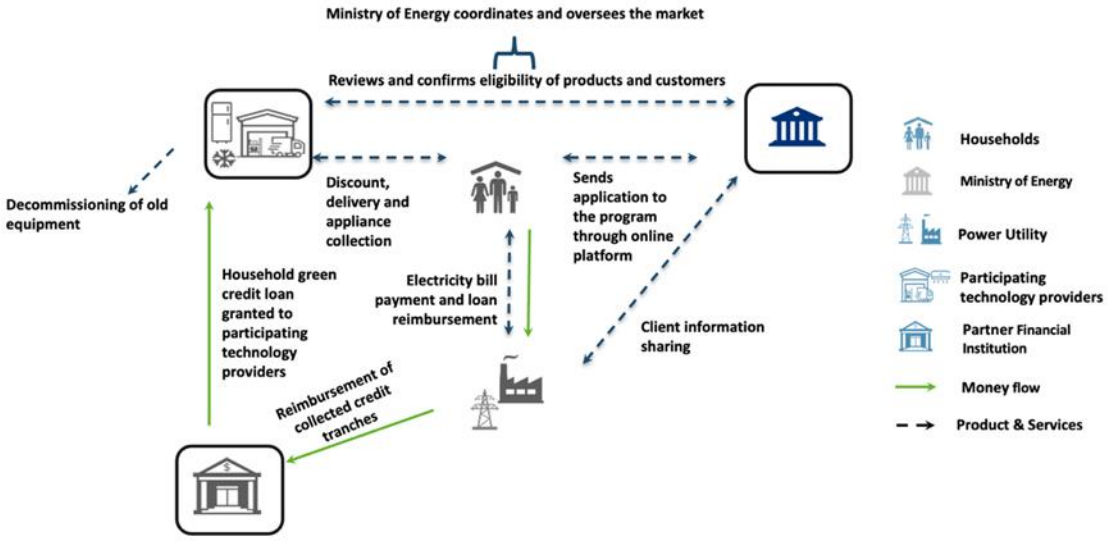

Figure 3-5: Recommended On-Bill Financing Scheme

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

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

Involvement of key national stakeholders

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

Ministry of Mines and Energy (MME) acting as the lead compliance entity/program manager.

NamPower and partner utilities (e.g., REDs, City of Windhoek, Oshakati Premier Electric, Local Authorities and Regional Councils, NamPower Distribution.)

Partner financial institutions (e.g., banking institutions, microfinance institution, DBN.)

Partner technology providers of energy-efficient residential refrigerator (e.g., local retailers, local distributors, international manufacturers.)

3.4.3 Actions & Timeframe

Table 3-9 lists key actions for developing and implementing a supporting financial mechanism for energy-efficient residential refrigerators (See ANNEX I – Recommended Detailed implementation Plan of the financing mechanism for Refrigerators).

Table 3-9: Action Plan for Establishing and Implementing Financial Mechanisms for Refrigerators

Action	Lead Agency & Other Stakeholders	Timeframe
1. Finalize finance strategies and detailed implementation plan	MME leads, with support from ECB/NERA, DEA, MOF, etc.	2023
2. Engage potential donors and prepare technical assistance project proposals to turn the On-bill financial mechanism concept into a program	MME	2023
3. Develop and implement the On-bill financing mechanism program	MME leads, with support from ECB/NERA, DEA (take-back scheme), MOF, and technical assistance projects supported by international donors and experts.	2024
4. Design and implement marketing campaigns to promote the On-bill financing mechanism	MME, NamPower, REDs, financial institutions and technology providers	2024 onwards

3.5 Monitoring Verification and Enforcement

3.5.1 Current Situation

Although Namibia has not established a legislative and administrative framework to address non-compliance with MEPS and labelling requirements for electrical appliances, however, Namibia has a legal framework to certify compliance and inspect non-compliance with the

electrical safety regulations. The current compliance and inspection activities are being carried out by the Namibian Standards Institution (NSI).

Rather than redesign a legal and administrative functions for MV&E implementation of the appliance MEPS and labelling programs, MME and NSI will consider apply the existing regulatory framework for product safety legislation for electrical and electronic household products such as refrigerators, whether can be adapted and expanded to include additional EE regulations and standard enforcement as well as structure an MV&E scheme.

3.5.2 Recommended Framework

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

Table 3-10 provides a summary of MV&E components for the full implementation of MV&E actions for refrigerators in Namibia.

Table 3-10: Components of MV&E for Refrigerators

MV&E Component
Establishment and operation of a national MV&E system The following aspects to be considered: • Mandatory or voluntary participation • Legislative powers and program administration • Budget and financial considerations for compliance activities • Identification of key institutions for undertaking specific actions (certification, monitoring & market surveillance) under the legislation
Establishment of a national registry system for refrigerators The following aspects to be considered: • Procedure and process of registration to ensure that the applicant provides all the information to assess whether a product meets the requirements • Identification of information that the applicant must provide • Identification of stakeholder engagement in certifying and managing product registry system
Establishment of communication program to promote compliance activities The following aspects to be considered: • Main stakeholders involved in the supply chain • Key messages – compliance requirements, the risk of detection and sanctions
Establishment of market surveillance program for refrigerators The following aspects to be considered:

• Approaches to checking markets for non-compliance (e.g., risk-based and random sampling) • Procedures for applying penalties for non-compliance cases
Establishment of verification testing program for refrigerators The following aspects to be considered: • Criteria for selecting test laboratories for testing a product • Clear guidance on procurement and transport of samples to the test laboratory for verification testing • Setting up MRAs with other countries or for regional level product testing laboratories to save cost
Establishment of evaluation program for mandatory MEPS and labelling program for refrigerators The following aspects to be considered: • MEPS registration & certification process and compliance

A detailed description of MV&E can be found in *ANNEX J– Monitoring, Verification, and Enforcement (MV&E)****Error! Reference source not found.****.*

3.5.3 Actions & Timeframe

Key actions specific to establishment and implementation of the MV&E framework such as development of a national MV&E system and administrative functions, a product registration system, market surveillance and verification testing programs for refrigerators, communication and evaluation programs are listed in Table 3-11.

Table 3-11: Key Actions specific to MV&E framework for Refrigerators

Action	Lead Agency & Other Stakeholders	Timeframe
Establishment and operation of a national MV&E system for refrigerators		
Develop a regulatory & enforcement mechanism - to address managing compliance activities and clearly specify roles and responsibilities of related enforcement authorities on all related MV&E activities including liability measures with a penalty structure for cases where non-compliance has been established	MME (lead), NSI, ECB/NERA, NAMRA, MoF	Draft by end of 2023 and full enforcement by 2024
Develop administrative procedures/ operational manual for enforcing regulations on MEPS and labelling program	MME (lead), ECB/NERA, NSI, Customs	2023
Assess and conduct capacity building on national MV&E mechanism for responsible	MME, ECB/NERA	2023

staff (customs and other related-MV&E officials)		
Establishment of a national registry system for refrigerators		
Develop a procedure and process of product registration system (PRS) for refrigerators Review U4E's prototype PRS software and consider whether to use it (in whole or part) as the basis for developing a national PRS Explore regional coordination options for establishing a regional product registry to minimize the cost associated with product certification	MME, ECB/NERA	2024
Train responsible officers in charge of management and maintenance of PRS	MME, ECB/NERA	2023
Develop procedures for customs personnel to monitor compliance of imported refrigerators with the import regulations for refrigerator products, listed under mandatory MEPS and labelling requirements	MME (lead), ECB/NERA, NAMRA, MoF, Customs	Draft by end of 2023 and full enforcement by 2024
Develop national regulations on mandatory registration of refrigerators	MME	Draft by end of 2023 and full enforcement by 2024
Establishment of communication program to promote compliance activities for refrigerators		
Design communication plan for all the main stakeholders involved	MME, ECB/NERA	2023
Develop information materials for custom officials and consumers	MME, ECB/NERA	2023
Train importers on mandatory registration of regulated refrigerator products and their legal obligations	MME, ECB/NERA	2023
Develop and publish annual reports to maintain market transparency and declare non-compliance cases	MME, ECB/NERA, NSI	2023
Establishment of market surveillance program for refrigerators		
Establish a methodology for identification of products selected and purchase for verification processes, allocate staff for verification (Market Surveillance) and implement	MME, ECB/NERA, NSI	Draft by the end of 2023 and full operation on annual basis by 2024

Train responsible officers in charge of market surveillance	MME, ECB/NERA, NSI	2023
Implement a pilot market surveillance program and evaluate the results for full application deployment	MME, ECB/NERA, NSI	2024 and full operation on annual basis by 2025
Establishment of verification testing program for refrigerators		
Develop procedures for verification testing and test laboratory selection (outsourcing lab testing and/or using shared test results from neighbouring countries or other entities) to verify EE of selected products	MME ECB/NERA and NSI	2024
Implement pilot verification testing program and evaluate the results for full application deployment	MME ECB/NERA and NSI	2024 and full operation on annual basis by 2025
Establishment of evaluation program for mandatory MEPS and labelling program for refrigerators		
Plan and implement the evaluation program on MEPS registration & certification process, compliance and impact	MME, ECB/NERA, NSI	2025 and on an annual basis for the following years

4 Distribution Transformers

The supply market for distribution transformers (DTs) in Namibia comprises 4 main players: product suppliers, electric utilities, industrial businesses, and electrical contractors. There are around 10 local suppliers proving DTs sizing from 16 kVA - 800 kVA with few suppliers proving repairing services.

Regional Electricity Distributors (REDs) and NamPower, operating under the Ministry of Mines and Energy, are the two major buyers of DTs in Namibia. The prominent distributors of REDs are NORED, CENORED, and ERONGO RED, which distribute electricity in their respective jurisdictions, OPE, City of Windhoek, Local Authorities (such as Keetmanshoop municipality), and Regional Councils. While NamPower distributes electricity to unserved areas in the regions of Khomas, Omaheke, Hardap, and Karas.

All DTs in Namibia are imported mainly from South Africa through the Public Procurement Act No.15, 2015, by public open tenders or contractual agreements. There is also a small number of DTs imported from India and from other parts of the world, depending on the specifications of the tender.

Currently, over 1,000 DT are procured each year, with NORED procuring about 90% of the total. The estimated total market size for DT would be 1,900 units in 2021. This figure includes about 870 units procured to replace end-of-life equipment only. Subsequently, the estimated stock level would be 27,000 units in 2021. With an average DT of USD 9,300 or NAD 137,000; the total market value for distribution transformers would be USD 18 million (NAD 265 million) in 2021.

If the market size projections of the DTs were to follow the government strategy to reach full electrification by 2030, country's electrical load demand forecasts, economic growth, stock replacement at end-of-life, the projected market size will increase to 2,600 units by 2030. This would correspond to a market value of USD 24.7 million (NAD 363 million) as shown in Figure 4-1.

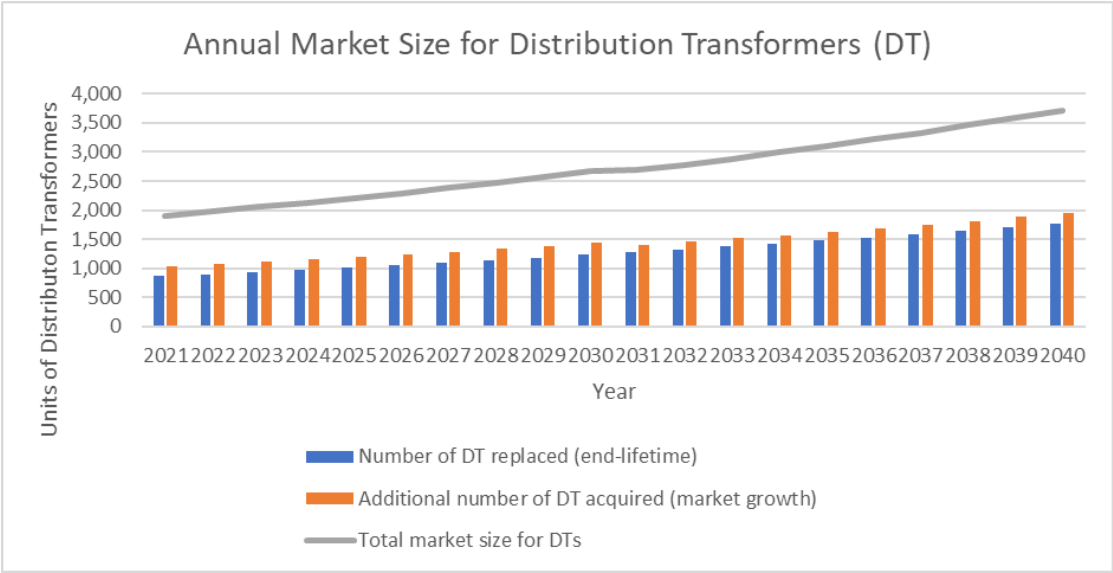

Figure 4-1: Annual Market Size for Distribution Transformers (Eco Fin Analysis, CTCN Namibia Distribution Transformers, 2021)

The estimated total stock of DTs would reach 38,265 units by 2030. Beyond 2030, a significant drop in demand for DTs would be expected following the completion of the full electrification goal. Market demand would then be mainly driven by economic growth for commercial and industrial customers, population growth in the residential sector, as well as replacement of end-of-life equipment, which would not compensate for the end of large-scale electrification investment by the Government. This would justify both the sudden drop in market size and value in 2031 onwards.

