Leapfrogging to Energy Efficient Refrigerators and Distribution Transformers

ACW/NDE FORUM
5 SEPTEMBER 2023
Multi-Country GCF Readiness Project: Development of a National Framework for Leapfrogging to Energy Efficient Refrigerators and Distribution Transformers

**Countries:** Botswana, Eswatini, Lesotho, Malawi, Namibia, Tanzania (dropped out), Zambia, Zimbabwe

**Project runtime:** January 2021 – October 2022

<table>
<thead>
<tr>
<th>Consortium of CTCN network partners</th>
<th>Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>BASE, SACREEE, ICA</td>
<td>Malawi, Namibia, Zambia, Zimbabwe</td>
</tr>
<tr>
<td>Clasp, Green Issues</td>
<td>Botswana, Tanzania</td>
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<tr>
<td>Botswana, TAREA</td>
<td></td>
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<tr>
<td>Pegasys, Unlimited Energy</td>
<td>Eswatini, Lesotho</td>
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Key Outputs:

• **Market assessment** of domestic refrigerators and distribution transformers

• Formulation of **Policy Working Groups and Technical Committees** for coordination during and beyond the project

• Development and adoption of national testing standards, Mandatory **Minimum energy performance standards** (MEPS), and labelling schemes for refrigerators and distribution transformers

• Development of **Monitoring, Verification & Enforcement plans** for refrigerators and distributions transformers

• Delivery of a national **consumer awareness campaign** for energy efficient refrigerators

• Delivery of **trainings** on energy efficient refrigerators (customs officials on MEPS and labelling) and distribution transformers (procurement officers on TCO)

• Development of appropriate **financing mechanisms** to accelerate the deployment of energy efficient refrigerators and distribution transformers
Background on Domestic Refrigerators and Distribution Transformers
Domestic Refrigerators

- Domestic refrigerators account for over 30% of domestic electricity consumption. With urbanization, economic development and a growing middle class in Africa, the installed stock of residential refrigerators will grow in the coming years.

- Without the development of energy-efficient policies, inefficient products will continue to enter the market and remain strained on the grid for their useful life (approximately 10 years for refrigerators)

- For a systemic shift towards energy efficient appliances, transparent indications on energy efficiency, effective enforcement, as well as awareness of and financial support for end-users are needed
Distribution Transformers

- Distribution transformers (DTs) are typically responsible for 30% of distribution losses, and with governments expanding grids to increase electricity access, adopting higher efficiency DTs is critical.

- Without the development of energy-efficient policies, inefficient products will continue to enter the market and remain strained on the grid for their useful life (approximately 40 years for distribution transformers).

- For a systemic shift towards energy efficient distribution transformers ambitious standards, effective enforcement, training of utilities, as well as financing mechanisms are required.
Key Outputs and Results
Market Assessments

- **Information** on electricity context, national energy policies and programmes, key institutions, refrigerator and DT market growth, types of appliances and equipment, etc.
- Combination of secondary data with **primary data collection** through household questionnaires, retailer surveys, and utility interviews
- Identification of **energy and GHG emissions savings potential**
- **Baseline** for designing MEPS, labelling, communication campaigns and financing mechanisms

*Country example: Zimbabwe*

**Refrigerators**

<table>
<thead>
<tr>
<th>Willingness to pay extra for more energy efficient refrigerator</th>
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<tr>
<td>Not willing</td>
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<tr>
<td>7%</td>
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Market Assessments

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*Country example: Zimbabwe*

*Distribution Transformers*
Minimum Energy Performance Standards

- Development of Minimum Energy Performance Standards (MEPS) and testing standards
- Balancing between raising to international standards and allowing for realistic transition of national market
- **Refrigerator MEPS**: Alignment with international standard IEC 62552-2015 (SADC/EAC regional MEPS harmonization by U4E)
- **Distribution Transformer MEPS**: Alignment with international standards SANS 780:2021 (South Africa) and IEC 60076-20
- Some countries first move to voluntary MEPS (i.e. 2023) before mandatory MEPS (i.e. 2025) for smooth market transition

**Country example: Botswana**

The Botswana PWG and TCs have endorsed the

- Refrigerator: IEC62552:2015 parts 1, 2 and 3 as test standard and MEPS
  
<table>
<thead>
<tr>
<th>Category</th>
<th>2022</th>
<th>2026</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refrigerators, Refrigerator-Freezers, and Freezers</td>
<td>R=1.00</td>
<td>R=1.25</td>
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- **DT**: SANS 780:2021 and IEC TS 60076-20 as test standard and MEPS

<table>
<thead>
<tr>
<th>Category</th>
<th>Year 1</th>
<th>Year 4</th>
<th>Year 7</th>
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<tbody>
<tr>
<td>Distribution transformers</td>
<td>SANS 780:2021 (Tier 1)</td>
<td>SANS 780 standard (Tier 1)</td>
<td>IEC TS 60076-20</td>
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The standards are currently being gazetted by the Botswana Bureau of Standards (BOBS) to be adopted soon.
Energy Labelling

- Labelling is an effective tool to inform consumers about the energy consumption of an electrical appliance, in comparison against other appliances on the market.
- The design of such labels should consider international alignment opportunities or further consider aligning with regional harmonization with the major trade partner.
- Energy labels typically include information on model name / serial number, type of unit, manufacturing country, volume of compartments, rated performance grade, yearly energy consumption, reference ambient temperatures, and refrigerant and foam-blowing designation.
- Scale is based on performance grades linked to MEPS.

