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HFC Licencing and Quota Framework

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Acknowledgement Page

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List of Acronyms and Abbreviations

BSJ	Bureau of Standards, Jamaica
CFC	Chlorofluorocarbons
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide equivalent
JARVA	Jamaica Air Conditioning, Refrigeration and Ventilation Association
JCA	Jamaica Customs Agency
GOJ	Government of Jamaica
GWP	Global Warming Potential
HC	Hydrocarbons
HCFC	Hydrochlorofluorocarbon
HFC	Hydrofluorocarbons
HFO	Hydrofluoroolefin
HPMP	HCFC Phase out Management Plan
MAC	Mobile Air Conditioning
MIIC	Ministry of Industry Investment and Commerce
MOHW	Ministry of Health and Wellness
MT	Metric Tonne
NEPA	National Environment and Planning Agency
NOU	National Ozone Unit
ODP	Ozone Depleting Potential
ODS	Ozone Depleting Substance
OEM	Original equipment manufacturers
PPE	Personal Protective Equipment
RAC	Refrigeration and Air Conditioning
RACHP	Refrigeration, air-conditioning and heat pumps
RMP	Refrigerant Management Plan
SRBPRA	Standards and Regulation Branch, Pharmaceutical and Regulatory Affairs Unit.
TPMP	Terminal Phase-out Management Plan

Executive Summary

The Montreal Protocol is an international treaty designed to protect the ozone layer by phasing out the production and consumption of several substances that are believed to be responsible for the depletion of the ozone layer. The treaty was opened for signature in September 1987 and entered into force on January 1, 1989. Jamaica signed the treaty at the Vienna Convention in 1993.

The treaty serves a dual function by protecting the ozone layer and global climate because most of these halogenated hydrocarbons are ozone depleting substances (ODS) and potential greenhouse gases. Hydrofluorocarbons (HFCs) were some of the alternatives used to replace the ODS that are being phased out under the Montreal Protocol, because they have zero (0) impact on the ozone layer. However, HFCs are powerful greenhouse gases that contribute to global warming which influences climate change.

Therefore, the Kigali Amendment added a new Annex F to the Protocol that parties have agreed to phase-down. This lists the HFCs, separated into two groups: Annex F, Group I: all HFCs (except HFC-23, and HFOs) and Annex F, Group II: HFC-23. There are two groups of Article 5 Parties with different baseline years and phase-down schedules. The Amendment requires that Article 5, Group 1 Parties freeze consumption at the set baseline in 2024 and systematically phase down their consumption to 20% of the baseline by 2045.

The Government of Jamaica has a well-established Legal and Institutional Framework to implement the Montreal Protocol commitments. Notwithstanding, the new Kigali Amendment will bring additional challenges to determine: (a) the national requirements to enable the ratification of this Amendment, (b) the establishment of a sound foundation to undertake future work towards its implementation thereby supporting Jamaica's fight against global warming.

This report seeks to outline a draft licensing and quota framework for Jamaica by reviewing the current framework in place to fulfil the obligations under the Montreal Protocol and achieve the HCFC phaseout targets. The review is supported by information and data collected from stakeholders.

Licensing and Quota Framework

A Licensing and Quota Framework is required to support Jamaica intention to ratify the Kigali Amendment. The framework outlined the objectives, principles and strategies that the country will employ and the required input from stakeholders in order to fulfil all its requirements under the Kigali Amendment. In addition, the framework also highlighted gaps that need to be addressed before the start of the phase down in 2024.

The framework was developed taking into consideration the existing policies, legislative and institutional framework that exist to support other convention under the Montreal Protocol.

Gaps Identified

Currently, under the HPMP Jamaica has enacted and promulgated new legislations to support the phaseout of the HCFCs. However, no specific legislation is in place to implement the Kigali Amendment, a new order needs to be prepared or the existing 2014 Order under the Trade Act needs to be amended. Other relevant legislation would include the Standards Act (promulgate/amend standards to deal with the implementation of the Kigali Amendment) and

the Customs Act. Once legislation is in place the existing powers under section 209, 210 and 211 of the Customs Act can be utilized by Jamaica Customs.

Some of the obligations under the Kigali Amendment such as reporting and monitoring of consumption need not be addressed by legislation but can be implemented by administrative arrangements. NEPA could coordinate the collection of this information, and this could then be transmitted to the Ministry of Economic Growth and Job Creation.

Legislations need to be in place to support the following:

- the training and certification of technicians in good practices
- the recovery and storage of refrigerants for disposal
- the annual reporting of HFC imports
- the reporting of greenhouse gas emission
- the development of a quota system for the importation of HFC refrigerants

Institutional Framework

The framework that is currently in place to facilitate the HCFC Phaseout under the HPMP is used as a blueprint for the current framework. The framework describes the role and functions of all stakeholders in the process.
Some areas that would require strengthening include:

- Training of Customs and Enforcement Officers
- Training of Environmental Officers
- Training of RAC Technicians and
- Launching of an awareness building campaign

Baseline Calculation

The total average projected HFC imports between 2020 to 2022 is 532.49 and 748.82 ktonne CO_2e for the low growth model and the business-as-usual model. These amounts were combined with 65% of the HCFC baseline to determine the HFC baseline. The HCFC baseline amounts of 268.24 mt were converted to 448,602.63 tonne CO_2e. The HFC projected baseline amount in ktonne CO_2e are 824.1 and 1040.4 for the low growth and business-as-usual models respectively. This amount will be used to compute the HFC phasedown to plateauing in 2045.

Quota allocation

Only twenty-six (26) of the forty-seven (47) importers received import quota amounts for the low growth and business-as-usual models. The twenty-one importers did not receive quota allocations because in total they account for 0.3% of the annual importation between 2018 and 2020. The importers receiving quota allocation will be notified of the amount allocated and asked to accept or reject in writing. The twenty-one importers who did not receive allocations would also be notified and asked to accept the decision in writing.

HFC Market

Twelve HFC refrigerants and their blends were used in Jamaica over the period of the survey (2016 – 2020). Of these, five are pure refrigerants with GWP ranging from as low as 124 to a high of 3500 and the remaining are blends with much higher GWP, ranging from as low as 1774 to a high of 13396.

The amount and types of HFC refrigerants purchase annually varies from year to year, therefore, to get a true picture, the average annual consumption was used. Four refrigerants' accounts for 96% of the total consumption. These are HFC-134a, R-410A, R-404A and HFC-245fa. The three most dominant refrigerants when expressed in metric tonne are HFC-134a accounting for 49%, R-404A at 21% ad R-410A accounting for 18%.

When expressed in terms of tonnes CO_2 equivalent, the four most dominant refrigerants accounts for 97% of consumption. However, R-404 at 40% accounts for the largest proportion of total GWP-weighted consumption as it has the largest GWPs of the three more dominant HFCs. The fourth refrigerant in terms of consumption is HFC-245fa that is imported as a pre-blended polyols for use to manufacture spray foam. HFC.

Alternative Refrigerants

The list of HFC alternative available in each sector is short, this can be seen as an advantage or a disadvantage depending on how it is viewed. It might be easier to track the consumption of three refrigerants that it is to track ten. But disruption in the supply of one refrigerant can seriously affect a sector. One good thing about the alternative is that the GWP range from 0 in the case of Ammonia to about 7 for HFO-1234ze, used in the RAC sector.

It is recommended that the use of HFC-152a in the aerosol sector continue because of the low GWP (124) of HFC-152a. It is also recommended that consideration be given to the use of HCFC-123 in the RAC sector because of the low GWP of 79.

Background

Jamaica Acceded to the Vienna Convention for the Protection of the Ozone Layer and the Montreal Protocol on Substances that Deplete the Ozone Layer, and its London Amendment on 31 March 1993. The country subsequently acceded to the Copenhagen Amendment on 6 November 1997, and the Montreal and Beijing Amendments on 24 September 2003. Jamaica is classified as an Article 5 country under the Protocol.

The Jamaica Country Programme (CP) for the phasing-out of ozone depleting substances was approved at the twentieth meeting of the Executive Committee of the Multilateral Fund (MLF) in October 1996 and implementation began in February 1997. The CP provided data on consumption and usage of Ozone Depleting Substances (ODS) and identified actions that must be undertaken by the Government and private industry to achieve the phase-out of these substances within the timeframes established under the Protocol. The CP included support for the establishment of a National Ozone Unit (NOU), public education and awareness initiatives and support to execute projects approved under the Refrigerant Management Plan (RMP) and Terminal Phase out Management Plan (TPMP). Between 1995 and 2001, and with the assistance of the Multilateral Fund (MLF), Jamaica implemented a number of projects to reduce its consumption of ODS in the Refrigeration and Air-Conditioning (RAC) servicing sector, the main sector where ODS were consumed in the country.

Jamaica completely phased out the consumption of Annex A Group 1 Chlorofluorocarbons (CFCs) on January 1, 2006 and has commenced the process of phasing-out consumption of Annex C, Group 1 Hydrochlorofluorcarbons (HCFCs) on January 1, 2013, through implementation of the HCFC Phase-out Management Plan (HPMP). The HPMP will enable Jamaica to meet all the Montreal Protocol's HCFC control targets.

Throughout the HPMP project, several sub-projects were implemented to include:

- Training of Refrigeration and Air-Conditioning (RAC) technicians on good refrigeration practices and alternatives to HCFCs
- Training of Customs and Enforcement Officers on the phase out of HCFC refrigerants and the used of refrigerants identifiers and analysers to verify imports at the border
- Purchase and distribution of refrigerants identifiers and analysers to the Jamaica Customs Agency
- The purchase and distribution of equipment to technicians to support good practice
- Publication of a Guide on Good Practice in the Refrigeration and Air Conditioning Servicing.
- Developing Labelling Standards
- Developing Standards on the handling, transporting and storage of HCFC refrigerants

Over three hundred (300) Refrigeration and Air-Conditioning (RAC) technicians were trained under the programme. However, in order to facilitate and support an early phase out of ODS and phase down of refrigerants with high Global Warming Potential (GWP), the cadre of technicians must be constantly trained and retrained to be aware and knowledgeable of the evolving and emerging climate friendly cooling technologies available, chief amongst these

are the natural refrigerants. Additionally, the sector needs to procure only equipment that is energy efficient and utilises non-ODS, low GWP refrigerants to ensure that Jamaica makes this critical transition.

One key aspect related to developing Jamaica's HPMP and enabling compliance with the Protocol is the existence of an appropriate legal and regulatory framework. Also, there is an obligation for the Parties to the Montreal Amendment under Article 4b that requires countries to establish an ODS licensing system, covering also HCFCs. As a result, the Ministry of Industry Investment and Commerce passed "The Trade (Montreal Protocol) (Trade in Ozone Depleting Controlled Substances) Order, 2014, Ministry of Industry Investment and Commerce". This Act allows for the fulfilment of obligations under the MP and meeting the phase-out targets.

The trade Act 2014 included:

- The prohibition on imports and export of controlled substances
- Licensing and Quota framework

In phasing-out the ODSs, the Montreal Protocol serves a dual function by protecting the ozone layer and global climate because most of these halogenated hydrocarbons are ozone depleting substances (ODS) and potential greenhouse gases. Hydrofluorocarbons (HFCs) were some of the alternatives used to replace the ODS that are being phased out under the Montreal Protocol, because they have zero (0) impact on the ozone layer. However, HFCs are powerful greenhouse gases that contribute to global warming which influences climate change. Therefore, the Kigali Amendment which is an amendment to the Montreal Protocol that was adopted by the 28th Meeting of Parties to the Montreal Protocol (MOP28) on 15 October 2016 in Kigali, Rwanda added HFCs to the list of chemicals that parties have agreed to phase-down. This lists the HFCs, separated into two groups: Annex F, Group I: all HFCs (except HFC-23, and HFOs) and Annex F, Group II: HFC-23.