4.1 Minimum Energy Performance Standards

4.1.1 Current Situation

Namibia does not have its own national standards and regulations for distribution transformers and there is no uniformity in specifications. Each electricity distributor and large users developed their own specifications aligned with SANS 780 for transformers up to 3150 kVA and IEC60076-20 for larger transformers. NamPower and REDs use the No Load Losses (NLL) and Load Losses (LL) to develop procurement specifications and conduct factory-acceptance testing.

Large users such as mines (B2 Gold, Husab, Namdeb, Skorpion), green schemes and commercial customers use the same transformers as those used by the distributors. They have developed their own specifications for tendering. All connections made by the larger users feeding at medium-voltage (MV) to or from the grid must comply with the distribution grid code promulgated under the Electricity Act, 2007 (Act No. 4 of 2007).

Table 4-1 below summarises the standard power ratings and standard component losses of dual-ratio transformers as per SANS 780 including the type of cooling, number of phases, type of mounting and frequency levels.

Table 4-1: Standard Power Ratings and Standard Component Losses of Dual-ratio Transformers

Transformer Ratings (kVA)	Primary Voltage (kV)	Secondary Voltage (kV)	No-Load Losses (W)	Load Losses (W)	Type of cooling	No. of Phases	Type of mounting	Frequency (Hz)
16	11	0.242	80	400	ONAN	Single	Pole	50
16	22	0.242	100	400	ONAN	Single	Pole	50
25	11	0.42	120	570	ONAN	Three	Pole	50
25	22	0.42	150	570	ONAN	Three	Pole	50
50	11	0.42	180	1000	ONAN	Three	Pole	50
50	22	0.42	220	1000	ONAN	Three	Pole	50
100	11	0.42	300	1700	ONAN	Three	Pole	50
100	22	0.42	360	1700	ONAN	Three	Pole	50
315	11	0.42	750	3800	ONAN	Three	Ground	50
315	22	0.42	840	3800	ONAN	Three	Ground	50
630	11	0.42	1300	6400	ONAN	Three	Ground	50
630	22	0.42	1400	6400	ONAN	Three	Ground	50
800	11	0.42	1600	8000	ONAN	Three	Ground	50
800	22	0.42	1650	8000	ONAN	Three	Ground	50

ONAN: Oil Natural Air Natural

Source: ERONGO RED - Specifications for Distribution Transformers

4.1.2 Recommended MEPS

Many countries and regions have adopted all, parts, or modified versions of the "IEC 60076 series - Power transformers"[20] to best fit their local or regional requirements. In South Africa, SANS 60076 Parts 1 and 20 and SANS 780:2021 are used. SANS 780:2021 includes provisions for both performance testing and MEPS.

As discussed earlier, DTs are mainly procured in Namibia through REDs (NORED – 90%) and NamPower. The current electric power transmission and distribution losses represent 36.2% of output in Namibia[21]. This is more than 4 times the losses in South Africa. As such, improving the DT energy efficiency policy and regulation is of paramount importance for Namibia. It is predicted that adopting higher energy efficiency DTs may result in 11.8 to 18.7 GWh of annual energy savings in 2030 which is equivalent to 16.9 to 24.7 thousand tonnes of CO2eq emissions avoided and USD 1.06 to 1.68 million savings in energy bills. While the cumulative impact over a decade under the minimum ambition scenario is estimated to be 58.2 GWh of

[20] https://webstore.iec.ch/publication/588

[21] https://data.worldbank.org/indicator/EG.ELC.LOSS.ZS?locations=NA

energy savings and 82.2 thousand tonnes of CO_2 emissions avoided. Savings in energy bills would amount to USD 5.24 million.

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

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

This standard may specify the energy performance by:

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

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

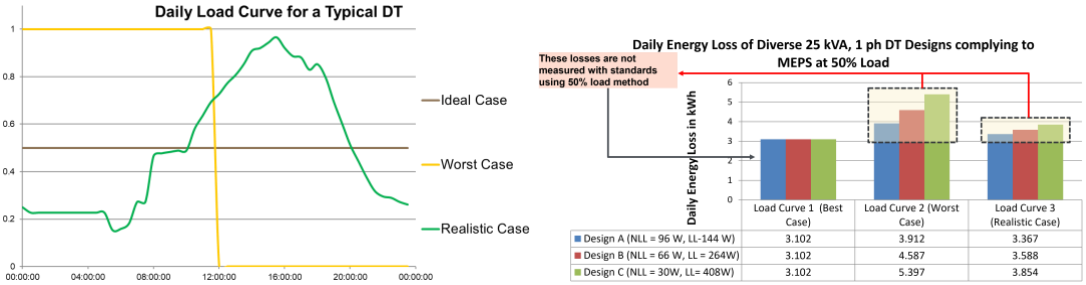

Figure 4-2: Energy loss in DTs based on usage pattern.

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

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

Step 1 – The Government of Namibia should consider adoption of SANS 780:2021 as the initial MEPS for DTs in Namibia and NamPower and REDs to reference the maximum LL/NLL specified in SANS 780:2021 in its procurement specifications. This step would essentially move Namibia closer to IEC 60076-20 Level 1 efficiency requirements. Namibia may wish to also coordinate with SADC Countries to create a regional framework to improve the purchasing power and demand for manufacturers, hence sustain the supply of energy efficient DTs in the region.

Timeline: one (1) year after adoption of MEPS or 1 July 2023, whichever is sooner.

Step 2 – This step is considered as an interim step towards higher efficiency DTs. During Step 1, the market would have evolved through the integrated policy approach (MEPS, HEPS, MV&E, stakeholder education). The maximum LL/NLL is this step could bel IEC 60076-20 Level 1 or simply an average of SANS 780 standard and the IEC 60076-20 Level 2. This interim step helps to save more energy and keeps the focus in the sector on investing in reducing losses.

Timeline: four (4) year after adoption of MEPS or 1 July 2026, whichever is sooner.

Step 3 – This provides final alignment with international best practices -IEC 60076-20 Level 2. This ensures that the country eventually transit to the international high efficiency standard and companies are given adequate time to procure new equipment and train staff. Setting this level out in the future gives the planning horizon suppliers and customers need so they are prepared.

Timeline: seven (7) years after adoption of MEPS or 1 July 2029, whichever is sooner.

4.1.3 Actions & Timeframe

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

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

Action	Lead Agency & Other Stakeholders	Timeframe
1. Develop an implementation plan on the national policy roadmap	NSI, MME, and International/ national advisor	2023
2. Finalise the draft MEPS for voluntary implementation	NamPower and REDs, NSI, MME, and relevant stakeholders	2023

3. Establish/designate the Authority (preferably ECB/NERA) to regulate DTs	TWG and International/ national advisor	2023
4. Develop and implement a capacity building and training program for ECB/NERA to effectively regulate DTs	REDs and NamPower, NSI, MME, local manufacturers, and International/national advisor	2024
5. Conduct public consultation on the voluntary MEPS to become mandatory	ECB/NERA, REDs and NamPower, NSI, MME, and International/ national advisor	2024
6. Develop regulatory mechanisms to enforce mandatory MEPS and testing methods	MME, ECB/NERA, REDs and NamPower	2025
7. Promulgate the mandatory MEPS regulation	MME, Cabinet, and Parliament	2025
8. Enforce the mandatory MEPS	ECB/NERA, MME	2025
9. Review and adjust the MEPS level based on the analysis of statistical data collected and the regional harmonisation trend	REDs and NamPower leads enforcement of DT MEPS	Every 5 years

4.2 Energy Labelling

DTs are considered as large electrical equipment and manufactured based on orders from electric utilities and commercial and industrial clients. Endorsement and comparative energy labelling schemes can be beneficial for some commercial or industrial products, however affixing energy labels on DTs is not a common practice around the world as the product nameplates per IEC 60076-1 standard already provide information on LL and NLL. According to the U4E policy guide series on Accelerating the Global Adoption of Energy-Efficient Transformers, there are only six economies worldwide[22] implementing energy labelling programs for DTs. As for Namibia, NamPower and REDs specifies the labelling requirements for DTs as per the IEC 60076-1 nameplate specifications, hence LL and NLL information should be available for designers and end-users to evaluate and compare efficiency of DTs. Considering this, an energy labelling scheme for DTs in Namibia is not considered as a priority action under the proposed national policy roadmap.

[22] China, India, Japan, Mexico, Republic of Korea, and USA

4.3 Communication Program

4.3.1 Current Situation

As described previously, each electricity distributor and large users developed their own specifications aligned with SANS 780 and IEC60076-20. NamPower has its own specifications when procuring distribution transformers guided by the IEC60076 and SANS 780 distribution transformer standards, as well as other international standards. The public procurement Act No.15, 2015 guides/governs the method of procuring or buying such transformers.

4.3.2 Recommended Communication Plan

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

Target Group A includes engineers, consultants, and system design engineers. Their role is primarily to determine the specification, develop terms of reference and support the decision maker

Target Group B includes decision makers, like CEO and owners

Target Group C includes salespersons, distributors, and representatives. Their role is primarily to represent the efficient product effectively to the Target Group A.

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

Communication and Educational Program for Target Group A

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

- Understand the energy consumption, efficiency, reliability, and cost aspects of DT.
- Create awareness of the life-cycle cost analysis (LCA) or total owning cost (TCO).
- Develop capacity on available tools.
- Understand how to lower the lifecycle cost (LCC) through improved DT reliability and the role of preventive maintenance
- Learn how to use IEC TS 60076-20 as a guideline of reference when they compare the specification and standard provided by the manufacturer

The communication and educational strategy for the Target Group A is summarized in Table 4-3. Table 4-3 listing the messages that need to be communicated and the available tools to implement these.

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

Message:	Tools Available:
What is the right transformer for you? (LCA vs. TCO) **What is energy loss? "Load/No-Load Losses"** **How to keep your transformer running at a minimum Total Cost of Ownership (TCO) while ensuring reliability?**	U4E TCO [23] Utilities informational content Transformer manufactures content/data Articles in electrical engineering magazines Articles on Engineering & Construction association magazine and its website, etc.

Communication and Educational Program for Target Group B

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

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

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

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

Message:	Tools Available:
What is the right transformer for you? (LCA vs. TCO) **What is energy loss? "Load/No-Load Losses"**	Articles/content in magazines, Website, and social media Newsgroup

[23] https://united4efficiency.org/resources/a-guide-to-using-total-cost-of-ownership-when-purchasing-distribution-transformers/

How to keep your transformer running at a minimum Total Cost of Ownership (TCO) while ensuring reliability?	Support from electrical engineers and consultants (target group A)

Communication and Educational Program for Target Group C

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

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

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

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

Message:	Tools Available:
What is the right transformer for you? (LCA vs. TCO) **What is energy loss? "Load/No-Load Losses"**	U4E TCO[23] Incorporate energy efficiency and its impact on lifetime operation in company brochures or PowerPoint presentations. Develop a stand-alone digital media and post on the company website, Facebook, etc.

*ANNEX K– Awareness Raising and Education Campaigns****Error! Reference source not found.*** further outlines international best practices.

4.3.3 Actions & Timeframe

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

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

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

4.4 Financing Mechanisms

4.4.1 Current Situation

MME leads the implementation of the Rural Electrification Master Planning through allocations from the national budget and, more recently, allocations from the National Energy Fund (NEF) electricity levy, which is derived from electricity consumers. Whereas off-grid mini-grids made up of 11 kVA distribution networks in Namibia, are directly funded by a combination of the national budget and grant funding by international development institutions.

Electrification efforts are guided by the Off-grid Energisation Master Plan (OGEMP) of 2007 and the Rural Electrification Distribution Master Plan (REDMP), last updated in 2010.

At the project level, for rural areas and public institutions that benefit from subsidized electrification projects, as well development of Mini-grids, MME conducts annual planning processes in consultation with regional councils, other local stakeholders and NamPower in order to determine priority projects.

NamPower is responsible for executing some projects before hand-over to a distributor (or NamPower Distribution) for operation, while MME implements the bulk of rural electrification before hand-over to the REDs for operation for grid electrification only.

