



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 electricity is consumed by just four products: **electric motor systems, lighting, room air conditioners** and **residential refrigerators** These products and Transformers 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

**World Ozone Day
16 September**

**World Refrigeration Day
26 June**

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

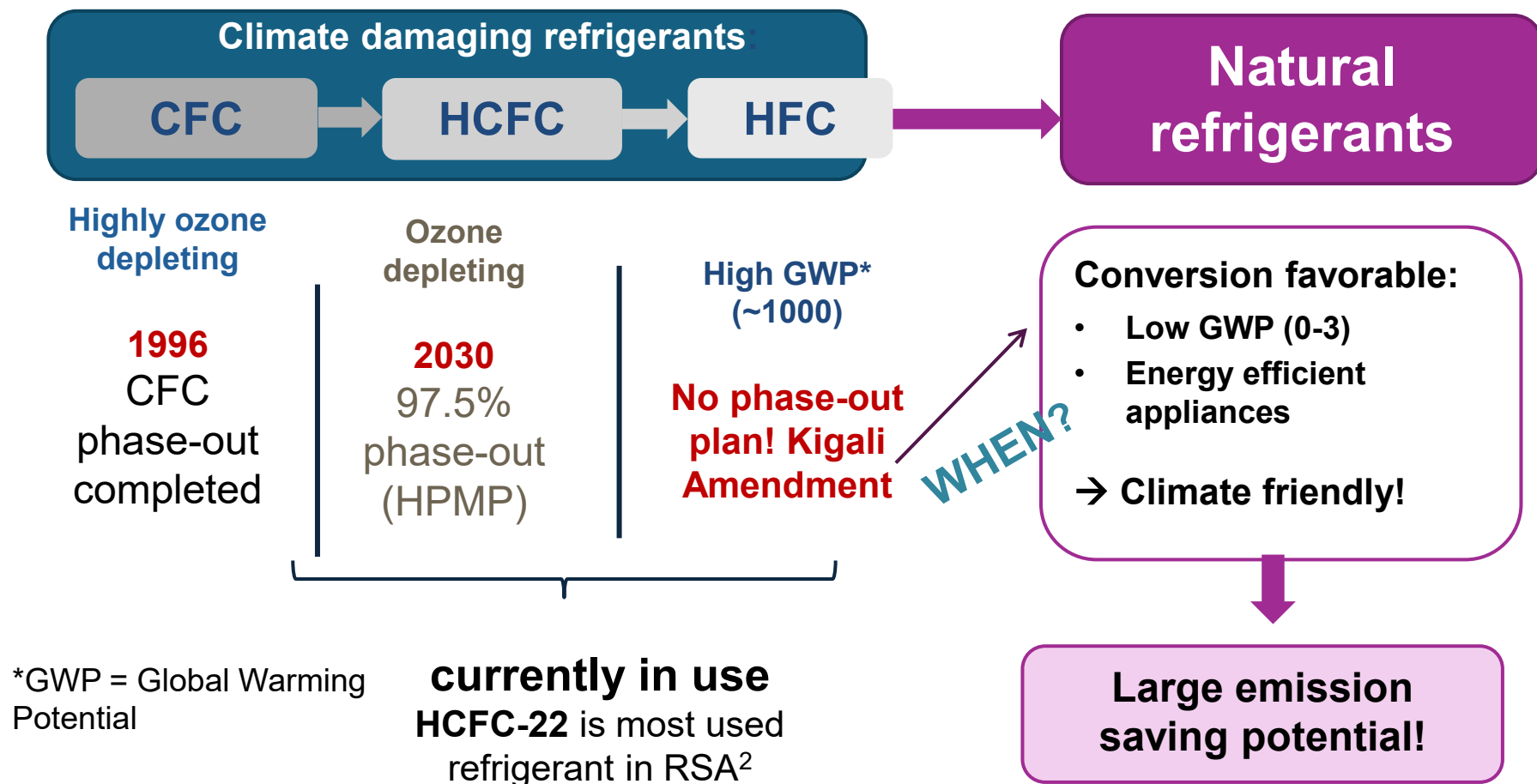


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Refrigerant use in South Africa – overview and evolution

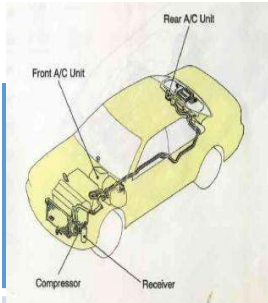


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Climate-friendly, sustainable alternatives for (nearly) all applications



Mobile AC



Domestic Refrigeration.