Jamaica has ratified all the earlier amendments of the Montreal Protocol except the Kigali Amendment. To ratify the Kigali Amendment, Jamaica has implemented a project, titled "Implementing Enabling Activities for the Ratification of the Kigali Amendment". Major deliverable under this project include:

- HFC consumption survey and report which break down consumption within the country by sector and substance (HFCs and their blends) based on data collected from key stakeholders.
- Develop a licensing and quota framework based on data collected from key stakeholders

Introduction

The Kigali Amendment is an amendment to the Montreal Protocol that was adopted by the 28th Meeting of Parties to the Montreal Protocol (MOP28) on 15 October 2016 in Kigali, Rwanda. The Amendment entered into force on 1st January 2019. Jamaica has ratified all the earlier amendments of the Montreal Protocol except the Kigali Amendment. To ratify the Kigali Amendment, Jamaica has implemented a project, titled "Implementing Enabling Activities for the Ratification of the Kigali Amendment".

Hydrofluorocarbons (HFCs) was one of the alternatives used to replace the substances that are being phased out under the Montreal Protocol, because they have zero (0) impact on the ozone layer. However, HFCs are powerful greenhouse gases that contribute to global warming which influences climate change. Therefore, the Kigali Amendment added HFCs to the list of chemicals that parties have agreed to phase-down.

As the consumption of HFC and other substances with high global warming potential (GWP) are being phased down to meet the 2045 plateau at 20% of the 2024 baseline consumption of HFC as required by the Kigali Amendments, the full implementation and enforcement of a licensing and quota systems will assist Jamaica in meeting its obligations under the Amendments. A licensing and quota system is mandatory for all Parties to the Kigali Amendments.

The licensing and quota framework must consider the following:

- the replacement of HFC
- The possible introduction of other blends of HFCs as alternatives.
- An analysis of the current and future requirements of the market including the possibility of new importers with new HFC alternatives.
- An outline of the requirements of each importer to access a license, the process of acquiring same and any possible restrictions associated with the license.
- An analysis of each sector and the possible alternatives in each and make recommendations of the future consumption of each of the HFCs and their blends (both current and future) as alternatives.
- A proposal on how to allocate the license and possible quotas to import HFC and their blends complying with the Kigali Amendment as it relates to CO2 equivalent.

To develop the draft licensing and quota framework a comprehensive review of the current licensing and quota framework currently in place to facilitate the phaseout of the consumption of HCFC refrigerants will be conducted. This will be a litmus test of Jamaica's readiness to ratify the Kigali Amendment. It will also identify gaps if any that need to be addressed before the freeze date of January 1, 2024.

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Licensing and Quota Framework

The Licensing and Quota Framework is developed to support Jamaica intention to ratify the Kigali Amendment. The primary objective of the Kigali Amendment is environmental protection by the phase-down of the consumption of extremely high Global Warming Potential (GWP) HFC refrigerants that contribute greatly to climate change. The framework will outline the objectives, principles and strategies that the country will employ and the required input from stakeholders in order to fulfil all its requirements under the Kigali Amendment. Finally, the framework will help to assess Jamaica's readiness for the ratification in a timely manner so that any gaps identified can be addressed before the 2024 which is the start date for the phase-down.

The framework will be developed taking into consideration the existing policies, legislative and institutional framework that exist to support other conventions under the Montreal Protocol. Currently, under the HPMP Jamaica has enacted and promulgated new legislations to support the phaseout of the HCFCs.

Existing Policies

There are not many policies that directly relate to the Kigali Amendment. However, given that one of the main objectives of the Kigali Amendment is environmental protection by the reduction in the consumption/production of greenhouses gases the Climate Change Policy Framework would have some relevance. In particular as the Climate Change Policy Framework has received Cabinet approval this would provide a policy framework for the ratification of the Kigali Amendment.

Vision 2030 Jamaica

While the Vision 2030 Jamaica National Development Plan does not speak explicitly to the Kigali Amendment, Outcome 14.4 - *"Contribute to the efforts to reduce the global rate of climate change"* (Vision 2030 Jamaica) and makes reference to implementing mitigation measures to reduce greenhouse gas emissions.

Climate Change Policy Framework

The Climate Change Policy Framework for Jamaica is intended primarily to support the goals of Vision 2030 by reducing the risks posed by climate change to all of Jamaica's sectors and development goals. It outlines the objectives, principles and strategies that the country will employ in order to effectively respond to the impacts and challenges of climate change, through measures which are appropriate for varying scales and magnitudes of climate change impacts. A number of special initiatives have been identified for early implementation.

Specifically, the goal of the Policy Framework is to create a sustainable institutional mechanism to facilitate the development, coordination and implementation of policies, sectoral plans, programmes, strategies, and legislation to address the impacts of climate change.

The objectives of the Policy Framework are:

- To mainstream climate change considerations into national policies and all types and levels of development planning and to build the country's capacity to develop and implement climate change adaptation and mitigation activities.

- To support the institutions responsible for research, data collection, analysis and projections at the national level on climate change, its impacts, and appropriate adaptation and mitigation measures, to facilitate informed decision-making and strategic actions at all levels.

- To facilitate and coordinate the national response to the impacts of climate change and promote low carbon development.

- To improve communication at all levels on climate change impacts and also adaptation and mitigation related opportunities so that decision makers and the general public will be better informed.

- To mobilize climate financing for adaptation and mitigation initiatives.

National Policy and Strategy for the Environmentally Sound Management of Hazardous Waste

The National Policy and Strategy for the Environmentally Sound Management of Hazardous Waste is based on an integrated life cycle approach to hazardous waste management from generation to reuse/recovery/refurbishment/final disposal. It also provides guidance to public sector decision-makers, the private sector, public interest non-governmental organization and the general public on issues related to the management of hazardous wastes, including the special arrangements for labelling, packaging, storage, transportation and treatment.

The Policy points out that none of the island's solid waste disposal sites are engineered or sufficiently equipped to treat or dispose of hazardous waste in a manner that provides for environmentally sound management. In addition, it is pointed out that there is no centralized facility for the interim storage or treatment of hazardous waste.

Sustainable Development Goals (SDGs)

The Sustainable Development Goals (SDGs) are the blueprint to achieve a better and more sustainable future for all. They are a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity.

The SDGs were adopted by all United Nations Member States in 2015 as a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity by 2030. Goal 13: *Take urgent action to combat climate change and its impacts.*

The greenhouse gas emissions from human activities are driving climate change and continue to rise. They are now at their highest levels in history. Global emissions of carbon dioxide have increased by almost 50% since 1990.

As a consequence Jamaica has taken steps to "Integrate climate change measures into national policies, strategies and planning". (Sustainable Development Goals 2015).

Existing Legislation

As the Kigali Amendment is new there is no specific legislation that is applicable to the Kigali Amendment. What is required is the enactment/promulgation of new legislation or the amendments of existing legislations to facilitate the fulfilment of obligations under the amendment. However, several pieces of legislation are relevant to the ratification and implementation of the Kigali Amendment. These include the Trade Act (a new Order could be promulgated under this Act to implement the Kigali Amendment), Customs Act (relevant to imports and exports), the Standards Act (standards could be promulgated under this Act), the Natural Resources Conservation Act and the Natural Resources (Permits and Licences) Regulations, 1966 as amended and the Natural Resources (Hazardous Waste) (Control of Transboundary Movement) Regulations are relevant to aspects of the Kigali Amendment, (McCalla 2019).

Trade Act

Section 8(b) of the Trade Act empowers the Minister to prohibit the importation or exportation of goods or any class or description of goods from or to any country except under the authority of a licence granted by the Minister. Section 2 of the Trade Act defines "import" as to bring or to be concerned in bringing into Jamaica or the territorial waters thereof, and "importation" shall be continued accordingly.

The following Orders were promulgated in respect of ODS:

- The Trade (Prohibition of Importation) (Equipment Containing Chlorofluorocarbons) Order
- Trade (Restriction on Importation) (CFCs) Order, 1999
- The Trade (Prohibition of Importation) (Halon) Order, 2002

All the above Orders were repealed and replaced by the Trade (Montreal Protocol) (Trade in Ozone Depleting Controlled Substances) Order, 2014 which revised and consolidated the legislative framework in respect of the trade in Ozone Depleting Substances, (McCalla 2019).

This 2014 Order seeks to regulate the importation of ODS, ensuring that imports to Jamaica do not exceed the prescribed quota for each party. An annual quota allocation is given to each entity, where failure to comply constitutes a breach of the Trade Order.

Paragraph 2 of the Order defines "State Party" as meaning a party to the Montreal Protocol. Paragraph 3(1) of the Trade (Montreal Protocol) (Trade in Ozone Depleting Controlled Substances) Order, 2014 Order imposes a prohibition on the import of controlled substances identified in-

a) Annex A Group 1 and Group 2

b) Annex B Group 1

c) Annex C Group 1

d) Annex C Group 2

e) Annex C Group 3

of the Montreal Protocol.

Also, paragraph 3(2) imposes a prohibition on the importation of any equipment specified in the Second Schedule containing or using the chlorofluorocarbons specified in Annex A Group 1 of Annex B Group 1 of the Montreal Protocol.

Paragraph 3(3) provides that sub-paragraph (2) shall not apply to the importation of chlorofluorocarbon-based propellants in metered dose inhalers.

Sub-paragraph 6 specifies that no person shall import a controlled substance in breach of the conditions of a licence granted to that person under the Order.

Paragraph 3 of the Order imposes a prohibition on the import of hydro-chlorofluorocarbons unless-

a) that person is a company specified in Part 1 of the First Schedule of the Order;

b) the company has been issued a licence to import HCFC under this Order;

c) the hydro-chlorofluorocarbons are of a type approved for import (hereinafter referred to as "HCFC") as specified in Part II of the First Schedule and are imported from a State Party.

Paragraph 6 of the Order specifies the procedure for applying to import HCFC and specifies that an application shall be made to the Minister in the form set out in Form 1 in the Third Schedule.

Paragraph 7 of the Order makes provision for an import quota system for the importation of HCFC. This import quota system means the amount of HCFC allocated for the import of a particular period specified in the First Schedule of the Order.

Paragraph 9 imposes a prohibition on the importation of methyl chloroform except under a licence. Sub-paragraph (3) permits a university, college, or other institution conducting research or experiments requiring the use of methyl chloroform for research or experimental purpose may apply to the Minister for a licence to import methyl chloroform from a State Party.

Paragraph 10 imposes a prohibition on the importation of carbon tetrachloride except under a licence.

Subparagraph (3) allows a university, college or other institution conducting research experiments requiring the use of carbon tetrachloride for research or experimental purposes to apply for a licence to import carbon tetrachloride from a State Party.

Under paragraph 11(1) where a person imports HCFC in a breach of its annual quota the Minister may-

a) reduce the annual quota of HCFC in respect of any year in which the company next makes an application to import HCFC after the year in which the breach occurs;

b) require the company, at its expense, to export for disposal the quantity of HCFC imported in breach of its annual quota allocation;

c) revoke the company's licence to import HCFC.

The permit and licence system established under the Trade (Montreal Protocol) (Trade in Ozone Depleting Controlled Substances) Order has been effective to control the import and export of ODS. Many of the provisions of this Order can be adapted to meet the requirements of the HFC phase down requirements of the Kigali Amendment. The 2014 Trade Order also included a list of HCFC Refrigerants and their blends approved for import. However, new HFC alternatives are being developed daily, therefore, not including a list of approved refrigerants in the new or revised Trade Order will allow new alternatives to be introduced to the market if and when they become available.

Customs Act

Under section 210 of the Customs Act there is a penalty for evading customs laws regarding the importation or exportation of goods. Further section 211 imposes a penalty in relation to persons who import, export or cause to be imported or exported or attempt to export goods that are concealed in any way. Section 209 also imposes a penalty for false declaration, (McCalla 2019).

No substantial change will be required to the Customs Act to meet the HFC phase down requirements of the Kigali Amendment.

Standards Act

Under section 7(1) of the Standards Act, the Bureau of Standards, Jamaica (BSJ) shall formulate for the Minister specifications for such commodities, processes and practices. By section 7(2) the Bureau on formulating a specification may, with the consent of the Minister, declare it to be a standard specification for the commodity, process or practice to which it relates. Section 7(4) requires that the Bureau shall as soon as practicable after the declaration of a standard specification cause notice thereof to be published in the *Gazette* and in such other manner as the Minister may direct.