4.4.2 Recommended Financing Mechanism

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

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

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

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

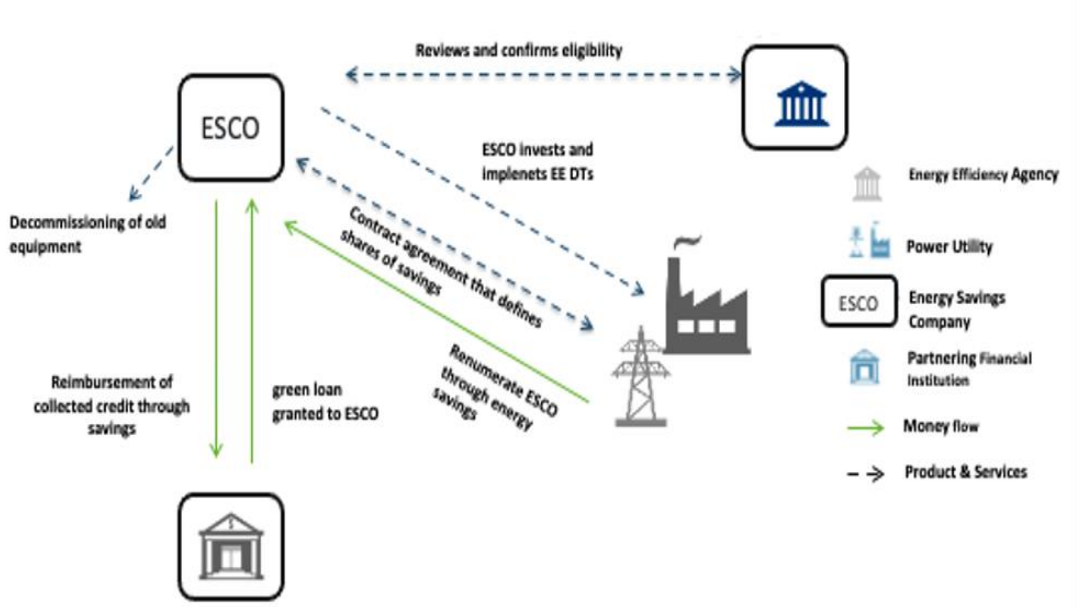

Figure 4-3: Recommended ESCO EPC - shared savings model scheme

Option 2: ESCO EPC – Guaranteed Savings Model

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

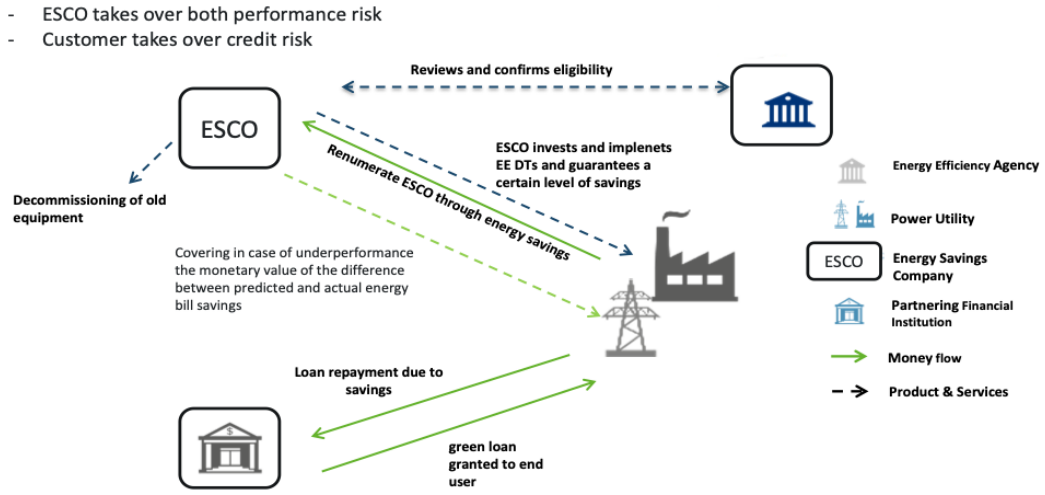

Figure 4-4: Recommended ESCO EPC - guaranteed savings model scheme

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

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

(TCO) of the lowest bidder. The volume of the bid is then allocated to all the manufacturers who agree to match the lowest TCO in the bid.

Involvement of key national stakeholders

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

MME acting as the lead compliance entity/program manager

Other relevant government institutions (e.g., ECB/NERA, NSI, DEA, MOF, Central Procurement Board of Namibia (CPBN), etc.)

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

Power Utility (NamPower, REDs, etc.)

Partner financial institutions (e.g., MDBs, DBN, green funds, banking institutions)

4.4.3 Actions & Timeframe

Table 4-7 lists key actions for developing and implementing a supporting financial mechanism for energy-efficient DTs (See ANNEX K – Recommended Detailed Implementation Plan of the financing mechanism for DTs).

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

Action	Lead Agency & Other Stakeholders	Timeframe
1. Establish finance/procurement strategies and detailed implementation plan for each financing mechanism	MME leads, and NamPower, ECB/NERA, NSI, DEA, MOF, CPBN, and international/ national advisor	2023
2. Engage potential donors and prepare technical assistance project proposals for the proposed financial mechanisms	MME and international/ national advisor	2023
3. Develop and implement the proposed financial mechanisms through technical assistance projects supported by international donors and experts	MME leads, with support from NamPower, ECB/NERA, NSI, DEA, MOF, CPBN, and technical assistance projects supported by international donors and experts.	2024

4. Seek and develop partnerships with financial institutions and NamPower including T&C and agreements signing for the proposed financing mechanisms	MME and NamPower/ financial institutions	2024
5. Assess eligibility and negotiate with ESCOs and/or technology providers, including MOU signing.	MME and NamPower, ESCOs/ technology providers	2024
6. Implement marketing and promotion strategy and activities to promote the pilot demonstration program(s).	MME and NamPower, financial institutions and ESCOs/technology providers	2024 onwards

4.5 Monitoring Verification and Enforcement

4.5.1 Current Situation

Currently, there is no framework for a national or regional MV&E of MEPS for distribution transformers in Namibia. Validation testing is only conducted at a factory for DTs with capacity larger than 315 kVA, while DTs with lower capacities are provided with test certificates upon delivery. Routine tests are done on all DTs. The engineer reserves the right to witness the tests. The results of these tests are made available to the engineer for evaluation before delivery of the DTs. Type tests and special tests are conducted on one transformer of each size supplied or the manufacturer may also provide certificates of previous tests done on identical transformers.

4.5.2 Recommended Framework

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

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

MV&E Component
Establishment and operation of a national MV&E system The following aspects to be considered: • Mandatory or voluntary participation • Legislative powers and program administration • Budget and financial considerations for compliance activities • Identification of key institutions for undertaking specific actions (certification and monitoring) under the legislation
Establishment of a national registry system for distribution transformers The following aspects to be considered: • Procedure and process of registration to ensure that the applicant provides all the information to assess whether a product meets the requirements

• Identification of information that the applicant must provide • Identification of stakeholder engagement in certifying and managing product registry system
Establishment of communication program to promote compliance activities The following aspects to be considered: • Main stakeholders involved in the supply chain • Key messages – compliance requirements, the risk of detection and sanctions
Establishment of evaluation program for mandatory MEPS and labelling program for distribution transformers The following aspects to be considered: • MEPS registration & certification process and compliance

A detailed description of MV&E can be found in *ANNEX J– Monitoring, Verification, and Enforcement (MV&E)**Error! Reference source not found.***.

4.5.3 Actions & Timeframe

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

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

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

Explore regional coordination options for establishing a regional product registry to strengthen the enforcement		
Train responsible officers in charge of management and maintenance of PRS	MME, NamPower, REDs, ECB/NERA	2023
Develop national regulations on mandatory registration of distribution transformers	MME, NamPower, REDs, ECB/NERA	Draft by end of 2023 and full enforcement by 2024
Establishment of communication program to promote compliance activities for distribution transformers		
Design communication plan for DT suppliers, customs, and other stakeholders on enforcement obligations	MME, ECB/NERA	2023
Develop information materials on regulatory compliance requirements and obligations (e.g., procedures to obtain registrations and import permits)	MME, ECB/NERA	2023
Develop and publish annual reports to maintain market transparency and declare non-compliance cases for manufacturers, distributors, power utilities, and end users	MME, NSI, NamPower and REDs, REDs, ECB/NERA	2023
Establishment of evaluation program for mandatory MEPS for distribution transformers		
Plan and implement the evaluation program on MEPS registration & certification process, compliance and impact	MME, NSI, ECB/NERA	2025 and on an annual basis for the following years

5 Overall Action Plan & Budget

5.1 Action Plan & Estimated Budget

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

5.1.1 Refrigerators

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

Action No.	Action	Lead Agency & Other Stakeholders	Timeframe	Budget (US$)
A	**MEPS**			
A.1	Develop an implementation plan on the national policy roadmap	MME, NSI, and International/ national advisor	2023	105,600
A.2	Finalise the draft MEPS for voluntary implementation	NSI	2023	35,200
A.3	Establish/designate the Authority (preferably ECB/NERA or NOU) to regulate refrigerating appliances	MME, ECB/NERA or NOU	2023	158,400
A.4	Develop and implement a capacity building and training program for ECB/NERA or NOU to effectively regulate the refrigerating products	MME & International Partners	2024	35,200
A.5	Conduct public consultation on the voluntary MEPS to become mandatory	Regulator (ECB/NERA) designated to regulate the refrigerating appliances	2024	52,800

Action No.	Action	Lead Agency & Other Stakeholders	Timeframe	Budget (US$)
A.6	Develop regulatory mechanisms to enforce mandatory MEPS and testing methods	MME & ECB/NERA	2025	105,600
A.7	Promulgate the mandatory MEPS regulation	ECB/NERA, MME, Cabinet, and Parliament	2025	Included in A.6
A.8	Enforce the mandatory MEPS	ECB/NERA, MME	2026	50,000
A.9	Review and adjust the MEPS level based on the analysis of statistical data collected and the regional harmonisation trend	NSI, ECB/NERA, MME	2025	52,800
B	**Energy Labelling**			
B.1	Phase 1- Conduct consultation workshops to discuss with the South African authorities and adopt the South African label with relevant modifications on the labels	ECB/NERA, MME, NSI	2023 to 2024	35,200
B.2	Phase 2-Develop a uniform energy performance labelling for all residential refrigerators sold in Namibia (In coordination with the mandatory MEPS regulation)	ECB/NERA, MME, NSI	2025	70,400
B.3	Formalize institutional frameworks for regular market data collection and analysis (as needed)	ECB/NERA, NSI, NAMRA	2024 to 2025	35,200
B.4	Develop a labelling regulation requiring all residential refrigerators imported to and sold in Namibia to be compliant with the mandatory labelling requirement	MME, ECB/NERA, NSI, NAMRA	2025	70,400
C	**Communication Program**			
C.1	Develop awareness campaigns and capacity building programs on new MEPS and labelling regulations	MME, ECB/NERA	2023	26,400
C.2	Conduct a training program for ECB/NERA, MME and relevant government agencies staff on evaluation and revision of the MEPS and labelling requirements	International Advisor	2025	Included in C.1
C.3	Conduct a training program for NamPower and REDs on managing and maintaining on-bill financing scheme	MME, ECB/NERA, International Advisor	2024	35,200

Action No.	Action	Lead Agency & Other Stakeholders	Timeframe	Budget (US$)
C.4	Conduct a training program for in-store salespersons on understanding energy label and educating customers on the label usage and value	MME	2025	44,000
C.5	Implement awareness campaigns for retailers/ wholesalers/ distributors on MEPS and labelling regulations to manage inventories	MME, ECB/NERA	2025	Included in C.4
C.6	Conduct regular public awareness and educational campaigns for consumers, and develop communication tools (incl. website, brochures, media reports, TV, and radio broadcasts, etc.)	MME, ECB/NERA	Every year	50,000
D	**Financing Mechanisms**			
D.1	Finalize finance strategies and detailed implementation plan	MME leads, with support from ECB/NERA, DEA, MOF, etc.	2023	35,200
D.2	Engage potential donors and prepare technical assistance project proposals to turn the On-bill financing mechanism concept into a program	MME	2023	35,200
D.3	Develop and implement the On-bill financing mechanism program	MME leads, with support from ECB/NERA, DEA (take-back scheme), MOF, and technical assistance projects supported by international donors and experts.	2024	250,000 (per mechanism)
D.4	Design and implement marketing campaigns to promote the On-bill financing mechanism	MME and NamPower, REDs, partner financial institutions and participating technology providers	2024 onwards	50,000
E	**Monitoring, Verification, and Enforcement**			
E.1	Develop a regulatory & enforcement mechanism - to address managing compliance activities and clearly specify roles and responsibilities of related	MME (lead), NSI, ECB/NERA, NAMRA/MoF	Draft by end of 2023 and	158,400

Action No.	Action	Lead Agency & Other Stakeholders	Timeframe	Budget (US$)
	enforcement authorities on all related MV&E activities including liability measures with penalty structure for cases where non-compliance has been established		full enforcement by 2024	
E.2	Develop administrative procedures/ operational manual for enforcing regulations on MEPS and labelling program	MME (lead), ECB/NERA, NSI, Customs	2023	35,200
E.3	Assess and conduct capacity building on the national MV&E mechanism for responsible staff (customs and other related MV&E officials)	MME, ECB/NERA	2023	57,800
E.4	Develop a procedure and process of product registration system (PRS) for refrigerators Review U4E's prototype PRS software and consider whether to use it (in whole or part) as the basis for developing a national PRS Explore regional coordination options for establishing a regional product registry to minimize the cost associated with product certification	MME, ECB/NERA	2024	65,200
E.5	Train officers in charge of management and maintenance of PRS	MME/ECB	2023	8,800
E.6	Develop procedures for customs personnel to monitor compliance of imported refrigerators with the import regulations for refrigerator products, listed under mandatory MEPS and labelling requirements	MME (lead), ECB/NERA, NAMRA/MoF, Customs	Draft by end of 2023 and full enforcement by 2024	Included in E.2
E.7	Develop national regulations on mandatory registration of refrigerators	MME	Draft by end of 2023 and full enforcement by 2024	Included in E.1
E.8	Design a communication plan for all the main stakeholders involved	MME, ECB/NERA	2023	17,600
E.9	Develop information materials for Customs officials and consumers	MME, ECB/NERA	2023	27,600