Country example: Eswatini Refrigerator Label
Monitoring, Verification and Enforcement

Standards require a **legal and administrative framework for Monitoring, Verification and Enforcement**. This includes:

- National MV&E system
- National registry system for refrigerators and DTs
- Communication program to promote compliance activities
- Market surveillance program for refrigerators
- Verification testing program for refrigerators
- Evaluation program for mandatory MEPS and labelling program for refrigerators and DTs

**Country example: Malawi**

**MV&E for refrigerators:**

- Legal framework to certify compliance and inspect non-compliance with the electrical safety regulations in place
- Expanding the existing regulatory framework to include additional EE regulations and standard enforcement.

**MV&E for DTs:**

- Witness testing at the factory is only conducted for large power transformers or large procurements of distribution transformers.
- Manufacturers may provide either type or special tests on one transformer of each size or provide certificates of previous tests done on identical transformers.
Awareness Campaigns (Refrigerators only)

- Consumer awareness about energy efficiency standards for refrigerators is relatively low.
- Most consumers focus mainly on the unit price (upfront investment) rather than the energy efficiency performance (total cost of ownership) of the appliance.
- Consumer and stakeholder awareness and education are important to the energy-efficient market transformation. All stakeholders need to understand the value of MEPS.
  - 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
  - End-users who should receive clear information and messaging to help make informed decisions

Country example: Botswana

The proposed key campaign messaging towards end-users is directly tied to monetary savings as cost is the main driver when they purchase an appliance:
- ‘Go Green, Save More’
- ‘The greener the label, the more the savings’
- ‘Eco friendly=wallet friendly’

Recommendations include main communication channels, communication partners and a media toolkit for consumer awareness.
Communication Plans (Distribution Transformers only)

- Communication, and educational programs on procurement of energy efficient DTs should be developed and implemented for major target groups for utility and non-utility DT procurement.

- A key aspect is taking a “total cost of ownership” perspective on the procurement of DTs.

**Country example: Zambia**

*Three major target groups were identified with the following needs:*

<table>
<thead>
<tr>
<th>Target Group A: engineers, consultants, and system design engineers.</th>
<th>Target Group B: decision makers, like CEO and owners</th>
<th>Target Group C: salespersons, distributors, and representatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understand energy consumption aspects of DT</td>
<td>Impact of DT selection on organization’s operating cost.</td>
<td>Educate customers about the impact of DT efficiency on operating cost.</td>
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<tr>
<td>Create awareness on TCO</td>
<td>Prioritise decision based on TCO</td>
<td>Convince decision makers to prioritize based on TCO</td>
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Financing Mechanisms

• Achieving energy efficiency improvements will require a significant increase in investments in energy efficiency.

• Energy-efficient refrigerators and distribution transformers could cost more than conventional products, and customers and utilities are inclined towards the less costly options.

• Financial mechanisms are needed that facilitate end-users access to energy-efficient options and provide incentives to overcome financial and technical barriers.

Country example: Lesotho

Recommended refrigerator financing mechanisms:

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

Recommended DT financing mechanisms:

• Regulatory Framework for utilities and the TOC Model for transformer procurement
• Guaranteed savings model via energy services companies (ESCOS)
• Bulk procurement and standardization
National Policy Roadmaps

National Policy Roadmap

- **Activities and actions** per work package
- **Timeline** for operationalization (up to 2025 mostly)
- ** Responsibilities** of different stakeholders
- **Budget** to be allocated through national or international financing
Achievements, Learnings and Next Steps
Key Achievements

**Full market shift within 2-3 years**
Through the effective implementation of MEPS, the projects can achieve a full market shift towards energy efficient refrigerators and DTs within only a few years.

**Considerable mitigation potential**
The cumulative GHG reduction potential (up to 2040 with immediate MEPS adoption) for the projects is close to 11 Mt CO2 (50% refrigerators and 50% DTs).

**Regional harmonization**
The projects united the countries around the same ambitious energy efficiency standards which fosters regional economic integration and growth.

**Effective stakeholder coordination**
The PWGs and TCs were highly effective to bridge interests of different stakeholders, including various Ministries Standards Authority, utilities, manufacturers, distributors and end-users.
Learnings and Best Practices

**Project preparation**
Stakeholders should be made aware of data collection and engagement activities at a project preparation stage to avoid loss of time later on.

**Implementation during COVID-19**
Travel restrictions and in-person meeting limitations made project implementation difficult. The team of local consultants was strengthened, and virtual meetings were organized for continued communication.

**Stakeholder ownership**
Creating awareness and strengthening the ownership early on in the project leads to success (e.g. maintain the PWG / TCs and engage local consultants beyond the project).
Next steps

**Implementation of National Policy Roadmap:** Each country proceeds with the implementation of its National Policy Roadmap for refrigerators and DTs. The PWG and TCs can continue to be used as stakeholder engagement forums for the operationalization. Funding for the implementation needs to be leveraged through national budget or international financing.

**Multi-country project on On-bill Financing for Refrigerators:** The CTCN has proposed a multi-country project on On-bill financing for the uptake of energy efficient domestic refrigerators. On-bill financing has been prioritized as a financing mechanism in all 7 countries.