Under section 11(a) the Minister may make regulations for regulating the promulgation of standard, specifications and compulsory standard specification.

In 1999 the Bureau of Standards published the Jamaica Standard Specification for the labelling of products and equipment containing or manufactured using ozone depleting substances or their substitutes. The standard describes the labelling requirements for the equipment and products that utilize ozone depleting substances or their substitutes. The equipment includes, but is not limited to:

a) aerosol sprays

b) foam products

c) cleaning solvents

d) vehicular air conditioning units

e) halon based firefighting equipment

f) domestic, commercial and industrial air-conditioning units

g) domestic, commercial and industrial refrigeration units.

There is a 2015 version – JS 1: Part 29: 2015, Jamaican Standard Specification for the Labelling of Commodities Part 29: Labelling of products and equipment containing or manufactured using ozone depleting substances and/or their substitutes.

The Bureau of Standards has also published a Final Draft Standard Specification for the transportation, handling and storage of refrigerants. The standard is intended to be voluntary. The Standard was prepared to meet Jamaica's requirements to phase out targets set under the Montreal Protocol. The aim is to ensure that refrigerants are transported, handled and stored in a safe manner to reduce harm and risk to human health and the environment.

The Standard describes the requirements for the transportation, handling and storage of refrigerants and their blends. It is to be used for the heating, ventilation, air conditions and refrigeration (HVAC-R) section, (McCalla 2019).

The requirements under the standard are applicable to meet the HFC phase-down requirements of the Kigali Amendment.

The Natural Resources Conservation Authority Act

The Natural Resources Conservation Authority Act provides for the management, conservation and protection of the natural resources of Jamaica: various regulations have been promulgated on the Act to address different aspects of environment or natural resource management. Among the many provisions of the Act are section 32(1)(a) of the Natural Resources Conservation Authority Act where the Authority reports to the Minister the existence of any local condition in any part of the island tending to endanger the environment, and there are no powers under any law other than this section whereby any condition may be removed or guarded against the Minister may by order, direct the enforcement of any measures recommended by the Authority or any measures that he thinks expedient for removing or otherwise guarding against any such condition and the probable consequences for preventing or mitigating as for as possible such destruction or degradation.

The Natural Resources Conservation (Permits and Licences) Regulations, 1996 defines "hazardous waste" as meaning any substance which by reason of its chemical activity, toxicity, explosivity, corrosivity or other characteristics, causes or is likely to cause danger to health or the environment, whether of itself or on contact with other waste.

The 1996 Regulations were amended by the Natural Resources Conservation (Permits and Licences) (Amendment) Regulations 2015 (hereinafter referred to as the 2015 Amendment). Under the 1996 Regulations as amended by the 2015 Amendment permits are required, *inter alia*, for-

a) Construction and operation of facilities for the storage of dangerous materials, toxic chemicals and other similar substances (item 17).

b) Construction and operation of hazardous waste removal, storage, transportation, treatment or disposal facility (mobile or fixed).

In circumstances where HFCs are stored for disposal or transported for disposal it is likely that the permit requirement of the Natural Resources Conservation (Permits and Licences) Regulations), 1996 as amended in 2015 would be applicable.

i. Regulation 6, 7 and 9 of the Natural Resources (Hazardous Waste) (Control of Transboundary Movement) Regulations, 2002 are relevant. These Regulations address the importation, movement, and the export of hazardous waste and equipment which contains hazardous waste.

ii. The Natural Resources (Hazardous Waste) (Control of Transboundary Movement) Regulations provides the regulatory regime for permits related to the transboundary movement of hazardous wastes.

iii. The Regulations also empower the Minister to declare particular waste as hazardous.

Implementation of other International Conventions

Montreal Protocol and the Vienna Convention

The Vienna Convention for the Protection of the Ozone Layer (Vienna Convention) provided the general framework for the tools to protect the ozone layer that surrounds the globe. Generally, "The objectives of the Convention were for Parties to promote cooperation by means of systematic observations, research and information exchange on the effects of human activities on the ozone layer and to adopt legislative or administrative measures against activities likely to have adverse effects on the ozone layer." Scientists first published their hypothesis that man-made chemicals could harm the stratospheric ozone layer in 1974. The ozone layer is important in keeping out harmful ultraviolet radiation from the sun. Losing this protective layer would cause serious problems to humans, plants, and animals alike. The damaging radiation could not only cause mutations in any of the human, plant, or animal cells, but it would also cause increases in skin cancer and other serious health issues. "The scientists found that the chlorofluorocarbon gases (CFCs), which were widely used and viewed as posing no harm, could migrate to the stratosphere, remain intact for decades to centuries, and by releasing chlorine, break down the ozone layer." (McCalla 2019)

The Montreal Protocol on Substances that Deplete the Ozone Layer (Montreal Protocol) went into effect in 1989. The purpose of the Protocol was to provide a system of backing the framework that was established in the Vienna Convention, in order to further the environmental goals and address the concerns that were established. "The ozone agreements are remarkable, in that they are the first to address a long-term problem in which the cause of the damage occurs today, but the effects are not evident for decades hence. Since scientific understanding of the problem would change, the agreements needed to be flexible and capable of being adapted to accommodate new scientific assessments. No single country or group of countries could address the problem of ozone depletion alone, so maximum international cooperation was needed." In doing so, the Montreal Protocol had to address the interests of a number of different groups, which usually has the effect of plaguing further progress in many treaties. The treaty controls the consumption and production of certain

non-natural chemicals, and also sets out a timeframe for reduction targets for these chemicals for each of the ratifying states to abide by. Without the Montreal Protocol, it is estimated that the ozone depletion would have been 10 times worse than current depletion (in 2012) by 2050. The Protocol is estimated to have prevented 19 million more cases of non-melanoma cancer, 1.5 million more cases of melanoma cancer, and 130 million more cases of eye cataracts. Furthermore, 98 percent of the ozone depleting substances controlled by the Montreal Protocol have been phased out, and that because of the implementation of the treaty and its provisions, the ozone layer is estimated to return to pre-1980 levels by 2050 to 2075. Because these chemicals are also greenhouse gases, this treaty has had a mitigating effect on climate change.

Jamaica became a party to Vienna Convention for the Protection of the Ozone Layer and the Montreal Protocol and its London Amendment on March 31, 1993. The country subsequently acceded to the Copenhagen Amendment on November 6, 1997, and the Montreal and Beijing Amendments on September 24, 2003. Jamaica is classified as an Article 5 country under the Protocol.

The Protocol requires State Parties to gradually phase out the production and consumption of Chlorofluorocarbons (CFCs), hydrochlorofluorocarbons, halons, methyl bromide and other ozone depleting substances. Jamaica has implemented its obligations under the Protocol through the promulgation of Regulations and Orders and the implementation of a Country programme. Jamaica began implementation of the Protocol through the design of a "country program". The Country Program sets out the projects that need to be implemented to achieve the phase out under the Protocol.

Jamaica has a good track record of implementing international conventions to protect the Ozone layer and the environment. Notably among these are the Refrigerant Management Plan (RMP) and the Terminal Phaseout Management Plan (TPMP) for the phaseout of the use of Chlorofluorocarbons (CFCs), halons, methyl bromide and other ozone depleting substances. The Hydrochlorofluorocarbons Phaseout Management Plan (HPMP) is in progress and on target to phaseout the consumption of Hydrochlorofluorocarbons (HCFC) by the year 2030.

Between 1995 and 2001, and with the assistance of the Multilateral Fund (MLF), Jamaica implemented a number of projects to reduce its consumption of CFCs in the refrigeration and air-conditioning (R&AC) servicing sector, the main sector where ODS were consumed in the country. The projects were incorporated into Jamaica's RMP and TPMP, which were the country's strategy for achieving CFC phase-out in the RAC servicing sector. The RMP was approved by the Executive Committee of the MLF in March 1999 as a bilateral cooperation project financed through Canada's contribution to the Fund and implemented with the assistance of UNEP-DTIE. The TPMP was approved at the 37th meeting of the Executive Committee in July 2002. All of the activities identified in the Plans are completed and project completion reports submitted to the MLF Secretariat, (Jamaica's HPMP 2010).

Jamaica does not manufacture any ozone depleting substances or refrigeration equipment and therefore, implementation of the convention has been through the restriction of imports into the country and export from the country. The Protocol requires developing countries to phase out consumption of ozone depleting substances and equipment using ODS to prescribed levels required by the Protocol. The Trade (Prohibition of Importation) (Equipment containing CFCs) Order was passed in 1998 to ban the importation of equipment containing CFCs and halons (except propellants in metered dose inhalers). The items listed in the Schedule of the Order include halon-based firefighting equipment, refrigerators, deep freezers, air conditioning units,

soda fountains, aerosols, foams and solvents using CFC 11, 12, 113, 114 and 115. A ban on motor vehicles air conditioners using CFCs was made effective April 1, 1999.

On July 1, 1999, Jamaica instituted a programme to restrict its consumption of CFCs to the average of consumption levels as recorded in 1995/7 as required under the Protocol through the Trade (Restriction on Importation) CFCs) Order. These Regulations introduced a quota system for the establishment of levels for all importers and a schedule for phasing out from July 1999 to December 2005.

The NEPA is the lead agency implementing the Montreal Protocol. However, the core of the current regulatory framework is the Trade Act (which allows restriction and prohibition of goods), the Pesticides Act (methylbromide is a registered pesticide) and the Customs Act. The Customs Acts 215 addresses the import of prohibited or restricted goods without the required licences and permits and can result in forfeiture of the goods or a fine of treble the value of the goods.

Gaps in the current legislation Identified

No specific legislation is in place to implement the Kigali Amendment, a new order needs to be prepared or the existing 2014 Order under the Trade Act needs to be amended. Other relevant legislation would include the Standards Act (promulgate/amend standards to deal with the implementation of the Kigali Amendment) and the Customs Act. Once legislation is in place the existing powers under section 209, 210 and 211 of the Customs Act can be utilized by Jamaica Customs.

Some of the obligations under the Kigali Amendment such as reporting and monitoring of consumption need not be addressed by legislation but can be implemented by administrative arrangements. NEPA could coordinate the collection of this information, and this could then be transmitted to the Ministry of Economic Growth and Job Creation.

Legislations need to be in place to support:

- the training and certification of technicians in good practices
- the recovery and storage of refrigerants for disposal
- the annual reporting of HFC imports
- the reporting of greenhouse gas emission
- the development of a quota system for the importation of HFC refrigerants

Institutional Framework

Government

The Ministry of Economic Growth and Job Creation (MEGJC)

The Ministry of Economic Growth and Job Creation is the focal point for the Montreal Protocol. These matters fall within the purview of the Environment and Risk Management Branch of MEGJC. As the focal point for the Montreal Protocol, it is also responsible for the ratification of the Kigali Amendment.

National Environment and Planning Agency (NEPA)

The National Environment and Planning Agency is an agency under the MEGJC. It is responsible for the implementation of the Montreal Protocol. Within NEPA the following Divisions are of particular relevance:

National Ozone Unit

The National Ozone Unit (NOU) is a department within the National Environment and Planning Agency responsible for implementation of the Montreal Protocol. It was set up in 1997 to facilitate the phase-out of chlorofluorocarbons (CFCs) and other Ozone Depleting Substances (ODSs) in Jamaica. The phaseout is part of Jamaica's obligations under the Montreal Protocol on substances that deplete the ozone layer, an agreement between countries to phase out the use of ODSs within stipulated time frames.

The National Ozone Unit is the central national unit responsible for co-ordinating a country's efforts for ozone protection by facilitating ODS phase-out. The NOU usually works in close co-operation with UNDP, UNEP and other Implementing Agencies of the Multilateral Fund.