Action No.	Action	Lead Agency & Other Stakeholders	Timeframe	Budget (US$)
E.10	Train importers on mandatory registration of regulated refrigerator products and their legal obligations	MME, ECB/NERA	2023	17,600
E.11	Develop and publish annual reports to maintain market transparency and declare non-compliance cases	MME, ECB/NERA, NSI	2023	Included in E.8
E.12	Establish a methodology for identification of products selected and purchase for verification processes, allocate staff for verification (Market Surveillance) and implement	MME, ECB/NERA, NSI	Draft by the end of 2023 and full operation on annual basis by 2024	26,400
E.13	Train officers in charge of market surveillance	MME, ECB/NERA	2023	Included in E.14
E.14	Implement a pilot market surveillance program and evaluate the results	MME, ECB/NERA	2024 and full operation on annual basis by 2025	27,600
E.15	Develop procedures for verification testing and test laboratory selection (outsourcing lab testing and/or using shared test results from neighbouring countries or other entities) to verify EE of selected products	MME ECB/NERA and NSI	2024	Included in E.14
E.16	Implement a pilot verification testing program and evaluate the results	MME ECB/NERA and NSI	2024 and full operation on annual basis by 2025	27,600
E.17	Plan the evaluation program on process and impact, identify resources and implement	MME, ECB/NERA	2025 and periodic assessment	17,600

Action No.	Action	Lead Agency & Other Stakeholders	Timeframe	Budget (US$)
			throughout the program	
			TOTAL	**1,820,200**

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

5.1.2 Distribution Transformers

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

Action No.	Action	Lead Agency & Other Stakeholders	Timeframe	Budget (US$)
F	**MEPS**			
F.1	Develop an implementation plan on the national policy roadmap	NSI, MME, and International/ national advisor	2023	105,600
F.2	Finalise the draft MEPS for voluntary implementation	NamPower and REDs, NSI, MME, and relevant stakeholders	2023	35,200
F.3	Establish/designate the Authority (preferably ECB/NERA) to regulate DTs	TWG and International/ national advisor	2023	35,200
F.4	Develop and implement a capacity building and training program for ECB/NERA to effectively regulate DTs	REDs and NamPower, NSI, MME, local manufacturers, and International/national advisor	2024	35,200
F.5	Conduct public consultation on the voluntary MEPS to become mandatory	ECB/NERA, REDs and NamPower, NSI, MME, and International/ national advisor	2024	35,200
F.6	Develop regulatory mechanisms to enforce mandatory MEPS and testing methods	MME, ECB/NERA REDs and NamPower	2025	35,200
F.7	Promulgate the mandatory MEPS regulation	MME, Cabinet, and Parliament	2025	Included in F.3

F.8	Enforce the mandatory MEPS	ECB/NERA, MME	2025	Included in F.3
F.9	Review and adjust the MEPS level based on the analysis of statistical data collected and the regional harmonisation trend	REDs and NamPower leads enforcement of DT MEPS	2023-3	17,600
G	**Communication Program**			
G.1	Develop and implement an educational program on DT MEPS and TCO for utility procurements to communicate on financial benefits of more stringent MEPS and updated formulas for computation of the Total Cost of Ownership (TCO) in the procurement guidelines	NamPower, REDs NSI, MME, and International/ national advisor	2023-2	27,600
G.2	Develop and implement an educational program on DT MEPS and TCO for non-utility procurements to communicate on financial benefits of procurement of energy efficient DTs and updated formulas for computation of the Total Cost of Ownership (TCO) in non-utility applications	NamPower, REDs, NSI, MME, International/ national advisor, and relevant stakeholders	2024-3	27,600
H	**Financing Mechanisms**			
H.1	Establish finance/procurement strategies and detailed implementation plan for each financing mechanism	MME leads, with support from NamPower, REDs, ECB/NERA, NSI, DEA, MOF, CPBN, and International/ national advisor	2023	35,200
H.2	Engage potential donors and prepare technical assistance project proposals for the proposed financing mechanisms	MME and International/ national advisor	2023	35,200
H.3	Develop and implement the proposed financing mechanisms through technical assistance projects supported by international donors and experts	MME leads, with support from NamPower, REDs, ECB/NERA, NSI, DEA, MOF, CPBN, and with technical assistance projects supported by international donors and experts.	2024	250,000 (per mechanism)

H.4	Seek and develop partnerships with financial institutions and NamPower including T&C and agreements signing for the proposed financing mechanisms	MME and NamPower/ financial institutions	2024	Included in H.3
H.5	Assess eligibility and negotiate with ESCOs and/or technology providers, including MOU signing	MME and NamPower/ ESCOs/ technology providers	2024	Included in H.3
H.6	Implement marketing and promotion strategy and activities to promote the pilot demonstration program(s).	MME and NamPower/ financial institutions and ESCOs/ technology providers	2024 onwards	50,000
I	**Monitoring, Verification, and Enforcement**			
I.1	Develop a regulatory & enforcement mechanism - to address managing compliance activities and clearly specify roles and responsibilities of related enforcement authorities on all related MV&E activities including liability measures with a penalty structure	MME, NSI, ECB/NERA, NamPower, REDs	Draft by end of 2023 and full enforcement by 2024	158,400
I.2	Organize consultation workshops with other GCF countries and the SADC region (public utilities) to ensure alignment with the national MV&E framework and harmonization of the DT product registry	MME, NSI, ECB/NERA, NamPower and REDs, REDs	2023	35,200
I.3	Develop administrative procedures/ operational manual for enforcing regulations on the MEPS program	MME, ECB/NERA, NamPower, REDs, NSI	2023	35,200
I.4	Develop a product registration system (PRS) for distribution transformers Explore regional coordination options for establishing a regional product registry to strengthen the enforcement	MME, NamPower, REDs, ECB	2024	65,200
I.5	Train responsible officers in charge of management and maintenance of PRS	MME, NamPower, REDs, ECB	2023	8,800
I.6	Develop national regulations on mandatory registration of distribution transformers	MME, NamPower, REDs, ECB	Draft by end of 2023 and full	Included in I.1

			enforcement by 2024	
I.7	Design communication plan for DT suppliers, customs, and other stakeholders on enforcement obligations	MME, ECB/NERA	2023	17,600
I.8	Develop information materials on regulatory compliance requirements and obligations (e.g., procedures to obtain registrations and import permits)	MME, ECB/NERA	2023	27,600
I.9	Develop and publish annual reports to maintain market transparency and declare non-compliance cases for manufacturers, distributors, power utilities, and end users	MME, NSI, NamPower and REDs, REDs, ECB/NERA	2023	Included in I.6
I.10	Plan and implement the evaluation program on MEPS registration & certification process, compliance and impact	MME, NSI, ECB/NERA	2025 and on an annual basis for the following years	17,600
			TOTAL	**1,090,400**

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

5.2 Revenue Streams

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

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

6 References

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

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

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

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

7 Annexes

7.1 ANNEX A – Members of the Policy Work Group

Mr. Nico Snyders – MME (Chairperson)

Mr. Paulus Ashili – MEFT/National Designated Entity

Ms. Susan Tise – MME

Ms. Charity Nsofu – ECB

Ms. Thandi Hambira – MoF/NAMRA

Mr. Benedict Likando – MoF/NAMRA

Tilya Chrissie – MoF/NAMRA

Mr. Reagan Chunga – MEFT

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

Ms. Amalia Nangolo – Ministry of Industrialisation and Trade (Chairperson)

Ms. Susan Tise – MME

Mr. Makuao Kaune – NSI

Mr. Reagan Chunga – MEFT

Technical Committee on Refrigeration and Air-conditioning safety standards

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Ms. Susan Tise – Ministry of Mines and Energy (MME)

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Mr. Lourence Ngozu - NamPower

Mr. Shinana Shinana - NORED

Mr. Buruxa //Hoabeb – Erongo RED

Mr. Demetrius Jonas – Ministry of Mines and Energy

Mr. Martin Tobias - Ministry of Mines and Energy

Mr. Simeon Kulo – NamPower

7.4 ANNEX D – Namibia's Socioeconomic Situation

The Republic of Namibia is located on the west coast of Southern Africa. It borders the Atlantic Ocean to the west, Zambia and Angola to the north, Botswana to the east and South Africa to the south and east. The Zambezi River separates Namibia from Zimbabwe by less than 200 m.

Namibia's population is estimated at 2.5 million according to a World Bank country overview updated in March 2021. The country's population density is 3 per km^2, with 55.2% of the population living in urban areas. The median age in Namibia is 21.8 years. The country's total land area is 823,290 km^2.

Namibia is classified as a higher-middle-income country with an estimated annual gross domestic product (GDP) of USD 11 billion and per capita GDP of USD 5,828 as of 2021 but has extreme inequalities in income distribution and standard of living. Namibia's GDP has grown by an average of 3.68% annually between 1990 and 2019. Namibia is one of the world's most unequal countries with a Gini coefficient of 59.1.

Namibia's formal economy is based on capital-intensive industry and farming. However, it is heavily dependent on the earnings generated from primary commodity exports in a few vital sectors, including:

- Mining especially diamonds
- Livestock, and fish

Furthermore, the Namibian economy remains integrated with the economy of South Africa, as the bulk of Namibia's imports originate there.

The COVID-19 pandemic adversely affected Namibia's economy, shrinking it by 7.8% in 2020, due to declines in tourism, retail, trade and investments, health, and education. However, the economy is projected to grow by 2.6% in 2021 and 3.3% in 2022, on the back of a steady recovery in financial services, tourism, retail and wholesale trade, and the mining industries—combined with an improvement in the regional and global economic environment.

Namibia's national development ambitions are guided by Vision 2030, which was adopted in 2004. Vision 2030 foresees the provision of secure and affordable electricity to the country's developing economy and its people; it provides the overall long-term development goals for the country; and it subscribes to the principle of sustainable development. Specifically, Vision 2030 foresees "a prosperous and industrialised Namibia, developed by her officers, enjoying peace, harmony and political stability".[24]

Namibia's medium-term goals and strategies are expressed in National Development Plans (NDPs) which are formulated in accordance with Vision 2030. The NDPs are revised every five years. Since 2016 the President released the Harambee Prosperity Plan (HPP), which sets out short term development priorities which includes energy access targets. HPP 2 targets to achieve a secure and cost-effective energy supply through;

- Increasing local electricity generation capacity from 624 MW (2020) to 879 MW by 2025, through renewable energy sources
- Electrifying 6,000 rural and 13,000 peri-urban households by the end of 2025

[24] National Planning Commission 2004. Namibia Vision 2030: Policy Framework for Long –Term National Development Summary. https://www.npc.gov.na/national-plans/vision-2030/?wpfb_dl=36

- Electrifying 213 new schools and health facilities by 2025

7.5 ANNEX E – Electrification Plans

The Ministry of Mines and Energy's (MME) electrification programme focuses mainly on the provision of grid electricity infrastructure to connect Government assets in rural areas to the national grid and renewable energy solutions in remote rural areas, while urban electrification has largely been the domain of Regional Electricity Distributors (REDs) or local authority entities. Policy, planning and strategic coordination for scaling up connectivity to electricity in rural areas has been the primary remit of the MME; informed by Rural Electricity Distribution Master Plans (REDMPs) and the Off-grid Electrification Master Plan (OGEMP). The original REDMP was adopted by the MME in the 2024000, with updates in 2005 and 2010.

Based on these plans together with the expected population growth, an additional 430,000 new connections will be needed by 2030 to achieve universal connectivity by grid and off-grid options.

- About 87 % of new connections are situated within 5 km of existing distribution network infrastructure
- 77 % are within 2 km of existing distribution network infrastructure
- Off grid solutions are more cost effective to reach smaller and dispersed settlements situated further off from the existing grid network infrastructure across all the REDs.

The 430,000 new connections are distributed across the service areas of the REDs as follows:

- NORED (64%)
- Central RED (18%)
- CENORED (10%)
- Southern RED and ERONGO RED (4%), South RED (4%)

MME conducts annual planning processes in consultation with regional councils, other local stakeholders and NamPower in order to determine priority projects to receive funds from Development Finance Institutions (DFIs), Government or NamPower's rural electrification budget. NamPower is responsible for executing some projects before handover to a distributor for operation, while MME implements the bulk of rural electrification before handover to the REDs for operation for grid electrification only. However, the containerized solar systems and mini grids are handed over to the Ministry of Works and Transport for operation.

REDs, local and regional authorities and NamPower may also propose new non-subsidized electrification projects based on local strategies, private requests (farms, etc.) and Net present value (NPV) costs; most grid densification and urban/per-urban electrification is handled in this manner.

7.6 ANNEX F - Transmission and Distribution Networks

Namibia's transmission network is composed of 66kV,132kV,220kV,330kV,400 kV and 350kVDC of overhead lines spanning more than 11,704 km, connecting generation sites and major demand centres, as shown in Figure 7-1.