Commercial. Refrigeration



Industrial Refrigeration



Air condition (AC)



Foams

PREVIOUS REFRIGERANTS

R502
HCFC
Application: Low Temp Rating

R22
HCFC
Application: Air Conditioning, Med Temp Rating

R12
CFC/HCFC
Application: Air Conditioning, High Temp Rating

R13
HCFC
Application: Ultra Low Temp Rating

R503
HCFC
Application: Ultra Low Temp Rating

REFRIGERANT REPLACEMENT (ZERO ODP)



Replacement refrigerants in most cases do not require a change of lubricant type, however manufacturers guidance as well as good engineering practice should be followed at all times.
The information supplied is for guide purposes only.

LONG TERM REPLACEMENT

R404A
HCFC
Application: Low Temp Rating, Med Temp Rating

R507
HCFC
Application: Low Temp Rating, Med Temp Rating

R407C
HCFC
Application: Air Conditioning

R410A
HCFC
Application: Air Conditioning

R134a
HCFC
Application: Med Temp Rating, Air Conditioning, Auto Air Conditioning

R23
HCFC
Application: Ultra Low Temp Rating

R508B
HCFC
Application: Ultra Low Temp Rating

GLOBAL WARMING

The EC Ozone Regulation (No. 1005/2009) was introduced to control and phase out the remaining use of all Ozone Depleting Substances (ODS).

ODS can result in greater UV radiation reaching the earth's surface which is harmful for humans, animals and plants, leading to increases in skin cancer, cataracts and a reduction in food crop yields. From 2015, it will be illegal to use Hydrochlorofluorocarbons (HCFCs). In addition, the ozone-depleting refrigerant and gas R22, in refrigeration, heat pump and air conditioning (AC) systems. No single product can replace R22 in all applications.

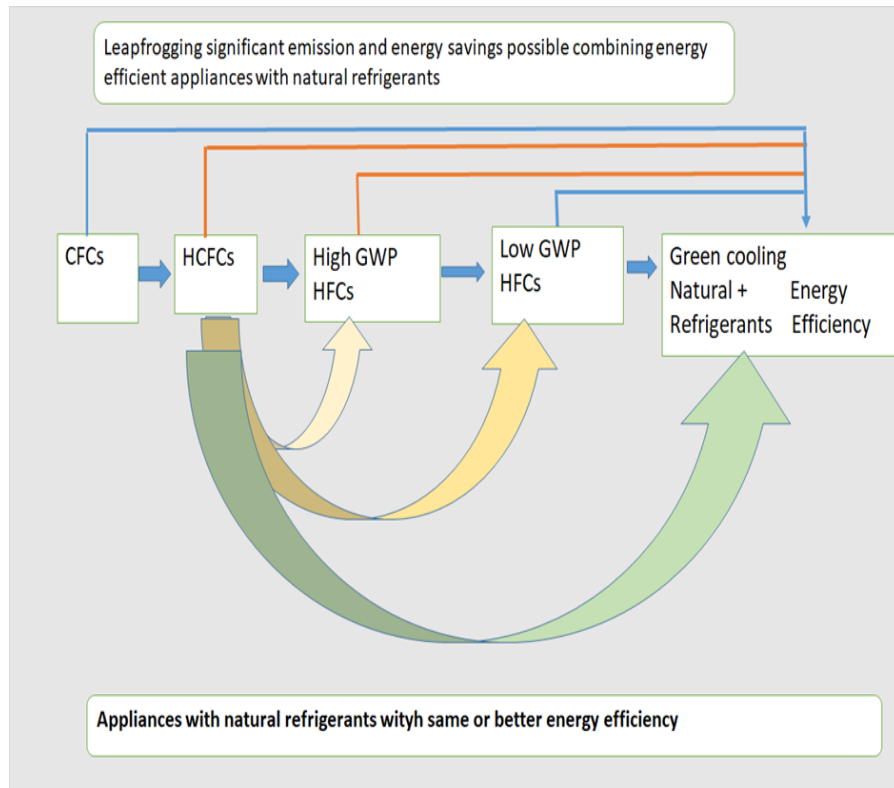


- **National Cooling Plan**
- **Minimum Energy Performance Standards (MEPs)** for testing standards – Refrigerator MEPS



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 .



- Flammability, toxicity and high working pressures equipments.



Fridge catching fire



Fridge exploding



Refrigerant exploding in a car



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



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



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Serviced by the R290 AC Chiller



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R717/744 Cascade system of full CO2 and ammonia installed



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Regulation to Phase-Out Polychlorinated Biphenyls (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 <u>a cost of business to end-use customers</u>
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	Magnitude 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