The NOU's main responsibilities include:

- Implementation of the Institutional Strengthening Programme
- Implementation of the HCFC Phase-out Management Plan (HPMP), which often includes recovery, recycling and reclamation (3R) programmes and training programmes for refrigeration technicians and Customs Officers. HPMPs were designed as the next step after completion of the Refrigerant Management Plans (RMPs), which dealt mostly with CFC phase-out.
- Preparation of proposals for policies, strategies, laws, regulations, incentives and agreements with the private sector and other measures for national ODS phase-out
- Consultation and co-ordination with stakeholders and organisation of stakeholder meetings as necessary
- Advice and support to industry, the services sector and end users on the different phase-out options for ODS
- Promotion of public awareness programmes
- Data collection and reporting, as required by the Montreal Protocol.

Applications Management Division

The Application Management Division is also located in the NEPA. Under this Division falls the Applications Processing Branch and the Application Secretariat. The Applications Processing Branch would have responsibility for issuance of Permits and Licences.

Environmental Management and Conservation Division

Environmental Management and Conservation Division also within NEPA. The Pollution Prevention Branch falls under the Environmental Management and Conservation Division and its mandate would include the responsibility for hazardous waste.

Ministry of Health and Wellness

The Ministry of Health and Wellness through the Standards and Regulation Branch, Pharmaceutical and Regulatory Affairs Unit is responsible for issuing import permits for the importation of cosmetics and chemicals which would include ODSs based on quotas established annually by the National Ozone Unit (NEPA). HCFCs and HFCs are classified as hazardous chemicals.

Ministry of Industry Investment and Commerce (MIIC)

The Ministry of Industry Investment and Commerce is mandate to lead the development of policies that will create growth and jobs, while achieving social inclusion and consumer protection.

The Ministry has directly responsibility for enacting the Trade Orders. Under these laws the Minister has the powers to limit or ban the import or export of certain goods including HCFC and HFC.

The Ministry also gives direction and oversight to the following agencies:

Trade Board

The Trade Board has the authority to issue licences for all goods imported to or exported from Jamaica.

Bureau of Standards Jamaica

The Bureau of Standards Jamaica (BSJ) has the authority to set standards for all goods imported into the country and goods manufactured locally. The BSJ may check imports for proper labelling. Under national law, the Bureau of Standards may have the authority to specify compulsory labelling standards for virgin, recovered, recycled or reclaimed ODS, ODS-based equipment or retrofitted equipment. It may also define the quality standards for other imported refrigerants and non-ODS alternatives based on existing ISO and other international standards. Close coordination with the Bureau of Standards is therefore essential when monitoring imports to ensure that the relevant national standards are used during screening.

National Compliance and Regulatory Agency (NCRA)

National Compliance and Regulatory Agency (NCRA) is responsible for enforcing standards developed by the Bureau of Standards.

Ministry of Finance and the Public Service

The Ministry of Finance and the Public Service has overall responsibility for developing the Government's fiscal and economic policy framework, collecting and allocating public revenues in the socioeconomic development of Jamaica. the Jamaica Customs Agency.

The Ministry has oversight responsibility for the following agencies:

Jamaica Customs Agency

The Jamaica Customs Agency has overall responsibility for the monitoring of all ports of entry into a country to control legal imports and to prevent illegal imports of all kinds through mislabelling or false documentation. They are also responsible for the enforcement of import restrictions and prohibitions under Ministerial Orders and provides statistical information.

Customs Officers

The following tasks are usually undertaken by Customs officers:

- Verify Paperwork
- Verify quota allowances import permits and license
- Check for improper labelling
- Do sampling and screening for refrigerants
- Conduct analysis of refrigerants

The Statistical Institute of Jamaica

The Statistical Institute of Jamaica's main functions are:

- to collect, compile, analyse, abstract and publish statistical information relating to the commercial, industrial, social, economic and general activities and condition of the people
- to collaborate with public agencies in the collection, compilation and publication of statistical information including statistical information derived from the activities of such agencies
- to take any census in Jamaica
- generally, to promote and develop integrated social and economic statistics pertaining to Jamaica and to co-ordinate programmes for the integration of such statistics, in accordance with the provisions of the Statistics Act.

The Institute can provide the required import and export data to assist with data reporting.

Ministry of Justice

Office of the Attorney General

The Office of the Attorney General is located in the Ministry of Justice. They provided support for the drafting of legislations including Orders to support the country's requirements under international convention such as the Montreal Protocol. They work in conjunction with other agencies to prosecute illegal trade and other breaches under the Trade Orders.

Ministry of Education, Youth and Information

The Ministry of Education (MoEYI) is the government entity responsible for the management and administration of public education in Jamaica.

Training Institutions

Provide the necessary training and certification in good refrigeration and air conditioning practices. They will also conduct training on new and emerging technologies as they are available.

Ministry of National Security

The Ministry of National Security is responsible for maintaining national safety through the enforcement of law and order. It is also charged with preserving the security of Jamaica's borders.

Police and Coast Guard

The police and coast guards play a major role in the enforcement of the Act. Working in conjunction with other agencies, they can gather intelligence information and conduct inspections of suspicious shipments in co-operation with the JCA and environmental inspectors. They also can enter premises and conduct search and seizure operations if necessary.

Other Stakeholders

Jamaica Air-conditioning Refrigeration and Ventilation Association (JARVA)

Jamaica Air-conditioning Refrigeration and Ventilation Association (JARVA) supports the execution of programmes and projects aimed at improving servicing practices in the industry. They act as a lobby group on behalf of their members. JARVA also assists with the training of technicians.

JARVA may be helpful in ensuring that the licensing and quota systems operate effectively. Their members also could play a role in public awareness raising and providing importers, exporters, service technicians and end users with information on changes in the industry and market trends.

Refrigerant Importers

Refrigerant Importers provided support by adhering to the requirements of the quota system. They could provide data on quantity of import, pricing, market shift and immerging trends.

Equipment Importers

Equipment Importers support the phaseout/down effort by complying with the orders and the introduction new technologies. They could provide data on quantity of import, pricing and immerging technologies.

Service Agencies/ Technicians

They could provide data on their activities to include the number of units serviced, quantity of refrigerant consumed and any trends in the industry. They could give an indication of the level of good practice being applied in the industry and the type of training required. They

could also assist in the public education campaign by informing their clients of new technologies and emerging trends.

General Public

The general public is a useful ally in the effective operation of the import/export licensing system. If members of the public are educated about climate issues, they may be less likely to import banned or soon to be phased out refrigerators and air-conditioners into the country unknowingly. As educated consumers, the public can choose to use newer technology using alternatives even though it might be a bit more expensive as opposed to buying old equipment. They are helpful in enforcing the Act by reporting their concerns which may constitute breaches.

Institutional Strengthening

As part of the institutional framework to respond to the Kigali Amendment it will be necessary to implement capacity building measures in support of achieving the phasedown targets. The measures can be implemented as small individual projects alongside the phasedown.

The measures are as follows:

Training of Customs and other Enforcement Officers

Under the HPMP, customs and other enforcement officers received training on the Montreal Protocol, ozone depleting substances, the quota system and the technologies uses to detect and analysed HCFC refrigerant gasses.

To support the Kigali Amendment and prevent confusion new training programmes need to be designed in order to train customs officers on monitoring and control of HFCs including detection of HFC consignments at the border checkpoints. Custom officers need to be aware of the new HFC-related requirements under the Montreal Protocol as well as national legislation, licensing system, quotas and bans related to HFCs and HFC-containing equipment/products.

Careful consideration should be given to the fact that these officers would be required to distinguish between the HCFC phaseout and the HFC phasedown. This training should be ongoing. The most cost-effective way to implement the training in that in the first phase trainers attached to the training department of the JCA are trained by UNDP supported consultants to deliver the training to different levels of staff. The training if needed could be supported by a consultant.

To support the proper discharge of their function as required under the Kigali Amendment the following support tools should be available:

- Equipment for the correct detection and analysis of refrigerant gases and the officers trained on the proper uses of the equipment.
- Personal protective equipment (PPE) due to the toxic nature of some of the chemical that they will encounter
- Updated training manuals for custom officers
- Establishment of separate 8 or 10 digits customs codes for the most commonly used HFCs and their blends in the national customs classification system. Currently, all HFCs are classified under one HS code together with some other chemicals (2903.39)

and HFC-blends have only one code in HS system (3824.78). This would be very effective in helping the custom officers to monitor and control imports and exports of HFCs and their blends.

Training of Environment Officers

The environment officers would be classified as enforcement officers who will be trained together. This will help to develop a collegiate relationship which will help the overall enforcement process and information sharing.

Training and certification of RAC Technicians

In light of the Kigali Amendment, new training and certification programmes need to be designed as part of HFC phase down related projects in order to train refrigeration technicians on using alternative technologies as well as on HFC containment. Appropriate training of refrigeration technicians will ensure the proper management of HFC alternatives and HFC containment and thus facilitate compliance with the Kigali Amendment.

The HFC-related training may consist of a train-the-trainers programme and a subsequent train-the-technicians programme. In terms of technology choice to replace HFCs, the energy efficiency and climate benefits of "natural" refrigerants and low-GWP unsaturated HFCs (HFOs) should be taken into account compared with HCFCs and high-GWP HFCs.

Currently, training and certification of RAC technicians in Good Practices are conducted by the University of Technology, Jamaica (UTech, Ja.), the HEART Trust NSTA and the Caribbean Maritime University (CMU) to satisfy the HCFC phaseout programme. Because of the informal nature of the sector, a number of technicians have received informal on the job training in good practices but are yet to be certified. The HEART Trust NSTA is the agency that is responsible for on-the-job assessment and certification.

A licensing authority should be established to license technicians after they have received training. Continuing Education should be tied to recertification to make sure that technicians are kept current with the new technologies.

It is observed that a few technicians transition to other sectors/jobs shortly after receiving training. This might be as a result of the informal nature of the sector, so the certification/licensing of technicians may be helpful in bringing some stability to the sector. Also, to guarantee value for money, develop a database of trained and certified technician.

To support the proper discharge of their function as required under the Kigali Amendment the following support tools should be available:

- A Code of Good Practice including the new technologies
- Personal protective equipment (PPE) due to the toxic nature of some of the chemical that they will encounter
- Assistance to purchase trade tools and equipment required to allow for good practice in the areas of new and emerging technologies

Awareness Raising Campaign

Consumers who purchase products and equipment containing HFCs with high GWP and those requiring the services of RAC technicians should be educated about the Kigali Amendments and

its requirements. In other developed countries like Australia, the educated public is seen as a strategy to the enforcement of the orders. An educated public would be advised to report any incidents of malpractice for further review and investigation.