Figure 7-1: Generation and transmission network in Namibia. Image Source: Namibia: Geospatial Least Cost Electrification Plan, 2021

The distribution network covers most of the densely populated areas in Namibia, as well as many rural areas. In total, the 11-33 kV medium-voltage network extends more than 45,000 kilometres across the country, with approximately 306 distribution and transmission substations as shown in Figure 7-2.

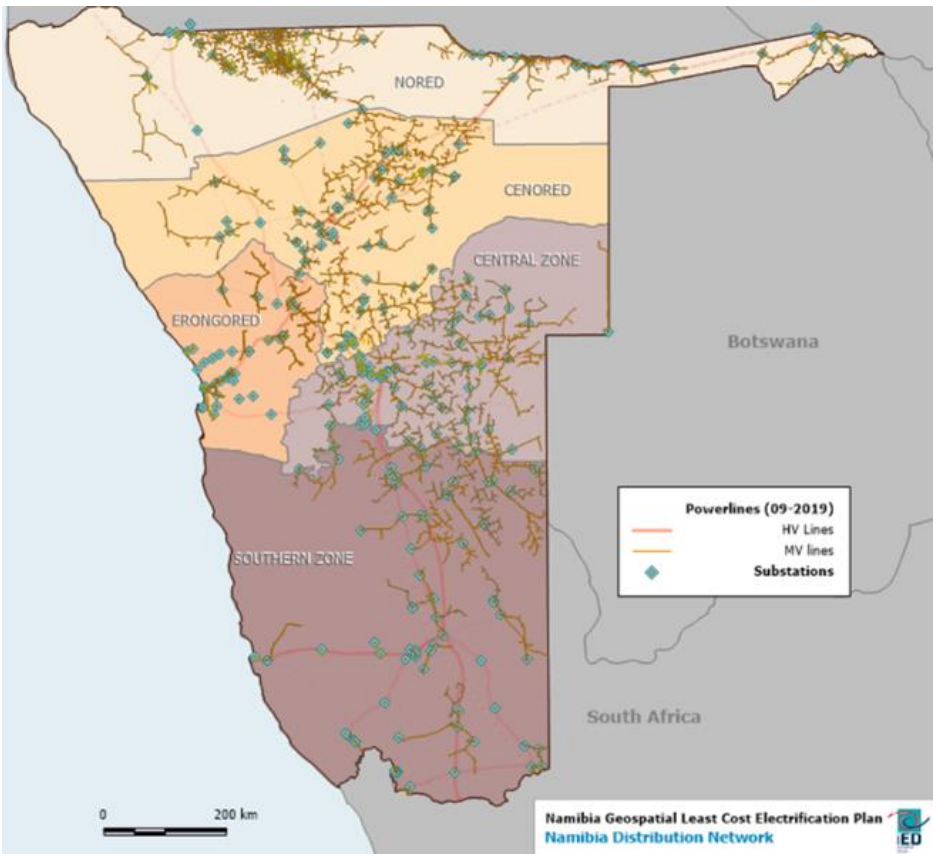

Figure 7-2: Distribution Network in Namibia. Image Source: Namibia: Geospatial Least Cost Electrification Plan, 2021

7.7 ANNEX G – Energy Efficiency Implementation Ecosystem

The energy efficiency market transformation relies on 5 main pillars:

6. MEPS
7. Labels
8. Consumer and Stakeholder Education
9. Monitoring, verification, and Enforcement
10. Financing

Minimum Efficiency Performance Standards

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

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

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

Labels

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

Cost-effective implementation of MEPS and Labels may be achieved through regional harmonization (as with the regional U4E model regulation) or the adoption of international standards (as with the adoption of IEC standards or major trade partner standards).

Consumer and Stakeholder Education

Consumer and stakeholder education is an important part of the energy efficient market transformation ecosystem. They raise the awareness towards energy efficient technologies and their socioeconomic impacts. Proper consumer and stakeholder education may involve communication campaigns, capacity building activities, etc. This is an important pillar of the ecosystem as it ensures that government officials understand the value of energy efficiency and how to create the proper policies, the supply chain is well educated about the value of energy efficiency and how they can better advise and convince consumers to opt for higher efficiency products, and that consumers understand the labels and purchase the most efficient products,

Monitoring, Verification, and Enforcement

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

Financing mechanisms

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

Energy-efficient residential refrigerators:

It is imperative to implement a financial mechanism that facilitates end-users in the residential sector to have access to energy-efficient and climate-friendly residential refrigerators (including to some extent off-grid solar refrigerators) and that provide some form of incentives along the demand and supply chain to overcome financial and technology barriers. On the demand side, a simple-to-access financial mechanism with competitive conditions will help to motivate households to acquire high-efficient appliances that can generate important energy savings. Credit is important to facilitate that end-user disburse an amount equivalent or lower to what implies to purchase a second-hand system. On the supply side, the financing mechanism will aim to engage and motivate providers to sell energy-efficient and climate-friendly appliances (including off-grid solar refrigeration systems) by increasing their sales volume through the provision of credit facilities to their clients.

On-bill financing is such a mechanism, specifically designed to promote investment in residential refrigerators and align with the country context - low to higher-income households in an upper middle-income country such as Namibia, targeting on-grid end-users with the possibility to extend it to off-grid end-users too.

On-bill financing enables energy utility customers to acquire energy-efficient appliances, and to pay for the equipment over time through their monthly utility bills. In many cases, on-bill programmes are designed to deliver immediate overall cost savings from the very first day without the need for the customer to invest (bill neutrality). This means that the energy cost

savings equal or exceed debt service, resulting in a lower total bill (debt repayment and electricity) after retrofit.

On-bill financing intends to:

- Set up green credit facilities to ease access to concessional finance and help overcome the higher upfront cost barrier for end-users.
- Structure low-risk repayment mechanisms between key local stakeholders such as partner banking institutions or National Development Bank (NDB) (e.g., the Development Bank of Namibia (DBN)), the power utilities (e.g., regional electricity distributors (REDs), City of Windhoek, Oshakati Premier Electric, Local Authorities and Regional Councils, NamPower Distribution), as well as EE technology providers.
- Address market barriers, align with the specific country context, and leverage local opportunities in order to maximise both technical and commercial feasibility (e.g., targeting prepaid metering customers, building on experience with consumer finance products, etc.)

Energy-efficient distribution transformers:

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

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

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

7.8 ANNEX H – Financing Mechanisms for Refrigerators

7.8.1 On-bill Financing

The model:

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

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

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

Benefits:

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

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

Risks and challenges:

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

- Engaging the utility to support the transition towards energy efficiency and/ or to serve as a financier.
- Evaluating credit risk of customers through their historical electricity consumption and payments.
- Changing the utilities data and information management system to allow for on-bill repayment.
- Customer risk of power shut-off. This can be mitigated by enabling customers to obtain assistance with complaints, raise legitimate issues related to the loan

  and the project funded by the loan, and access to a dispute-resolution process.
- Managing the contractor network who might misinform the clients.
- Repayment allocation (i.e., whether utility or lender is paid first) can be an issue when customers partially pay their bills.

Supporting mechanisms:

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

On-bill financing recommendations

Recommended key components:

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

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

Therefore, the recommendation is to seek partnerships with one or two key local financial institutions (i.e., banking institutions, MFIs) in terms of number of retail customers, existing

partnerships with technology providers (i.e., distributors, retailers), and climate initiatives. Then build on the existing offer of consumer loans, credit facilities (e.g., hire purchase agreements) in place and adapt the existing agreements and processes in place to comply with robust monitoring, reporting, and verification (MRV) measures to collect data on emissions, mitigation actions and support. Green loans and credits will be specifically dedicated to finance certified energy-efficient and climate-friendly residential refrigerators (including some off-grid refrigerator products) for households through the mechanism.

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

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

2. Eligibility assessment and bulk rebate negotiations with technology providers.

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

energy-efficient and climate-friendly off-grid solar refrigerator technologies too in alignment with SRF eligibility criteria.

Once the brand models of residential refrigerators are deemed eligible, bulk rebates are negotiated with the eligible retailers or distributors of complying technologies. After successful negotiations are concluded, they have to agree and sign terms and conditions for participation in the mechanism, as well as finance agreements with each partner local financial institution to themselves become partners of the programme enabling the sales and promotion of certified energy-efficient residential refrigeration through on-bill financing. This might come with financing or de-risking support (i.e., green credit lines, revolving loans funds, credit guarantees) from DBN or MDBs and credit recovery from the relevant partner electricity distributors or utilities (e.g., REDs, City of Windhoek, Oshakati Premier Electric, Local Authorities and Regional Councils, NamPower Distribution). The aim of the partnership with the technology providers is not to procure the products but to negotiate with distributors and retailers a minimum percentage rebate on the sale of each certified brand model through the mechanism. Part of the rebate is used to lower interest rates and increase tenor periods offered by partner banking institutions to consumers through credit facilities and another to incentivise consumers and offer vouchers or cash-back in exchange for the collection and disposal of end-of-life appliances through the programme. The benefit for the partner distributors and retailers is that the programme will aggregate demand for premium brand models and offer support to significantly increase the sales in energy-efficient and climate-friendly refrigeration technologies (which are difficult to sell due to upfront cost and competition with inefficient equipment) through facilitating access to credit to the certified products. If sufficient, the rebate is also used to cover the costs related to collection and disposal of the end-of-life equipment that is turned-in by households in alignment with e-waste management regulations in the country. Bulk rebate negotiations with providers are a practice that was proved successful in Ghana, Rwanda, and Senegal to facilitate access to energy efficient cooling appliances to households through ECOFRIDGES and the Rwanda Cooling Finance Initiative.

3. Marketing and Promotion of qualifying residential refrigerators.

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

4. Positive list.

It is necessary to build partnerships with at least one banking or microfinance institution to provide consumer loans or credit facilities to acquire new energy-efficient and climate-

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

5. Monitoring, Reporting, and Verification (MRV).

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

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

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

6. Collection and disposal.

A requirement for sales of the energy-efficient and environmentally friendly domestic refrigerators and access to green loans and credit facilities should be conditioned on the turn-in, collection, and disposal of end-of-life refrigerating appliances. This includes agreements with partner providers and local financial institutions may include a clause that the household can only access the rebate if an end-of-life equipment is turned in, collected, and disposed properly. Two approaches are proposed for efficient collection and disposal; a) the procedure in place that is used by partner providers to deliver and install the new equipment can also be used to collect and dispose of the old equipment. The partner provider in charge of delivering

the new equipment would then pay a small payment (coming from the agreed rebate) to cover the costs associated with the disposal to eligible e-waste management companies. In the absence of delivery and installation services from partner providers, eligible e-waste management companies are used to collect and dispose of end-of-life equipment against a commercial transaction. The e-waste management company benefits from a payment coming from the rebate. In both cases, the end-of-life equipment is sent to any existing e-waste management facility where potentially harmful gases can be disposed of in a safe and environmentally friendly manner.

Figure 7-3: Financial and non-financial components of on-bill financing mechanism

Recommended On-bill financing scheme:

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

On the demand side:

- Households wishing to take advantage of the attractive conditions of the programme announce themselves with a partner provider or a partner financial institution submitting an application to acquire an eligible equipment on credit to a partner banking or microfinance institution, in exchange of an agreement to reimburse credit through their electricity bill with the utility.

- Households, customers of the utility then refund their credits on their electricity bill for post-paid customers or pre-paid meters for prepaid customers. More than 85% of surveyed households were on a prepayment metering system, compared to less than 15% on post payment metering systems in Namibia in 2021. On-bill financing through prepayment metering systems is easier to implement than through post payment metering systems, due to the greater effectiveness and flexibility of prepayment information management systems, lower reputational risk, and regulatory costs for the utility. Indeed, the utility does not have to interrupt electricity service when facing non-repayments from prepaid customers if credit repayments are prioritised over electricity consumption in the prepayment metering systems of eligible customers.
- While the utility reimburses on a regular basis partner local financial institutions with whom it has entered into an agreement for its customers.
- The utility thus guarantees the repayment of household loans by enabling the linkage between electricity consumption and loan repayments, which make it easier for households to obtain a green loan at preferential conditions and reduce the need to provide additional collaterals or loan guarantees for households.

On the supply side:

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

On-bill financing is a unique solution that can be used by partner technology providers to promote and sell certified highly efficient and climate-friendly appliances as well as by partner financial institutions seeking to provide green loans to households for the purchase of products generating significant energy savings and climate benefits. The utility (e.g., REDs, City of Windhoek, Oshakati Premier Electric, Local Authorities and Regional Councils, NamPower Distribution) and MME act as facilitators and intermediaries of choice, through coordination and market surveillance, implementing and strengthening their positions as key

actors in energy efficiency in Namibia. They promote certified systems and partners and are also able to refer potential household customers to partners. On-bill financing will increase the supply of green credit to support energy efficiency in the residential sector, greatly facilitate access to efficient and climate-friendly domestic refrigerating appliances, open access to new markets for technology providers and will promote the modernization of the utility as the electricity provider company of the future through this national energy efficiency programme. The following financial structure is recommended based on the market assessment.

