

Leapfrogging to Energy Efficient Refrigerators and Distribution Transformers

THE 2024 SOUTHERN AFRICA REVENUE PROTECTION ASSOCIATION (SARPA) CONVENTION

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PRESENTATION OUTLINE

- 1. Problem statement
- 2. International obligations on Montreal Protocol and Stockholm Convention
- 3. Regulatory measures integrating the Energy Efficiency of Refrigerators and Transformers
- 4. Conclusions



Problem statement

Over half of the World's <u>electricity is consumed by just four products</u>: **electric motor systems, lighting, room air conditioners** and **residential refrigerators** <u>These products</u> and <u>Transformers</u> that help power to them often waste significant amount of electricity due to poor designs and improper use.

consumers and **business** face higher electricity bills, utilities struggle to meet excessive demand for power, **government** is burdened with additional economic development challenges

planet suffers from worse pollution and greenhouse gas (GHG) emissions

Distribution Transformers (DTs) are responsible for 30% of distribution losses and with Government expanding grids to increase electricity access, adopting higher efficient DTs is critical

Refrigerators

accounts for over 30% of domestic electricity consumption – increasing with urbanization & economic growth 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 (approx. 10 yrs for refrigerators or 40 yrs for transformers)

INTERNATIONAL AND NATIONAL FRAMEWORK

The 1985 Vienna Convention for the Protection of the Ozone Layer

- Act as framework for the Montreal Protocol

The 1987 Montreal Protocol on Substances that deplete the ozone layer

- Protect ozone layer by phasing out production and consumption (import minus export) of ODSs – e.g HCFCs
- Decreased ozone depleting potential (ODP) & low global warming potential (GWP)

The 2019 Kigali Amendment to the Montreal Protocol

Set in place a global phase down of the HFCs (hydrofluorocarbons) used in air-conditioning and refrigeration



Stockholm Convention on persistent organic pollutants (POPs)

Adopted May 2001 and entered into force May 2004.

Phasing out the use of PCB in transformers and capacitors by 2025 and PCB contaminated waste liquids and equipment by 2028.

Joint DFFE & DMRE - NATIONAL COOLING PLAN – RAC Sector; Minimum Energy Performance Standards (MEPS) for Refrigerators and Transformers (DMRE – SANEDI – NRCS)



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REFRIGERATION AND AIR CONDITIONING IS NO LONGER A LUXURY BUT ESSENTIAL FOR:

Food safety,

Distribution of vaccines,

Preservation of food stuffs,

Global trade in perishables,

Deep level mining,

Air travel,

Functioning of data centres,

Safe environments in health care centre and hospitals,

Blow moulding of plastics,

Comfort cooling in workplaces (impact on productivity)

Food processing









Refrigerant use in South Africa – overview and evolution



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Climate-friendly, sustainable alternatives for (nearly) all applications



FOCUS ON NATURAL REFRIGERANTS

Leapfrogging significant emission and energy savings possible combining energy efficient appliances with natural refrigerants



Available refrigerant with GWP below 1000

Substance	GWP
R32	675
R290 (Propane)	0.002 - 3
R6450A	604
R600A	4
R717 (Ammonia)	0
R718	0
R728	0
R744 (Carbon dioxide)	1
R1270	2
1234yf	4
R1234ze	6



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Human health (Safety) impact of incorrect installation and servicing of refrigerant gas .



Burns and sometimes burns resulting in the loss of the limbs and/or deaths,







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<u>R744 transcritical medium /large commercial refrigeration</u> (supermarkets/warehouse) and <u>R290 systems</u> small commercial refrigeration supermarket





















Serviced by the R290 AC Chiller



































R717/744 Cascade system of full CO2 and ammonia installed













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Regulation to Phase-Out Polychlorinated Biphenlys (PCBs) and PCB containing equipments developed.

- Eliminate PCB use in equipments such as transformers, capacitors and other receptacles containing fluid stock by 2025

Environmental & Economic impacts





Health Impacts

PCB Oil and myths







Land Remediation - impact





ESM – Destruction, Disposal & Recycling

> Energy efficient transformers technology

MEPS for Liquid – filled transformers and dry-type transformers

Barriers to adopting energy-efficient transformers

NO	BARRIER	DESCRIPTION	EXAMPLES
1	REGULATORY	Structural characteristics of legal system that make it difficult to promote efficient transformers	Lack of policies and practical experience with energy efficient transformers
2	MARKET	Market structures and constraints that prevent efficient transformer investments	 High number of refurbished transformers offered on the market Limited availability of energy-efficient transformers Utilities lack incentive to invest in efficiency because losses are simply passed along as a cost of business to end-use customers
3	TECHNICAL	Lack of resources and infrastructure for promoting efficient transformers	 Accessibility of poor quality refurbished transformers through unorganised units disrupt consumer choices Access to new materials and technologies Lack of adequate or accredited testing facilities Limited resources to monitor, verify and enforce regulations

Barriers to adopting energy-efficient transformers

NO	BARRIER	DESCRIPTION	EXAMPLES
4	INFORMATION AND AWARENESS	Lack of information provided on efficient transformers and their energy savings benefits	 Poor promotion of efficient transformer products Lack of knowledge among policymakers, transformers & Distributors system designers, suppliers, operators and maintenance facility managers Business as usual approach/risk aversion
5	ENVIRONMENTAL AND HEALTH RISK PERCEPTION	Concerns over health or safety relating to PCBs and other technologies	 Lack of collection and recycling schemes for recovery and treatment at end of life. Addressing safety issues such as PCB recovery and destruction, electrical safety. Lack of knowledge amongs different stakeholders where end-of-life material (transformer scrap) is imported or used for making new transformer
6	FINANCIAL	Magnitute of the first cost relative to less efficient technologies	 Lack of sustainable financing schemes Higher relative cost of energy efficient transformers posses an initial hurdle, despite favourable payback period

CONCLUSION

- Policies to transform markets and leapfrog outdated technologies to superior, cost-effective alternatives to promote energy efficient refrigerators and distribution transformers and large power transformers in national markets is available
- Awareness for procurement of energy-efficient refrigerator and distributors transformer technology
- Strengthening of monitoring, verifications and enforcement plans - to address inefficient products to enter the market and restrain the grid



THANK YOU!

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- Dankie
- Enkosi
- Ha khensa
- Re a leboga
- Ro livhuwa
- Siyabonga
- Siyathokosa
- Sharp sharp



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