Any or a combination of the following strategies could be as part of the awareness raising campaign:

- Stakeholders could receive formal training alongside technicians
- Targeted stakeholders' workshops
- Media release
- TV spots
    - Press release by implementing agencies
    - Interviews of government Ministers and professionals involved in the implementation
    - Brief announcement
    - Advertisement
    - Infomercial
        - Short skits and demonstration
- Radiobroadcasts
    - Press release by implementing agencies
    - Interviews of government Ministers and professionals involved in the implementation
    - Brief announcement
    - Advertisement
    - Expert discussions
- Technical Seminars
- Social media presence

Validation Session

A validation session is organised for Thursday December 8, 2021, at 5.00 pm in the afternoon. Twenty stakeholders will be invited to participate. The stakeholder group will comprise members from:

- Academia
- Refrigerant and RAC equipment importers
- Customs officers and other enforcement officers
- Service Agencies
- Service Technicians
- JARVA
- Members from other professional and trade associations

Recommendations from the Validation Session

- A recycling centre/disposal facility is required for the disposal of used refrigerants
- Serious considerations should be given to providing incentives for technicians to recover, recycle and or store refrigerant
- Assistance should be given to technicians for the purchase of specialty tools including recovery machines and cylinders
- There should be provisions in place to recycle refrigerants
- We should not be in any hurry to sign the Kigali Amendment unless they can guarantee that there will be suitable alternative refrigerants that can be used long term in the systems as replacements
- In Jamaica there is an over-reliance on information and efficiency calculations of units operating in other climates. The information of the service that exists at the Bureau of Standards, Jamaica (BSJ) should be shared with the stakeholders in the industry.
- Testing rig that tests the efficiency of RAC equipment in needed in Jamaica
- Technicians should be mandated to report their individual consumption
- There need to be legislation in place to mandate training and certification. Unless this is done the Licensing system will not gain the necessary traction within the trade

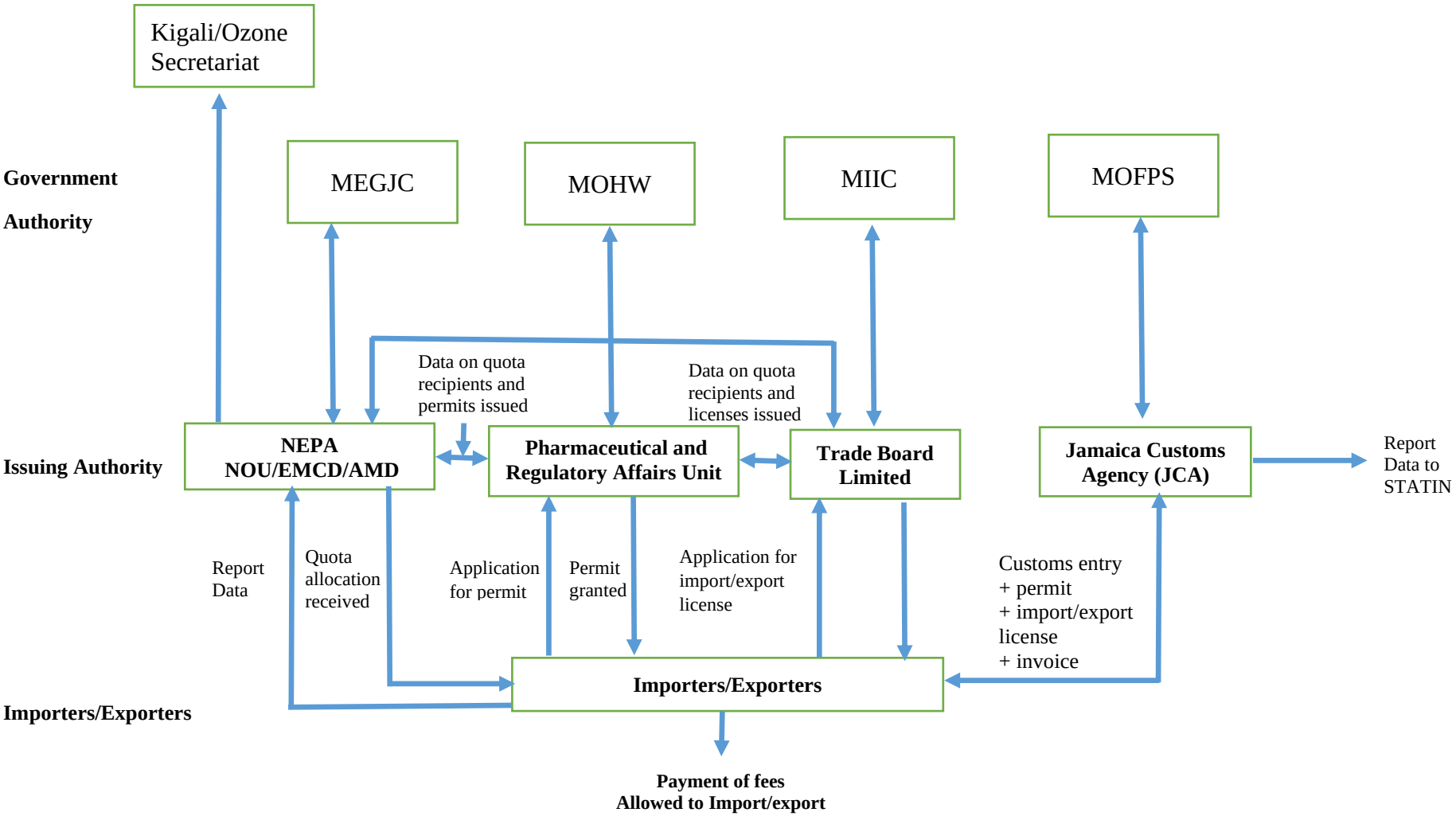

Figure 1 Structure and functioning of the import/export quota and licensing process

HFC Baseline

Under the Kigali Amendment, parties are required to gradually reduce their consumption of HFCs by 80-85% by the late 2040s (Table 1). First reductions by most developed countries are expected in 2019. Article 5, Group 1 and 2 countries will follow suit by a freeze of HFCs consumption in 2024, and in 2028 respectively. The baseline formula for the freeze is outlined in Table 1. Jamaica is located in Group 1. The HFC phase-down is expected to avoid up to 0.5 degree Celsius of global temperature rise by the year 2100.

Table 1: HFC Phase-down schedule

	A5 parties (developing countries)- Group 1	**A5 parties (developing countries)- Group 2**	**Non-A5 parties (developed countries)- Group 1**
Baseline formula	Average HFC consumption for 2020 - 2022 + 65% HCFC baseline	Average HFC consumption for 2024 - 2026 + 65% HCFC baseline	Average HFC consumption for 2011 - 2013 + 15% HCFC baseline
Freeze	2024	2028	-
1st step	2029 – 10%	2032 – 10%	2019 – 10%
2nd step	2035 – 30%	2037 – 20%	2024 – 40%
3rd step	2040 – 50%	2042 – 30%	2029 – 70%
4th step	-	-	2034 – 80%
Plateau	2045 – 80%	2047 – 85%	2036 – 85%

Information source: Kigali Amendment- operational plan, MLF document: UNEP/OzL.Pro.WG.1/39/INF/1

Notes:

1. Group 1: Article 5 parties not part of Group 2

2. Group 2: Bahrain, India, the Islamic Republic of Iran, Iraq, Kuwait, Oman, Pakistan, Qatar, Saudi Arabia and the United Arab Emirates

3. Non-A5 parties- For Belarus, Russian Federation, Kazakhstan, Tajikistan, Uzbekistan, 25% HCFC component of baseline and different two steps (1) 5% reduction in 2020 and (2) 35% reduction in 2025

Quota System

Under the Kigali Amendment, the baseline formula for Article 5, Group 1 countries is the Average HFC consumption for 2020 - 2022 + 65% HCFC baseline.

The Kigali Amendment focuses on greenhouse gases and their GWP, therefore, progress towards the HFC phase-down targets under the Kigali Amendment will be measured in tonnes CO_2 equivalent (tCO_2e). The baseline for the HFC phase-down calculations is based on a combination of both HFC and HCFC consumption. The baseline amount is also treated as a basket of gases, with the GWP values for HCFCs used to calculate their tonnes CO_2e.

The survey was conducted in 2021, therefore, the values for 2021 and 2022 were obtained by forecasting the growth rate over the period and making projections for the values. One projection assumes that the industry will rebound slowly after the pandemic and grow at an average rate of 3.8% per annum up to 2030 (low growth model). The other assumes that the

industry will rebound quickly and continue to grow at pre-covid rate of an average of 8.5% up to 2030, (business-as-usual model).

Methodology

Based on the survey conducted, forty-seven (47) individuals and companies were involved in the trade of HFC refrigerants and their blends over the period of the survey. The following steps were followed to determine the Quota for each importer.

The Baseline for the HFC Phasedown is based on the average consumption between 2020 and 2022. However, the survey was conducted in 2021, therefore, the value for 2021 and 2022 were obtained by analysing the growth rate between 2016 and 2020. Two models were used, a low growth model which considers the effect of the pandemic on the industry and predicts a slow recovery after the pandemic of 3.8% up to 2030 and a business as usual (BAU) model, which uses the growth rate before the pandemic (ignoring the effect of the pandemic), to predict the consumption up to 2030. The BAU model uses an average growth rate of 8.5%.

1. The percentage of annual imports for each importer was calculated using the tonne CO_2e.
2. The annual percentages were averaged, and each importer was assigned an annual import percentage.
3. The imports in metric tonne based for the two models were calculated and the average percentage imports for each refrigerant over the period of the survey used to calculate the tonne CO_2e for the low growth and BAU models. The GWP values used in the CO_2e are calculated in Table 2.
4. 12.0% of the CO_2et for the low growth and BAU models was set aside for abeyance. This will be held in custody of the MEGJC/NOU for emergency uses purposes or distributed to importers as required.
5. The percentage assigned to each importer was used to determine the tonne CO_2e for each importer based on the low growth and BAU models less the 12.0% abeyance.
6. The HCFC baseline amount for refrigerants and their blends (Table 3) were used to calculate the baseline amount in tonne CO_2e.
7. The phasedown schedule was calculated and presented in Table 4.
8. The baseline amount for each importer for both the low growth and the business-as-usual models are presented in Table 5.

The total average projected HFC imports between 2020 to 2022 is 532.49 and 748.82 ktonne CO_2e for the low growth model and the business-as-usual model. These amounts were combined with 65% of the HCFC baseline to determine the HFC projected baseline. The HCFC baseline amounts of 268.24 mt was converted to 448.60 ktonne CO_2e using the GWP values in Table 3. The HFC projected baseline amount in tonne CO_2e are 824.1 and 1,040.4 for the low growth and business-as-usual models respectively. This amount will be used to guide the HFC phasedown to plateauing at 80%b in 2045.

Using the steps outlined above, twenty-six (26) of the forty-seven (47) importers are responsible for 99.7% of the annual imports. The other twenty-one (21) importers imported only 0.3% of the annual imports. Therefore, only twenty-six importers are recommended to received import quota amounts for both scenarios. The importers receiving quota allocation will be notified of the amount allocated and asked to accept or reject in writing. It is assumed

that some importers will request lower amounts, likewise others will request increased amounts. Based on the feedback received and the discussions with importers, the quota amount can be readjusted if possible and final quotas amount determined, and the importers informed.

Twenty-one (21) importers did not receive import quota allocations because they imported less that 0.1% of the annual imports over the period of the study. These Twenty-one (21) importers should also be notified that they will not receive quota allocations giving reasons; and informing them that the refrigerants can be purchased locally. They will also be required to accept or reject the decision in writing, giving reasons. If an importer who has not received a quota is able to present good reasons why they should be included, the award can be made from the abeyance amount at the discretion of the MEGJC/National Ozone Unit.

Once a quota amount for all importers is decided, the importer will be informed about the freeze in importation of HFCs commencing on January 1, 2024, and given their final quota which was based on the method outlined above. The importers will be required to accept or reject the quota in writing to indicate their agreement or disagreement.