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

On-bill financing is an innovative mechanism that proves very effective for smaller investments and is therefore ideal for households who are customers of the partner utility and wish to replace their domestic refrigerating appliances for new energy-efficient and climate-friendly ones. The mechanism allows these households to repay green loans or credits obtained from partner financial institutions and vendors through their prepaid metering systems with the utility. For instance, the majority of the respondents (48%) spend between NAD 500 and NAD 1,000 (US$ 36 and US$ 72) on electricity per month, 19.3% spend between NAD 1,000 and NAD 1,500 (US$ 72 and US$ 107), and about 9% spend above NAD 1,500 monthly (over US$ 107). Assuming that average prices of residential refrigerators range between US$349 and US$484 according to the market assessment, the longer the tenor period offered (24-month onwards) the better to achieve a neutral or positive impact on households. Lending conditions (i.e., interest rates and tenor periods) and thus monthly loan repayments for the acquisition of residential refrigerators through on-bill financing can easily be aligned with expected household electricity expenditures in Namibia.

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

Operationalisation of the on-bill financing mechanism requires significant support from partner utilities (e.g., REDs, City of Windhoek, Oshakati Premier Electric, Local Authorities and Regional Councils, NamPower Distribution). Among other things, the utility adapts its information management system and prepaid metering system. In return, the utility switches from being a simple electricity provider to a provider of electricity and financial services and also has the opportunity to control the electricity consumption of its customers through this energy efficiency initiative, reducing country peak demand and savings on very expensive investments in avoided additional generation capacity. In the preferred approach, the utility

does not provide financing itself, but is supported by partner local financial institutions, which provide green consumer loans or credit facilities with partner technology providers to households through on-bill financing. The loan is not registered on the utility, and it does not bear the default risk. The utility is not directly responsible to assess the creditworthiness of beneficiaries but help partner banks by leveraging data on electricity consumption and payments from customer applicants. Partner technology providers and banking or microfinance institutions are the main interface with the beneficiaries. Indeed, the partner local financial institutions provide the financing and assess credit risks for beneficiaries and on-lend to them according to set terms. The utility in return collects the payments through the purchase of electricity, where a portion is sent back to the partner local financial institution to pay back the credit. Customer applicants are in agreement to share customer data with partner local financial institutions and reimburse credit through their prepaid metering system with the utility Approved customers then pay for electricity consumption including contractually agreed deductions from the prepaid metering system. The utility collects credit repayments of loans on behalf of the partner local financial institutions and returns these payments to the partner financial institutions monthly.

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

Semi-integrated systems between partner utilities and partner local financial institutions. The utility's customers refund their electricity credits through their prepaid metering systems while the utility, on a regular basis, reimburses partner local financial institutions with which it has entered into repayment agreement for its customers. In order to achieve this, there needs to be either systems integration for an online process or a paper-based approach. It is recommended that the lead compliance or implementing entities develop and manage the interface between the customers and the programme with support from the partner utilities, partner technology providers, and local financial institutions for increased system integration. This takes the form of an online shop for customers wishing to apply for the programme.

Semi-automated credit recovery processes between partner utilities and partner banks. With semi-integrated systems, it is recommended that partner local financial institutions and the utility follow semi-automated processes rather than fully automated processes to avoid further development related costs. When the utility's customers are approved for a credit from a partner banking institution, a list of names is shared by email with specific information on allocated credit that the utility needs to recover on an agreed frequency. This can also potentially be done by logging into the utility system and uploading the file with the list on the utility server. After getting approved credit customers into the utility system, the credit recovery is then automatic. Precisely, once contacted by a partner banking institution, the

utility fetches for approved customers in its database one by one or adds a file of approved customer names by the partner banking institution and the system connects it automatically. Partner banking institutions can gain limited access to the utility's system in which they input all the required credit information allocated for each approved customer. Then, the utility's system carries the information into the prepaid metering payment system.

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

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

Recommended involvement of key national stakeholders:

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

- MME. The support from the Government of Namibia is essential for the success of the on-bill financing mechanism option in Namibia. MME can play a key compliance role in the development and implementation of the mechanism, coordination with public stakeholders, facilitating access to the programme to new partners and technologies, promoting certified domestic refrigeration equipment and partners, and directing households towards the programme. MME can be central in coordinating and regulating the market and thus offers quality control to households and different stakeholders involved in the proposed financial mechanism when it comes to monitoring, reporting and verification as well.

- NamPower and partner utilities (e.g., REDs, City of Windhoek, Oshakati Premier Electric, Local Authorities and Regional Councils, NamPower Distribution). The partner utilities or electricity distribution companies play a central role in on-bill financing by collecting credit repayments from customers in their respective regions. They must adapt, set up, manage, and maintain the credit recovery mechanism. By supporting the programme, partner utilities help reduce the peak electricity consumption of their customers and thus help Namibia Power Corporation (NamPower) avoid the costs associated with running costly additional generation capacity during peak load and the construction of future additional power plants which would require expensive investments. NamPower can support the identification and engagement of the most relevant partner utilities for the development and implementation of the on-bill financing mechanism as a relevant demand side management initiative at the country level.

- Partner financial institutions. The partner local banking or microfinance institutions play a key role in developing, implementing, financing, and promoting the mechanism. Partner local financial institutions adapt their offering of consumer credits to propose green credits, while NDB such as DBN or MDBs such as the GCF might eventually support them with green credit lines, revolving loans funds, or credit guarantees to help mitigate any credit risk and improve concessional lending terms to households, as well as provide technical assistance to promote and develop key components of the mechanism, as well as streamline and digitalise the system integration and processes. DBN and GCF can advise partner local financial institutions and structure products to reduce their risks and improve their credit terms by eventually offering concessional green credit lines or credit guarantees to finance or de-risk energy efficiency investments starting with energy-efficient and climate-friendly domestic refrigerators and providing technical assistance to support the promotion and marketing, as well as the operationalisation and digitisation of the mechanism.

- Partner technology providers of energy-efficient domestic refrigerators. In order to implement the on-bill financing mechanism option to accelerate the adoption of energy-efficient domestic refrigeration equipment, providers must be involved from the beginning as they will play an important role in supplying the market and serve as technical experts. In the proposed on-bill financing mechanism, they are the main interface of the programme, allowing the interested household to consult a catalogue of certified and eligible equipment and get a pro forma invoice and credit application material to be then submitted to partner banking institutions and co-verified by the partner utilities and the lead compliance entities such as MME or DBN. Once a customer is declared approved, a partner provider of certified brand model will dispatch and install the household equipment on credit and eventually collect the turned-in end-of-life equipment into any eligible e-waste management facilities for disposal. As the mechanism is being scaled-up to other market segments, technology providers of off-grid solar refrigerator technologies or other climate mitigation technologies might be invited to join the programme.

- Households and micro entrepreneurs. The principal beneficiaries of the proposed mechanism, on the demand side, are households including micro entrepreneurs that must be customers of the partner utilities and thus connected to the grid. Households have been involved from the beginning and engaged through surveys to ensure that the programme corresponds to their preferences and expectations. Credit and participation conditions to the proposed financial mechanism must be easily accessible, concessional,

and transparent, while the application process must be as simple and efficient as possible. Advantages of the programme should be explained through target communications and awareness campaigns. Although the market assessment has already shown findings about households' preferences and expectations, households should be informed continuously on the financial mechanism progress and be invited to provide feedback through the Namibia Consumer Trust or directly when possible.

7.9 ANNEX I – Recommended Detailed implementation Plan of the financing mechanism for Refrigerators

This section describes the recommended detailed implementation plan including engagement and coordination with partners for the development and implementation of the financing mechanism. The responsibilities and activities related with the development and implementation of the mechanism with partners may include, but are not necessarily limited to:

(A) Lead compliance entity (e.g., MME, DBN, GCF, etc.)

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

- Supervise random quality testing of a sample of a subset of these products being certified to verify compliance
- Negotiate bulk rebates with interested providers; partners commit to indirectly bring down financing and prices of certified brand models sold through the mechanism for clients (i.e., vouchers, cash-back, and credit facility agreements with partner local financial institutions)
- Sign Memorandum of Understandings (MOUs) to officialise partnership with partner vendors
- Develop a marketing and promotion strategy that aims to raise awareness of the selected mechanism option during the development and implementation including a "communication toolkit" which includes programme branding, possible press release and social media posts to announce partnership on partner communication channels, as well as support on marketing and promotion to integrate the financing product into partner communication channels
- Refine cost-benefit analysis of certified eligible technologies and internal financial structure, which can help partner local financial institutions to define appropriate financial conditions based on available de-risking or concessional financing support from National Development Bank and Multilateral Development Bank to structure financing products to potential customers
- Prepare and implement guidelines to support partner local financial institutions adapt relevant current financing product scheme to deliver of the new financing products to target customers including financing product details, lending terms, conditions, eligibility, and simplified requirements, procedures for reviewing applications, end-user credit assessment template through the on-bill mechanism
- Prepare and implement guidelines and provide framework for monitoring, reporting and evaluation (MRV) for a data management system as part of the mechanism to track financing of approved products to customers and climate benefits attributed to the financial mechanism option (specify the features it should include, recommended protocol for integration into the financial mechanism processes, advising on existing software that may be a good fit for the digitisation of the MRV, agreement, processes, pricing, etc).
- Certify and oversee the programme and guide households wishing to apply for the programme through partners
- Help structure the flow of information between the different key actors including partner providers of certified brand models, enabling the tracking of project status and develop interface platform and systems for connecting salaried customer or partner utilities customer applications with partner local financial institutions and technology providers

- Capacity building, training, and implementation meetings with partner local financial institutions to support the development and operationalisation of the mechanism
- Promote certified domestic refrigerating appliances, technology providers, financial institutions, and partners
- Provide an advisory role to partners for the operationalisation of the mechanism
- Define, review, and enforce product application and customer application processes and draft standardized agreements and contracts to clarify terms and conditions of participation and responsibilities of different actors (e.g., partner technology providers, partner local financial institutions, partner utilities, etc.)
- Review draft standardized agreement between partner providers and partner local financial institutions and partner utilities including credit terms and conditions for customers in the financial mechanism option as well as rebate on credit
- Support the full financial integration of the collection and disposal of used but operable products into the mechanism option in a financially sustainable manner (covered by the rebate), including the proper disposal of the refrigerant gasses.
- Help partner vendors Identify and negotiate with e-waste management companies which will support on the collection and disposal of gases in an environmental and safe manner
- Capacity building, training, development and implementation meetings with partner distributors, retailers, banking or microfinance institutions, partner utilities, National Development Bank or Multilateral Development Bank to support the operationalisation of the mechanism
- Structure financing, support mechanisms, or de-risking mechanisms based on feedback from partner local financial institutions in order to improve on-lending conditions offered to end-users through the financing mechanism

(B) Partner local financial institutions (e.g., banking institutions, microfinance institutions, DBN, etc.) and key institutional partners (e.g., partner utilities, Solar Revolving Fund (SRF), etc.)

- Set up green credits facilities with partner technology providers, structure and provide green loans through prepaid metering system deductions with the partner utilities to eligible customers on concessional terms (e.g., 0% financing and long tenor periods)
- Implement the positive list of certified brand models, partner distributors and retailers based on product eligibility criteria set by the lead compliance entity
- Develop a quick and simplified credit application procedure for partner utilities' customers (i.e., credit scoring) wishing to access green loans in exchange of credit repayment on their prepaid metering system with support from partner utilities

- Define standard credit process and sign standardized contract to clarify terms and conditions of participation and responsibilities of different actors (e.g., partner providers to set up the credit facilities, partner utilities aggregating repayments through prepaid metering system, timing of repayments, transaction costs, etc.)
- Draft standardized agreements with partner utilities – the entities responsible of the loan repayment collection. This agreement aims to include the application process, requirements, eligibility criteria for partner utilities' customers, the commitment of the entities to act as guarantor of the loans to customers and define the conditions of such guarantees including the timing of repayments and the transaction cost flow, as well as system integration and credit recovery processes
- Exchange information to help monitor the programme
- Monitor, verify and evaluate the results of programme and exchange information on the extent of green loans granted to participating individuals and MRV
- Analysis of the possibility of extending green consumer loans and credit facilities with partners for other certified climate technologies

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

- Express interest, go through application and certification to participate in the selected financing mechanism and supplying certified energy-efficient and climate-friendly domestic refrigerators in return for negotiated bulk rebates on systems introduced into the market and sold through the programme
- Provide supporting documents to register certified appliances on the positive list based on product eligibility criteria defined by the lead compliance entity (submission of conformity assessment report, random sampling test, etc.)
- Proceed with signing of terms and conditions, and agreement with partner local financial institutions wishing to become partners detailing the rebate, in accordance with policies and regulations
- Implement the monitoring, reporting, and verification (MRV) guidelines to track the climate benefits of the programme
- Exchange information with partners to track the progress of the programme
- Consider extending the mechanism to supply other types of climate solutions into the market

7.10 ANNEX J – Distribution Transformers Supply Chain & Market Landscape in Namibia

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

- Regional Electricity Distributors (RED), with a mandate to distribute and supply electricity. The prominent distributors are NORED, CENORED and ERONGO RED, which distribute electricity in their respective jurisdictions, OPE, City of Windhoek, Local Authorities (such as Keetmanshoop municipality) and Regional Councils;
- NamPower, which distributes electricity to unserved areas in the regions of Khomas, Omaheke, Hardap, and Karas.

Additionally, several farmers, electrical utilities and other privately owned commercial/residential suppliers exist. They are in charge of operating the privately owned distributing networks.