Table 2: GWP values for various fluids imported into Jamaica and the impact of the Kigali Amendment

Chemical Compound/ Constituents	Substance	Global Warming Potential
	Hydroflourocarbons (HFCs)	
CF_3CH_2F	HFC-134a	1,430
CHF_2CH_3	HFC-152a	124
CF_3CHF_2	HFC-125	3,500
CF_3CH_3	HFC-143a	4,470
CH_2F_2	HFC-32	676
CHF_3	HFC-23	14,800
$CF_3CH_2CHF_2$	HFC-245fa	1,020
$CH_2=CFCF_3$	HFC-1234yf	4
$CHF=CHCF_3$	HFC-1234ze	7
	Hydrofluorocarbons blends (HFCs mixtures)	
R143a/125/134a	R-404A	3,922
R32/125/134a	R-407A	2,107
R32/125/134a	R-407C	1,774
R32/125	R-410A	2,088
R-125/R-134a/R-600	R-417A	2347
R143a/125	R-507A	3,985
R23/116	R-508A	13,210
R23/116	R-508B	13,396
	Hydrochlorofluorocarbons (HCFCs)	
CHF_2Cl	HCFC-22	1,810
$C_2HF_3Cl_2$	HCFC-123	79
CH_3CFCl_2	HCFC-141b	725
C_2HF_4Cl	HCFC-124	609
CH_3CF_2Cl	HCFC-142b	2310

	Hydrochlorofluorocarbons blends (HCFCs mixtures)	
HCFC-22/R-600a/R-142b	R-406A	1,900
HCFC-22/HFC-143a/HFC-125	R-408A	3,152
HCFC-22 / HCFC-124/HCFC-142b	R-409A	1,909
	Halogen-free Refrigerants	
C_4H_{10}	R-600a	3
C_3H_8	R-290	3
NH_3	R-717	0
CO_2	R-744	1

Source: Ozon Action Kigali Fact Sheet No. 3 GWP, CO2(e) and the Basket of HFCs

Table 3: HCFC Baseline imports in metric tonne and CO_2e

HCFCs Refrigerants	**GWP**	**Baseline imports (mt)**	**Baseline imports (tCO_2e)**
R22	1,780	207.188	368,794.6
R409a	1,909	9.76	18,631.8
R408a	3,152	11.05	34,829.6
R406a	1,900	0.19	361.0
R123	79	4.7	371.3
R141b	725	35.33	25,614.3
Total		**268.218**	**448,602.63**

Table 4: HFC Phase-down schedule based on projections

Baseline formula	**Average HFC consumption for 2020 - 2022 + 65% HCFC baseline**	**Low growth model (tCO_2e)**	**Business as usual model (tCO_2e)**
Freeze	2024	824.4	1,040.4
1st step	2029 – 10%	741.96	936.36
2nd step	2035 – 30%	577.08	728.28
3rd step	2040 – 50%	412.2	520.2
4th step	-	-	-
Plateau	2045 – 80%	164.88	208.08

List of Importers and Quota

Table 5: The list of importers and their proposed import quota amount

Importers	Average annual percentage of total imported	Proposed Quota (tCO2e)	
		Quota Allocation (Low growth model)	Quota Allocation (BAU model)
COMFORTSYSTEMS LTD.	18.56%	134.56	169.89
TROPICAL AIR-CONDITIONING & REFRIGERATION CO. LTD.	17.15%	124.38	157.03
QUALITY DISTRIBUTORS & MANUFACTURING CO. LTD.	14.64%	106.20	134.07
DONALD WITTER LTD.	11.53%	83.65	105.61
APPLIANCE TRADERS LTD.	7.72%	56.01	70.71
CHAD - AD DISTRIBUTORS LTD.	5.32%	38.55	48.67
GEDDES REFRIGERATION LTD.	4.21%	30.55	38.57
ACON SUPPLIES	4.11%	29.82	37.65
Seal Spray	3.91%	28.37	35.81
CARLISA ENTERPRISES LTD.	3.11%	22.55	28.47
V & M DISTRIBUTORS	1.91%	13.82	17.45
CAC 2000 LTD.	1.81%	13.09	16.53
S&F TRADING JAMAICA LTD.	1.50%	10.91	13.77
PUERTO CARIBE PROPERTIES LIMITED	1.30%	9.46	11.94
AREL LTD.	0.90%	6.55	8.26
B. J. HANNA & SONS LTD.	0.40%	2.91	3.67
RAYTON ELECTRIC COMMERCIAL EQUIPMENT LTD.	0.40%	2.91	3.67
RIU JAMAICOTEL LTD.	0.40%	2.91	3.67
OPERADORA PALACE RESORTS (JA) LIMITED	0.30%	2.18	2.75
JUICI BEEF LTD.	0.20%	1.45	1.84
BS AUTO ACCESSORIES & HI TECH. ELECTRONIC	0.10%	0.73	0.92
MACKCHEM CHEMICALS LTD.	0.10%	0.73	0.92
MBJ AIRPORTS LTD.	0.10%	0.73	0.92
NATIONS CHOICE LTD.	0.10%	0.73	0.92
PORT MARLY LTD.	0.10%	0.73	0.92
WISYNCO GROUP LTD.	0.10%	0.73	0.92
ABEYANCE (12%)		98.89	124.85
TOTAL		**824.08**	**1040.40**

Requirements to access a License

In order to access a license, the importer would have been issued a quota allocation. To receive a quota the aspirants would have:

- Operated a business in Jamaica that imports HFC refrigerants
- Imported HFC refrigerant over the 3-year period between 2018 – 2020
- Received and accepted the draft quota issued to the individual or company in writing
- Provided good reasons in writing, including statistical evidence that they imported HFC refrigerants in the past, why they should receive a quota allocation and how not receiving a quota would affect their business or the country negatively.
- Agreed to provide data to the NOU on their annual imports of HFC refrigerants
- Be familiar with the standard on the transportation, handling and storage of refrigerants published by the Bureau of Standards, JS 339: 2017
- Be familiar with the labelling standard publish by the Bureau of Standards, Jamaica, JS 1 Pt 29: 2014.

How to acquire an Import License

Importers needing a license to import HFC refrigerant should be required to have a:

- quota allocation
- permit issued by the Standards and Regulation Branch, Pharmaceutical and Regulatory Affairs Unit, MOHW

The individual must apply to the Minister of Industry, Investment and Commerce for a license to import the desired low GWP refrigerant.

Restrictions on the use of the License

The following are restrictions on the use of the license:

- The license should only be used to import any HFC refrigerants and their blends.
- The quota amount allocated to an importer cannot be transferred to another company unless permission is granted by the Minister in charge.
- Importation should only be from a State Party
- Only virgin refrigerants and their blends should be imported under the quota. Recovered and recycled refrigerants imported will not be counted as part of the quota allocation.
- All imported refrigerants should be properly labelled in English.

Recommendations for the Trade Order to support the Kigali Amendment

The Trade Order should:

- not include a list of approved HFC Refrigerants so that new low GWP refrigerants can be introduced into the market during the phase-down.

- should allow recovered and recycled refrigerants to be imported without contributing to the importer's quota allocation. It will account for zero CO_2e.
- allow importers to import the HFC refrigerants and blends of their choice.

HFC Market in Jamaica

Twelve (12) HFC refrigerants and their blends were used in Jamaica over the period of the survey (2016 – 2020). Of these, five are pure refrigerants with GWP ranging from as low as 124 to a high of 3500 and the remaining are blends with much higher GWP, ranging from as low as 1774 to a high of 13396.

The amount and types of HFC refrigerants purchased annually varies from year to year, therefore, to get a true picture, the average annual consumption was used. Figure 2 shows that in terms of metric tonnes, four refrigerants' accounts for 96% of the total consumption. These are HFC-134a, R-410A, R-404A and HFC-245fa. The three most dominant refrigerants when expressed in metric tonne are HFC-134a accounting for 49%, R-404A at 21% ad R-410A accounting for 18%.

When expressed in terms of tonnes CO_2 equivalent[1] (Figure 3), the four most dominant refrigerants accounts for 97% of consumption. However, R-404 at 40% accounts for the largest proportion of total GWP-weighted consumption as it has the largest GWPs of the three more dominant HFCs. The fourth refrigerant in terms of consumption is HFC-245fa that is imported as a pre-blended polyols for use to manufacture spray foam. HFC-245fa account for 8% of the market in metric tonnes but only 4% in tonnes CO_2 equivalent because of its lower GWP when compared with the other refrigerants.

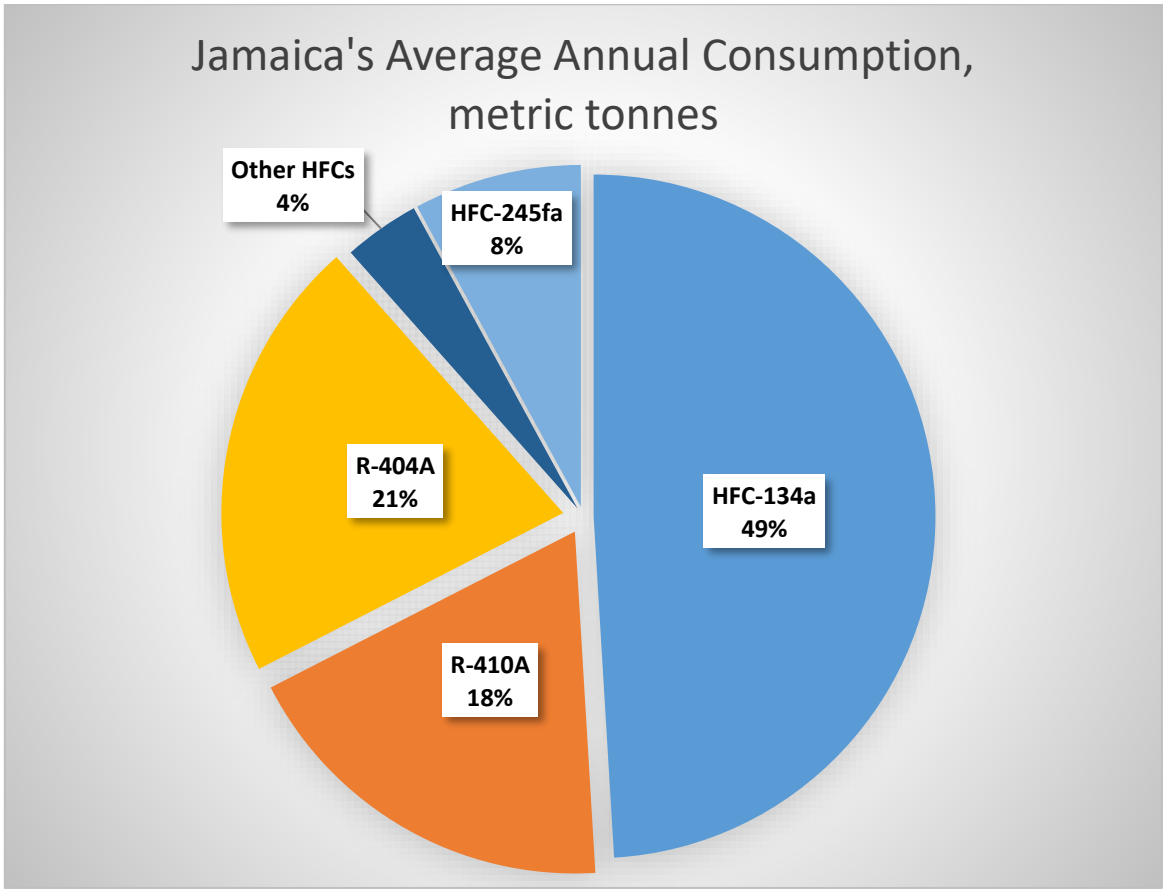

Figure 2: Jamaica's HFC average annual consumption, metric tonne

[1] Tonnes CO_2 equivalent are calculated by multiplying the metric tonnes of each HFC by its GWP

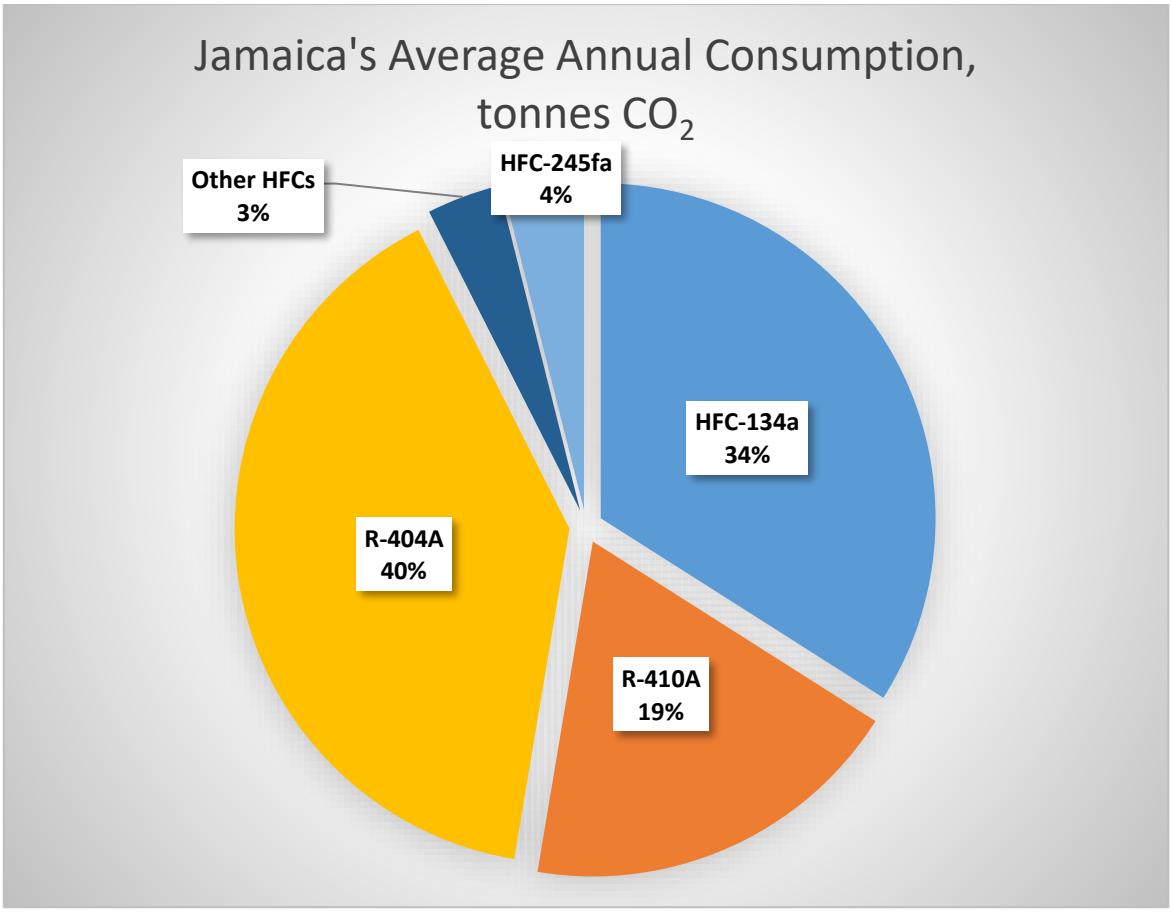

Figure 3: Jamaica's HFC average annual consumption, tonnes CO_2e

Five major sectors are responsible for the consumption of HFC Refrigerants. The Refrigeration and Air Conditioning (RAC) sector can be further divided into two sub-sectors. The sectors and subsectors are as follows:

1. Foam Manufacturers
2. Solvents Manufacturers
3. Aerosol Users
4. Fire Protection
5. Refrigeration and Air Conditioning Sector
    - Refrigerant Importers
    - Refrigeration and Air Conditioning Service Sector
        - Service Agencies
        - Service Technicians

The annual average consumption by sector in metric tonne is presented in Figure 4 and in terms of GWP-weighted tonnes CO_2 equivalent in Figure 5. The consumption by sector is dominated by the RAC sector, with service agencies and service technicians accounting for 92% in metric tonne and 96% in GWP-weighted tonnes CO_2 equivalent. The increase is because the RAC service sub-sector consumes high GWP HFC refrigerants, namely, R-404A. The GWP of R-404A is almost 4 times larger than the GWP of R-245fa.

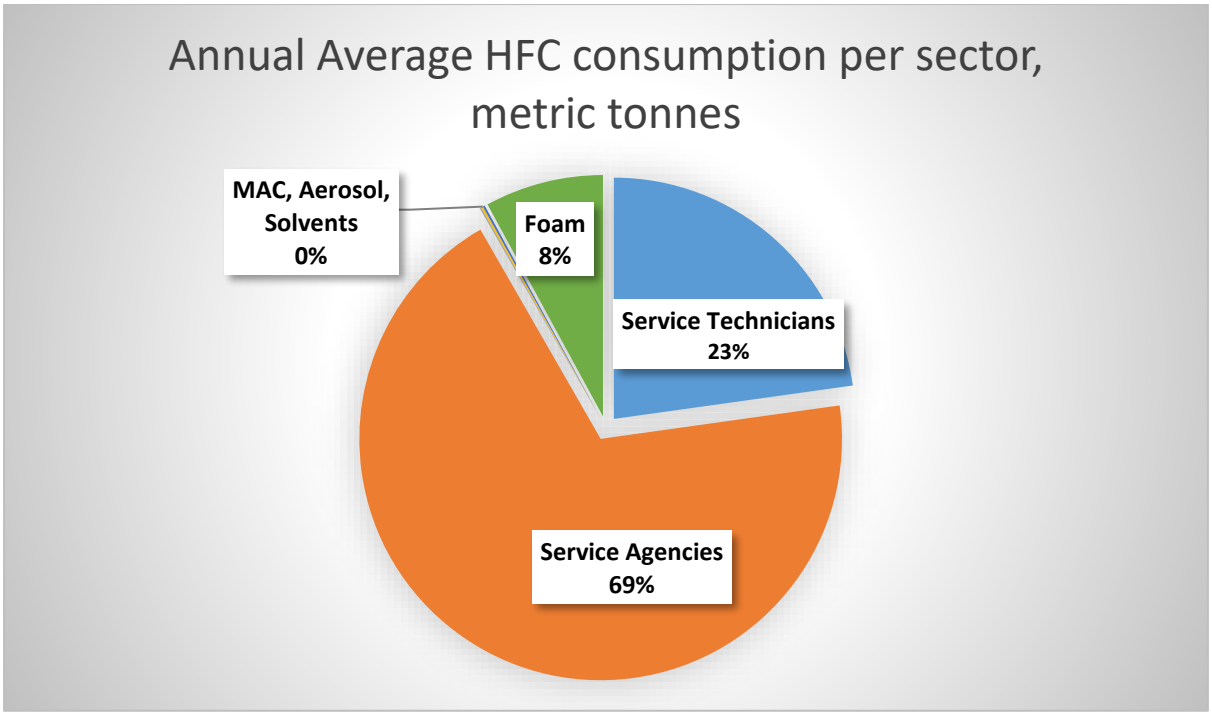

Figure 4: Annual Average HFC consumption per sector, metric tonne

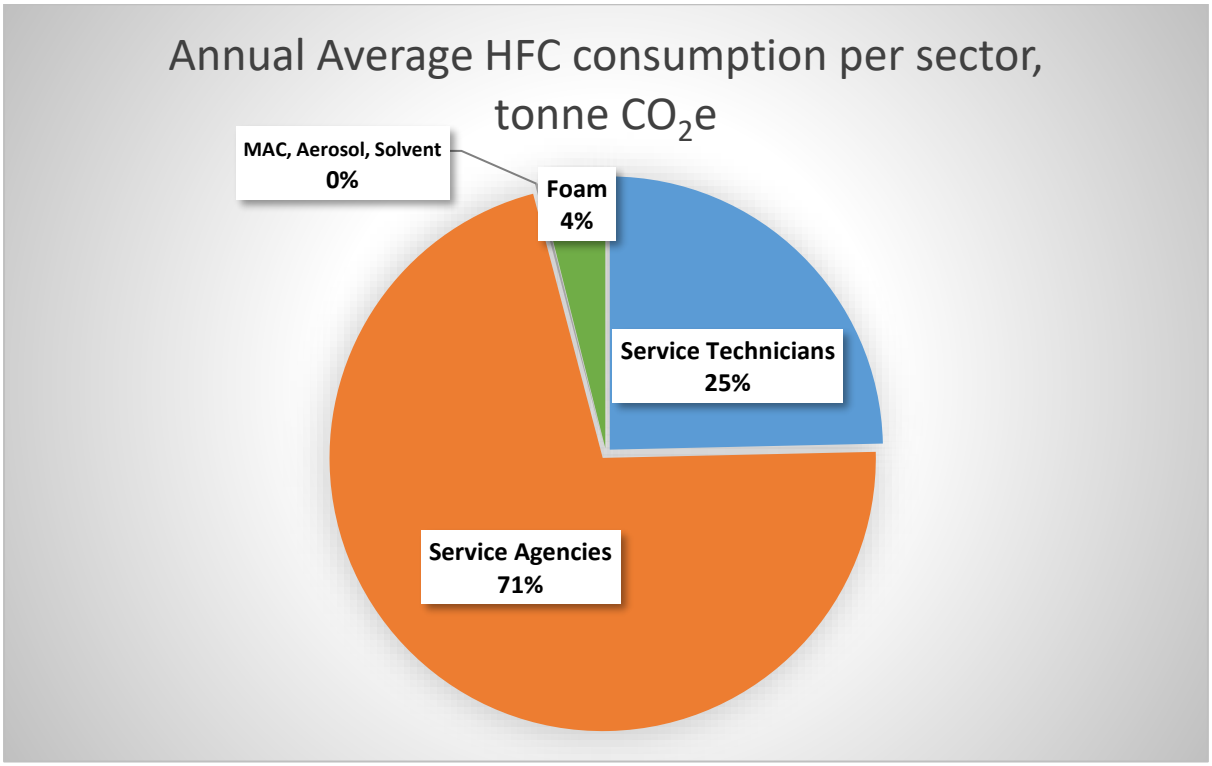

Figure 5: Annual Average HFC consumption per sector, tonne CO_2e

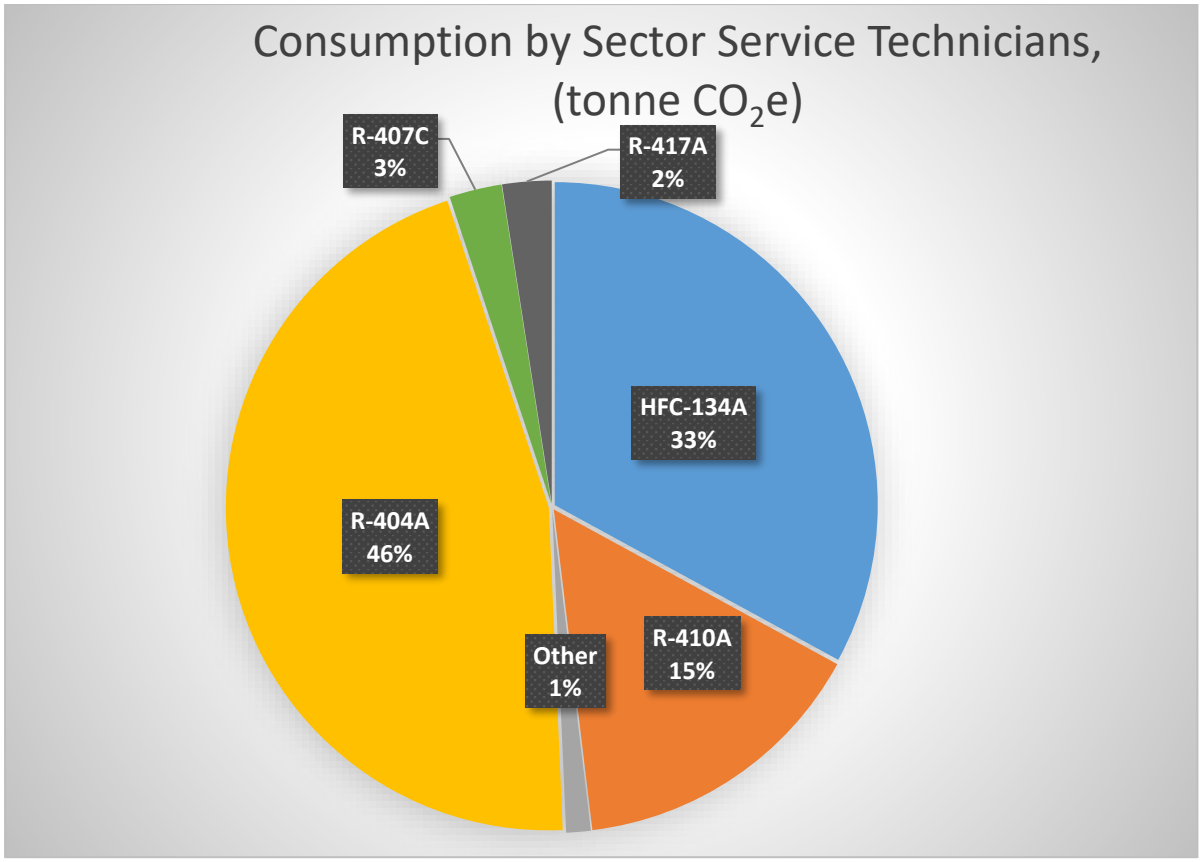

Figure 6 Consumption by sector, Service Technicians (tonne CO2e)