The market size of distribution transformers (DT) in various locations in Namibia is not uniform. DT sizes vary by location, dictated by the number of customers, distribution voltage and the capacity of the electrical load in the specific location. In terms of distribution network, the largest installed DT is 20 MVA, which is within one of the largest market locations in the country. In other areas, DTs of smaller capacities 10 kVA to 1000 kVA both single and three phases are installed either pole- or pad-mounted. In urban areas, most installed DT are pad mounted. The common voltage levels at distribution in many parts of the country are 11 kV, 19.1 kV, 22 kV and 33 kV.

All DTs in Namibia are imported mainly from South Africa through the Public Procurement Act No.15, 2015, by public open tenders or contractual agreements. There is also a small number of DTs imported from India and from other parts of the world, depending on the specifications of the tender.

A number of suppliers were identified as key stakeholders that play a fundamental role in the supply chain of DTs in Namibia. The main leading supplier of the DTs active in the Namibian market is MegaTech Pupkewitz (Pty) Ltd (distributor for PCB Power Transformers) which has six branches across the country with the main office in Windhoek. MegaTech Pupkewitz (Pty) Ltd supplies mainly City of Windhoek, CENORED and NORED.

Additional suppliers were identified as summarised in Table 7-1. It is worth noting that all DTs in Namibia are of the Oil Natural Air Natural (ONAN) cooling type. Furthermore, all suppliers identified provide both pole- and pad-mount DTs.

In some instances, an electric utility, industrial business, or electrical contractor may procure a DT directly from an overseas manufacturer or supplier through an import/trade customs office. For instance, in its dual approach, NamPower procures its transformers directly from overseas transformer manufacturers or from local importers or wholesalers. Figure 7-4 illustrates an overview of the distribution transformers supply chain in Namibia.

Table 7-1: DT Suppliers in Namibia

Name of Supplier	Brand Name	Transformer Capacity range	Refurbishment/ Repair/ Rewinding
Walfish Electric (PTY)LTD	Actom and SGB-Smit Power Matla Transformers	16 kVA – 800 kVA	Supply only
Swakop Electrical Supplies CC	Actom, Trans Electron, SGB-Smit Power Matla Transformers	16 kVA - 800 kVA	Supply only
MegaTech Pupkewitz (PTY) LTD	PCB and Actom Transformers	16 kVA - 2.5 MVA	Supply only
Swanib Cables (PTY) LTD	PCB, SGB-Smit Power Matla, and Actom Transformers	16 kVA - 2.5 MVA	Supply only
Actom Namibia	Actom and SGB- Smit Power Matla Transformers	16 kVA – 800 kVA	Supply only
Central Technical Suppliers	PCB, Actom, Free State and SGB-Smit Power Matla Transformers	16 kVA - 2.5 MVA	Supply only
Ark Trading	PCB, Free State and SGB-Smit Power Matla Transformers	16 kVA - 2.5 MVA	Supply only
Megatron Engineering Namibia	SGB- Smit Power Matla and Actom, and others	16 kVA - 800 kVA	refurbishment/ repair
HV Transformers	SGB- Smit Power Matla and Actom, and others	16 kVA - 800 kVA	refurbishment/ repair

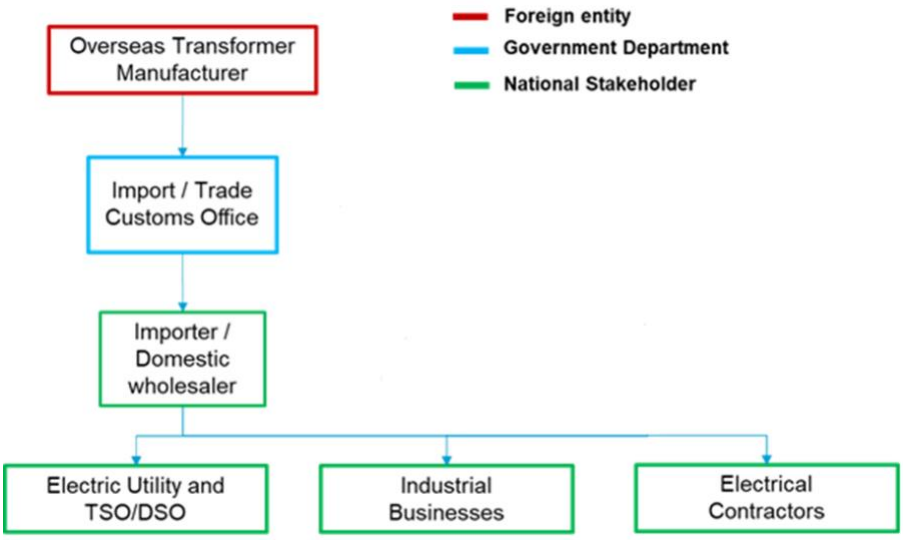

Figure 7-4: Flow of DTs into Namibia's electricity market.

Namibia's distribution transformers market landscape

The main customers of DTs in Namibia are farmers, small settlements, industrial establishments, commercial establishments, mines, individual households who procure through a utility and electricity distributors, City of Windhoek, and other municipalities. The largest buyers of DTs are the two regional distributors with the largest distribution networks – NORED and CENORED, followed by ERONGO RED and the transmission utility NamPower. The other small distributors include OPE and Keetmanshoop municipality.

Table 7-2 indicates the typical service life of distribution transformers, grouped according to their kVA rating from the survey. DTs rated up to 100 kVA are pole mounted used mainly in rural areas, while the ones rated more than 100 kVA are ground mounted via a plinth, mainly used in urban areas and mini substations

Table 7-2: Transformer Service Lifetime in Namibia based on kVA rating

kVA rating of Distribution Transformer	Application sector (e.g., Utility, Industrial, Commercial)	Typical Service Life (years)
Small (1-100 kVA)	Utilities, industries, commercial	15 - 20 years
Medium (101-1000 kVA)	Utilities, industries, mines	15 – 35 years
Large (1001-5000 kVA)	Utilities, industries, mines	35 - 40 years

The average initial prices of DTs on the market in Namibia are, respectively approximatively USD 1,400 (NAD 19,200) for 16 kVA distribution transformers (normally used for singe households), USD 3,500 (NAD 48,000) for 50 kVA and USD 13,700 (NAD 200,000) for 315 kVA

distribution transformers. Losses associated with the operation of the distribution transformers are usually incorporated in the tariffs charged to customers.

7.11 ANNEX K – Recommended Detailed Implementation Plan of the financing mechanism for DTs

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

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

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

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

marketing and promotion to integrate the financing product into partner communication channels.

- Promote certified EE DTs, partner ESCOs, participating technology providers, partner financial institutions, pilot projects, and other partners.
- Consider extending the mechanism to supply other types of climate solutions into the market beyond the program implementation through the Super ESCO model led by energy efficiency agency.

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

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

development and implementation of the selected financing mechanism.

- Support the development and implementation of a marketing and promotion strategy that aims to raise awareness of the selected mechanism option.
- Consider extending the mechanism to supply other types of climate solutions into the market beyond the program implementation.

(C) Power Utility:

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

development and implementation of the selected financing mechanism.

- Support the development and implementation of a marketing and promotion strategy that aims to raise awareness of the selected mechanism option.
- Consider extending the mechanism to supply other types of climate solutions into the market beyond the program implementation.

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

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

7.12 ANNEX J– Monitoring, Verification, and Enforcement (MV&E)

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

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

Figure 7-5 highlights the fundamental aspects of MV&E.

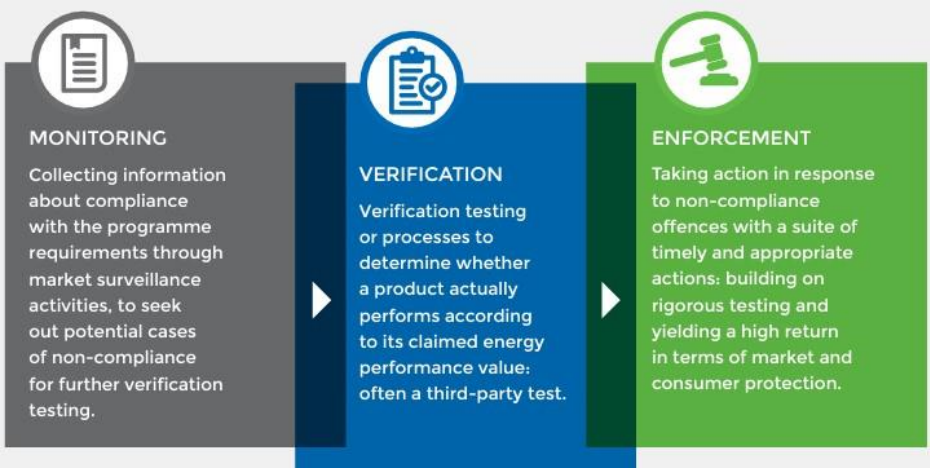

Figure 7-5: MV&E Process

Source: U4E (2017). Accelerating the Global Adoption of Climate-friendly and Energy-Efficient Refrigerators[25]

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

[25] http://united4efficiency.org/wp-content/uploads/2017/06/U4E-RefrigerationGuide-201705-Final-R1.pdf

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

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

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

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

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

This information is then used by the designated authority to:

- Design the market entry conditions, as shown in Table 7-3.
    - Recognize the cost distribution between the Government/Program, Industry Participant, and Consumer
    - Understand the trade-off in complexity for the different entry conditions.
- Devise the market surveillance plan
- Develop the verification plan – regional harmonization and discussions with major trade partners can be quite important in this step
- Develop an enforcement plan with a penalty structure (monetary and otherwise)
    - Penalty should be commensurate with the level of offense
    - Visible and communicated with the region (e.g., SADC) and trade partners

Table 7-3: Trade-off between entry conditions and distribution of costs

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

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

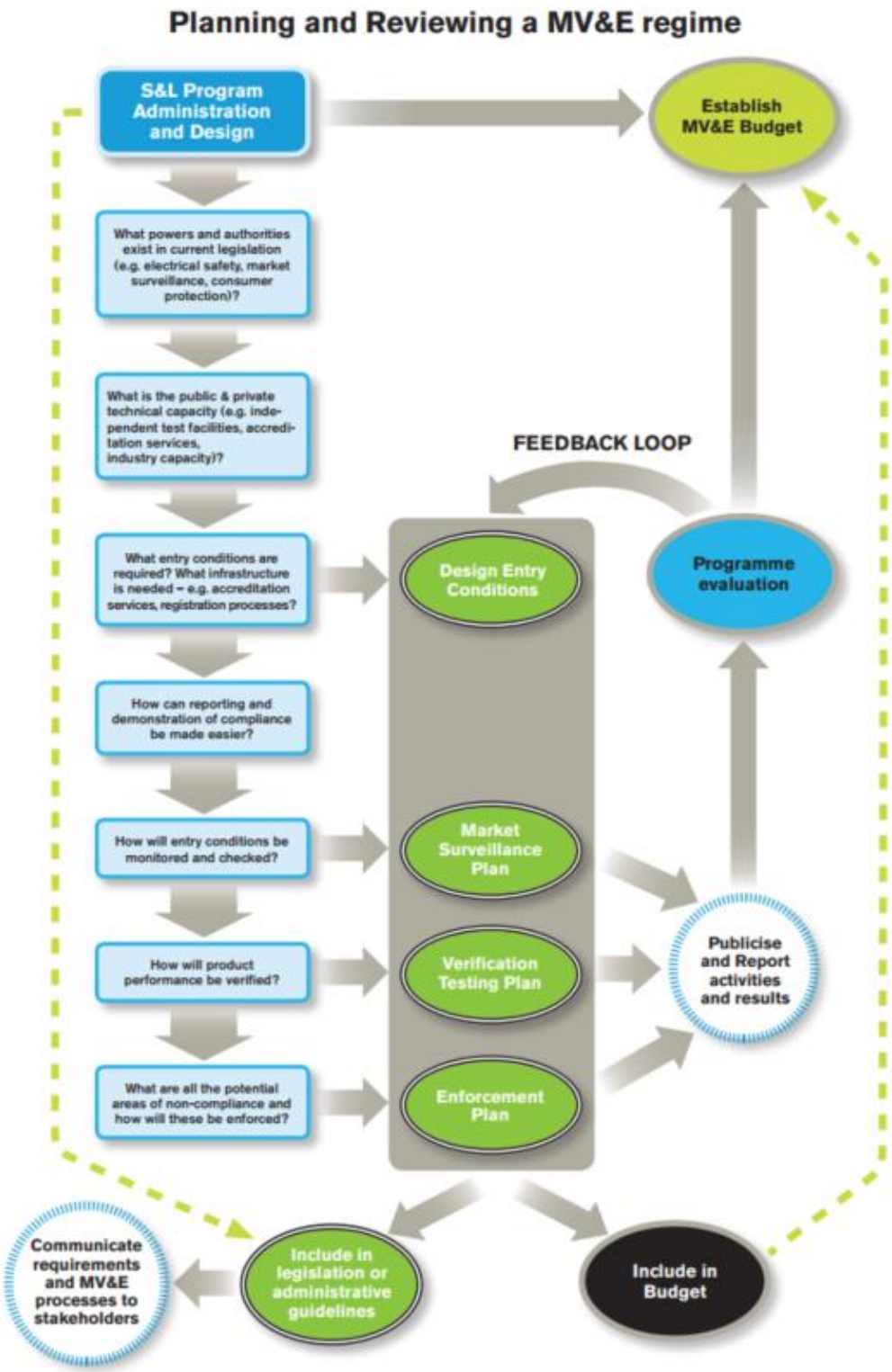

Figure 7-7: Planning and reviewing an MV&E regime

Source: Compliance Counts: A Practitioner's Guidebook on Best Practice Monitoring, Verification, and Enforcement for Appliance Standards & Labelling, CLASP[26]

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

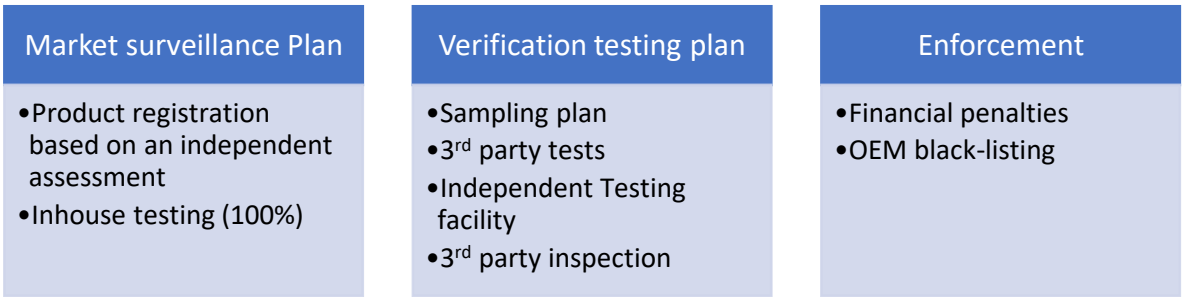

Figure 7-8: Typical MV&E plan for DTs

The following concerns must be considered in planning MV&E

- **Legal and Administrative Framework**

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

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

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

- **Specification of Requirements**

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

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

The procedure lists the steps that a supplier must follow to ensure that a product that they wish to place on the market complies with all legislative requirements. If the requirements

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

are unclear to suppliers or impractical, there is an elevated risk of non-compliance and missing documentation, even when market actors aim to abide by the law.

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

U4E Guidance on Ensuring Compliance with MEPS and Energy Labels further presents examples of conformity assessment protocols for refrigerators, as cited in European Union regulations[27].

- **Product Registry Systems**

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

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

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

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

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

U4E guidance notes on product registration systems further outline best practices[28].

- **Testing Laboratory**

[27] https://united4efficiency.org/resources/ensuring-compliance-with-meps-and-energy-labels/
[28] UNEP U4E (2020) Product Registration System Guidance Notes include 1) What is a Product Registration System and Why Use One? 2) Planning to Build a Product Registration System? – Foundational Considerations 3) Planning to Build a Product Registration System? 4) Detailed Consideration Implementing a Product Registration, all available at: https://united4efficiency.org/product-registration-systems/

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

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

- **Communications**

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

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

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

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

- **Market Surveillance Management and Responsibilities**

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

- **Conformity Verification**

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

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

The degree to which conformity verification actions are systemic or only conducted at the request of the market surveillance authority is a trade-off, balancing careful consideration of the cost and complexity relative to the benefit of enhancing compliance. The types of conformity verification, ordered from least costly but least certain, to most certain and more costly, include:

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

- **Regulatory Enforcement**

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

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

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

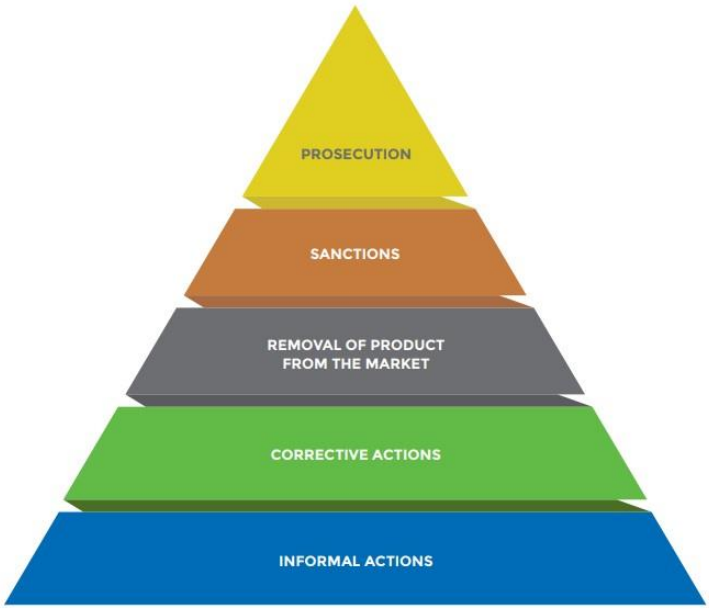

Figure 7-9: Pyramid of Escalating Enforcement

Source: UN Environment (2017)[29]

Recommendation

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

- Importers needs to provide third-party test certificate and up-to-date product labels for each model imported
- Each imported appliance should bear the Energy Label in compliance with the adopted standard

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

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

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

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

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

1. The designated authority submits a notice of non-compliance to the importer
2. The importer is allowed to provide rebuttal information – e.g., third-party test certificates, updated product labels, etc.
3. The designated authority inspects the rebuttal information
    a. If valid, update the product registry and/or affix the modified label
    b. If not valid the designated authority has to reject the non-compliant shipment, inform SADC partners of the offense to warn against dumping, and ensure the non-compliant shipment is returned to the country of origin or properly disposed of at additional cost (e.g., reclaim refrigerant charge, recycle plastic and metal, and incinerate or recycle polyurethane foam)[30].

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

7.13 ANNEX K– Awareness Raising and Education Campaigns

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

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

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

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

Source: UNDP (2020). Terminal Evaluation Report[31]

Designing a Communications Campaign

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

- ***Objectives*** should be established in line with policy goals. The objectives should be specific, measurable, attainable, relevant, and time-bound (SMART). They determine the choice of communication tools and messages as well as evaluation parameters.

- ***Communication messages*** should be simple and relevant to the audience. Messages should make the desired behaviour attractive and easy and should clearly demonstrate the benefits to end users. Usually, monetary savings are a strong motivator in all communications campaigns about efficiency, but in some

[31] https://erc.undp.org/evaluation/documents/download/16823

countries, messages that tap into a sense of national pride may resonate as strongly.

- ***Communication plans*** should be flexible. They should allow for adjustments based on monitoring results and any circumstantial changes. Project-management skills are needed to successfully manage the launch and ongoing operation of the campaign. Diagnostic skills are used to recognise whether the campaign fulfills its expectations. If the campaign falls short of its goals, then its problems must be addressed.

- ***Target audience*** should be correctly identified for a communications campaign. This helps in tailoring the messaging to that audience.

- ***Communication tools*** should include both offline and online channels. Some means of external marketing communication with target audiences are, for example, digital television, and advertising on websites. For written media (offline), the tools can be annual reports, handbooks, or newsletters. The *energy label* also constitutes a successful tool to communicate or provide information about the energy consumption of an electrical appliance to help consumers choose products with increased energy efficiency.
  Typical stakeholder education tools include:
  - Organizing events at selling places
  - Training of trainers for key stakeholders
  - Roadshows
  - Exhibitions taking advantage of the local energy exhibits
  - Brochures
  - TV and Radio advertisements

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

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

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

Source: UN Environment (2017)[32]

Table 7-4 provides more information on the communication interests of these major target audiences. It includes their primary interests and their areas of involvement with respect to energy efficiency for appliances. How exactly various groups of stakeholders are engaged varies a lot between countries and should be defined taking into account the cultural context and available resources. For example, the US has a culture of documenting all decisions and rationale. All stakeholders listed above are invited to take part in the discussions to build a negotiated consensus. The Mexican process relies mostly on subsets of selected stakeholders gathered in technical committees.

Table 7-4: Communication campaign stakeholders and areas of interest and involvement

TARGET AUDIENCE	PRIMARY INTEREST	AREAS OF INVOLVEMENT
INSTITUTIONS/ GOVERNMENTS **• Governments (potentially several ministries)** **• Electric utilities** **• Standards organisations** **• Customs authorities**	• For refrigerators several ministries may be involved: industry, energy, climate, and environment; each of which would have different interests • Reduce electricity use and GHG emissions through	• Support regulatory and legislative initiatives and policy implementation through available funding opportunities. • Provide experienced support in identifying success factors for

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• **Testing labs** • **Trade unions** • **Lobbying organisations – environmental advocacy; industry association**	energy-efficient and climate-friendly appliances • Ensuring efficiency standards and product quality in the market • Ensure competitiveness of local manufacturers on global markets • Promote market penetration.	promoting efficient appliances and market transformation. • Evaluate and monitor processes against established targets. • Provide in-kind support to regulatory and legislative initiatives and policy implementation through technical expertise. • Institute green public procurement programmes where only top labelled products would be acceptable.
BUSINESS • **Manufacturers** • **Industry associations** • **Wholesalers and retailers** • **Specifiers** • **Building owners and managers** • **Recyclers**	• Promoting innovative, energy-efficient new technologies • Business prospects • Corporate responsibility • Reducing electrical consumption • Managing the end-of-life of refrigerators.	• Facilitate direct and indirect end-user communication • Guide key actors in promoting sustainable policies and transforming markets to efficient appliances • Provide best practice solutions at the local, regional, or international level • Provide guidance on technical feasibility and realistic time schedules.
END USERS • **Customers** • **Civil society** • **Consumer and community associations** • **Environmental organisations**	• Acquire information to make informed decisions about the savings associated with a switch to efficient refrigerators • Own energy-efficient products.	• Accept and utilise of energy efficient appliances based on first-hand experience and affordability • Provide information about buying habits • Increase the market share of energy-efficient refrigerators and sustain the change in consumption patterns.

MEDIA AND OTHERS • **Media** • **Research and training institutes** • **Universities**	• Increase awareness and develop knowledge about energy-efficient refrigerators among professionals and consumers.	• Disseminate information on energy-efficient refrigerators and their benefits to consumers • Identify best practices and policies • Assist governments in implementing sustainable appliance policies • Publish formal and informal education and training materials.

Source: UN Environment (2017)[33]

In addition, effective communication and education campaigns should gain the active support of the key stakeholders. They should focus on the range of *benefits and outcomes* that end users will enjoy as a result of seeking out and selecting higher-efficiency appliances (refrigerators) or equipment (transformers). If end users can feel good about the outcome, they are more motivated to take an interest in seeking out information and to understand why it is meaningful to their purchasing decision. Dry, factual messages will have less impact than positive, beneficial statements.

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

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

Recommendation

Namibia is considering the design and implementation of its first batch of MEPS and labeling. Energy labeling is a critical component of national market transformation efforts, which allow consumers to make informed purchasing decisions. The campaign will focus on publicizing the refrigerator label and establishing brand recognition around energy efficiency labels for subsequent campaigns. While for distribution transformers (DTs); the communication will

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

focus on educating key stakeholders on the impact of higher-performance DTs and the financial benefits of integrating MEPS in their procurement guidelines. The following recommendations are made as follows:

- **Peer-to-peer communications** (networking/ collaborating peers or partners that define clear functions for the parties involved) should be used to create social and group pressure to change behaviour among like-minded or in physical neighbourhoods/ communities. The combined information instruments can be used such as website, e-groups, media reports, public service announcements etc.
- Campaigns should be designed based on a clear legal framework and contain more practical information on how to comply with the new legal framework. For instance, more focus can be on providing facts about the energy efficiency refrigerator. This can also be combined with efforts to ***inform the consumer about the benefits and environmental advantages***. Finally, these campaigns should also provide ***information on available financing schemes***.
- These campaigns need to work across ongoing interventions to provide ***tailored communications messages*** related to the value and function of the product, environmental consequences of switching towards efficient refrigerators, and encourage spin-off effects and local initiatives, like technician capacity building.
- Developing economies working on increased electrification rates may wish to consider equitable access to information and benefits for *low-income groups*. As such, the role of ***retailers, point-of-sale information, and local promoters*** is crucial in promoting higher-efficiency products. Retail personnel typically affect consumer choices, particularly in rural areas. Awareness and training activities should be directed to retail personnel on the benefits of efficient refrigerators, with information exchange workshops on promotion campaigns in small cities and rural towns. More skilled and knowledgeable retail staff or other professionals that give advice options can be complemented by more extensive point-of-sale information in terms of information posters or signage.
- ***Localized, pilot-tested messages*** from different points of view are recognized across the literature on international best practices. for smaller-sized campaigns, or campaigns for a shorter duration, it is important to consider how messages add value or complement ongoing campaigns. Humour and positive reinforcement are considered preferred campaign angles as indicated by several international experiences.
- Multiple ***channels*** and ***approaches*** are needed to support the communications and behavioral change objectives. These may include ***TV spots (most popular and effective), radio advertisements***, ***road shows***, and involving school children in various writing and drawing competitions with award ceremonies. In nearly all campaigns reviewed, ***information dissemination (top-down)*** was combined with more engaging methods and approaches (e.g., social networking media, school competitions), and in setting up systems for peer-to-peer communications to occur.

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

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