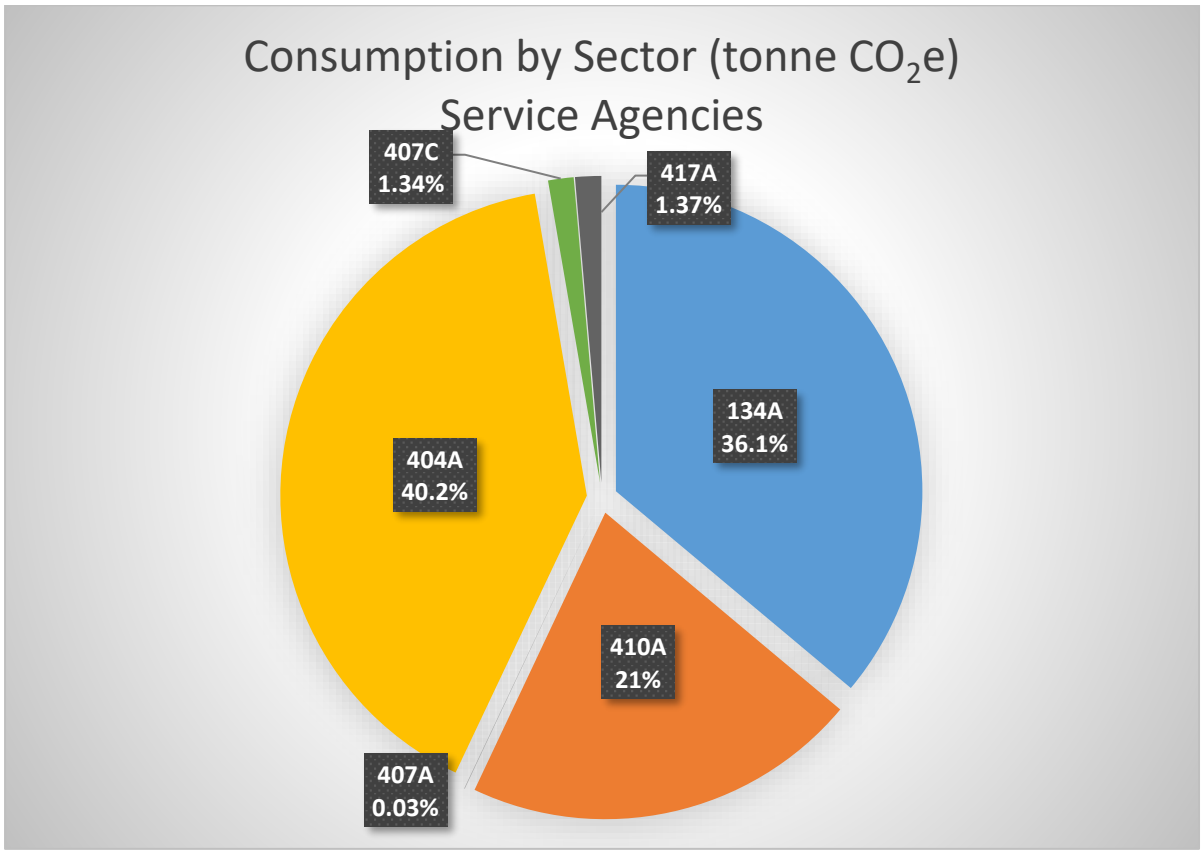

Figure 7 Consumption by sector, Service Agencies (tonne CO2e)

The three most dominant refrigerants used by the RAC servicing sector are R-404A, HFC-134a and R-410A in that order. For the Service technician R-404A accounts for 46%, HFC-134a for 33% and R-410A 15% in tonnes CO_2 equivalent (Figure 6). In total these three refrigerants account for 94% of the refrigerant consumed by this sector. Likewise, for the Service agencies R-404A accounts for 40.2%, HFC-134a for 36.1% and R-410A 21% in tonnes CO_2 equivalent (Figure 7). In total these three refrigerants account for over 97.3% of the refrigerant consumed by this sector.

The dominance of R-404 is as a result of:

- its use in predominantly large systems (centrifugal chillers)
- associated high GWP associated

The foam sector is dominated by HFC-245fa with GWP of 1020, the alternatives are Methyl Formate and R-1233zd with GWP of less than 5 and 1 respectively. Methyl Formate is also used as a feed stock to manufacture solvents and other chemicals. R-1233zd is a new chemical which will not be available on the market before 2023.

The aerosol sector is small, while HFC-152a has been used for some time now as a propellant, the likely alternatives are hydrocarbons R-290 and R-600a with GWP of 3. The use of hydrocarbons in the aerosol sector started as far back as 2004 under the Terminal Phase-out Management Plan (TPMP). The use of HFC-152a will continue because of the low GWP of 124 which well below the set target of 50.

The alternatives in the RAC sector includes natural refrigerants like CO_2, Ammonia, propane, isobutane with GWP ranging from 0 to 3. HFO-1234ze is an unsaturated HFC which are not considered under the Kigali Amendment because of the low GWPs of 7. Even though the Montreal Protocol is phasing out the consumption of ODSs, HCFC-123 is still seen as an alternative in the RAC sector because of the very low ODP of 0.02 and low GWP of 79.

The Mobile Air Conditioning (MAC) sector is dominated by HFC-134a, but most new vehicles imported into the island since 2018, especially those from Europe are using HFO-1234yf which has a GWP of 6.

The list of HFC refrigerants by sector and their alternatives are presented in Table 5. Table 6 give a description of some of the HFC alternatives.

Table 6: List of HFC Refrigerants by sector and their alternatives

Sector	Refrigerant	GWP	Alternatives	GWP
Foam	HFC-245fa	1,020	Methyl Formate R-1233zd	< 5 1
Solvents Manufacturers	HFC-134a	1,430	Methyl Formate	< 5
Aerosol Users	HFC-134a HFC-152a	1,430 124	HFC-152a HC-600a HC-290	124 3 3
Fire Protection	HFC-125	3,500	R-744 (Carbon dioxide)	1

RAC	HFC-134a HFC-32 R-404A R-410A R-407C R-407A R-417A R-507A R-508B	1,430 676 3,922 2,088 1,774 2107 2346 3985 13,396	R-744 (Carbon dioxide) R-717 (Ammonia) HC-600a HC-290 HFO-1234ze HCFC123 R-449A R-452A	1 0 3 3 7 79 1,397 2,140
MAC	HFC-134a	1,430	HFO-1234yf	6

Table 7: Descriptions of HFC Alternatives

Alternatives		Descriptions	GWP	Issues/barriers
Methyl Formate	Foam Solvent Fumigant Insecticide	Methyl Formate is widely used as a blowing agent in polyurethane foam manufacturing.	< 5	Safety issues
HFO-1234yf	MAC	HFO is a hydrofluoroolefin which is an unsaturated HFC with much less GWP than saturated HFCs. This has emerged as the main low-GWP alternative for automotive air-conditioning (MACS). Recent trend has indicated that all new German and some Japanese automobile imported into Jamaica are using HFO-1234yf. However, HFC-134a still occupy the largest shear of the automobile air conditioning market.	6	Currently, only small quantities are imported annually. The cost is still very high and sometime up to 5 times higher than the primary refrigerant it is replacing.
HFO-1234ze	RAC	HFO is a hydrofluoroolefin which is an unsaturated HFC with much less GWP than saturated HFCs. It has emerged as a replacement for HFC-134a in the air conditioning and refrigeration sector.	7	Currently, not imported into Jamaica. The cost is still very high and sometime up to 5 times higher than the primary refrigerant it is replacing.
HC-290	RAC	First developed as a substitute for HCFC-502 and HCFC-22 in commercial refrigeration and air conditioning. Currently, it has seen limited applications to date, but the use of HC-290 is on the increase in small commercial systems, and self-contained supermarket display cabinets. Additionally, trials are underway to replace R-404A with HC-290 in refrigerated transport systems.	3	Safety issues and price
HC-600a	RAC	Used as the primary refrigerant in the manufacture of domestic refrigerators and freezers. 90% of all domestic refrigerators and freezers imported in Jamaica over the last 3 years uses HC-600a as the primary refrigerant.	3	Safety issues and price
R-717 (Ammonia)		Ammonia is very commonly used in large industrial refrigeration installations with low temperature storage of frozen fish,	0	Toxic

		meat, vegetables, poultry and processed foods.		
R-744 (Carbon dioxide)	RAC MAC Fire suppressant	Carbon Dioxide is one of the oldest refrigerants. It is a non-toxic, high pressure and low temperature refrigerant used in trans-critical and subcritical cascade systems. Recently, there has been an increase in popularity. It is used as alternative for HCFC-22, HFC-134a, R-404A, and other HFCs. The applications include vending machines, commercial refrigerators and freezers, industrial refrigeration, and MAC and refrigeration. Carbon Dioxide has found use as a fire suppressant	1	
HFO-1233zd	RAC Centrifugal Chillers	R-1233zd is a hydrofluoroolefins (HFO) that have low GWP. R-1233zd is used in low pressure centrifugal chillers for large air conditioning installations. This product is non-flammable and should be used only in new equipment (does not match properties of R-123).	1	Should be available on the market in 2023
R-449A	RAC	This blend combines HFC and HFO components that produces a lower GWP than traditional HFC products. R-449A is intended for use in low and medium temperature refrigeration systems to replace R-22, R-404A or R-507. It can also be used to retrofit R-22-based blends such as R-402A/B and R-408A.	1,397	
R-452A	RAC	R-452A is a non-ozone-depleting, non-flammable, zeotropic blend designed to serve as a lower global-warming-potential (GWP) alternative to R-404A and R-507 for low- and medium-temperature applications in existing and new systems. A key feature of R-452A is its matched compressor discharge temperature of R-404A and R-507 at both low- and medium-temperature conditions, helping to further minimize application and retrofit costs. Plus, it provides a close capacity match to R-404A and similar energy efficiency. R-452A is an excellent refrigerant option for direct expansion of refrigeration low- and medium-temperature applications, including commercial and industrial refrigeration, condensing units, plug-ins and transport refrigeration like trucks and trailers, powered vans or reefer containers.	2,140	

Reference

McCalla, W., Final Report, Legal Consultant to Support the Ratification of the Kigali Amendment. UNDP 2019.

Vision 2030 Jamaica, National Development Plan. "Planning for a Secure & Prosperous Future". Planning Institute of Jamaica, 2009.

Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol, "Draft Guidelines for the preparation of the HCFC Phase-out Management Plan incorporating HCFC Surveys (Decision 53/37 (H))", Fifty-fourth Meeting, Montreal, 7-11 April 2008

Green Paper – Climate Change Policy Framework and Action Plan: Government of Jamaica (November 2013).

National Policy and Strategy for the Environmentally Sound Management of Hazardous Waste, Ministry of Economic Growth and Job Creation, June 2017.

Sustainable Development Goals 2030, United Nations, 2015.

Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol 63rd Meeting, "HCFC Phase out Management Plan for Annex C Group 1Substance for Jamaica". The National Environment and Planning Agency in cooperation with the United Nations Development Programme, December 2010.

The Kigali Amendment to the Montreal Protocol: HFC Phase-down, UNEP https://wedocs.unep.org/bitstream/handle/20.500.11822/26589/HFC_Phasedown_EN.pdf?sequence=1&isAllowed=y

OzonAction Kigali Fact Sheet 5. HFC Baselines and Phase-down, UNEP Timetablehttps://wedocs.unep.org/bitstream/handle/20.500.11822/26842/7880FS05Blines_EN.pdf?sequence=1&isAllowed=y

Global Warming Potential (GWP) of Refrigerants: Why are Particular Values Used? UNEP. https://wedocs.unep.org/bitstream/handle/20.500.11822/28246/7789GWPRef_EN.pdf?sequence=2&isAllowed=y

Refrigerant Blends: Calculating Global Warming, UNEP. Potentialshttps://wedocs.unep.org/bitstream/handle/20.500.11822/28320/7786RefBlends_EN.pdf?sequence=1&isAllowed=y

OzonAction Kigali Fact Sheet No. 3 GWP, CO2(e) and the Basket of HFCs