

# PROPOSED CONTROL OF HYDROFLUOROCARBONS (HFCs) IN SINGAPORE

## Introduction

The National Environment Agency (NEA), Singapore, is planning to include 18 types of Hydrofluorocarbons (HFCs) in the Environmental Protection and Management Act (EPMA) for licensing controls.

## Background

2 Singapore is a Party to the Montreal Protocol on Substances that Deplete the Ozone Layer. The main aim of the Montreal Protocol is to reduce and eliminate the production and consumption of Ozone Depleting Substances (ODS).<sup>1</sup> At the 28<sup>th</sup> Meeting of the Parties (MOP-28) to the Montreal Protocol held in October 2016, an agreement known as the Kigali Amendment was adopted by all Parties, primarily to phase down the production and consumption of HFCs, which are non-ODS but greenhouse gases (GHG).

3 Commonly used as refrigerants in the Refrigeration and Air-conditioning (RAC) equipment, HFCs are key replacements to Hydrochlorofluorocarbons (HCFCs), a type of ODS that is being phased out under the Montreal Protocol. In view that there is an increasing consumption of HFCs arising from the phase-out of HCFCs mandated under the Montreal Protocol, the control of HFCs has therefore been listed under the ambit of the Protocol.

## Key Elements of the Kigali Amendment

4 Entry into force: The Kigali Amendment will enter into force on 1 Jan 2019, as there are 23 instruments of ratification deposited as of 4 Dec 2017.<sup>2</sup>

5 List of controlled HFC: Under the Kigali Amendment, 18 types of HFCs are listed as controlled substances in Annex F of the Montreal Protocol. Apart from controlling the HFCs in its pure form, any blends and mixtures that contain one or more of the listed HFCs will also be controlled. The list of HFCs to be controlled can be found in **Annex A**.

6 Consumption phase-down schedule: Differentiated production and consumption phase down schedules were established for 4 different groups of Parties.<sup>3</sup> Singapore belongs to Article 5 Group 1 whose phase-down schedule for HFC consumption is illustrated in Fig. 1 below. The phase-down of HFC consumption in accordance with the schedule will

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<sup>1</sup> Consumption in Singapore's context is computed based on "Total Import Quantity minus Total Export Quantity".

<sup>2</sup> Ratification in this context is broadly used to represent instruments of ratification, acceptance or approval of the Amendment deposited by States or regional economic integration organizations that are Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer.

<sup>3</sup> As there is no HFC production in Singapore, the production phase-down schedule will not apply to Singapore.

only apply when Singapore ratifies the Kigali Amendment as a Party and after Kigali Amendment has entered into force.

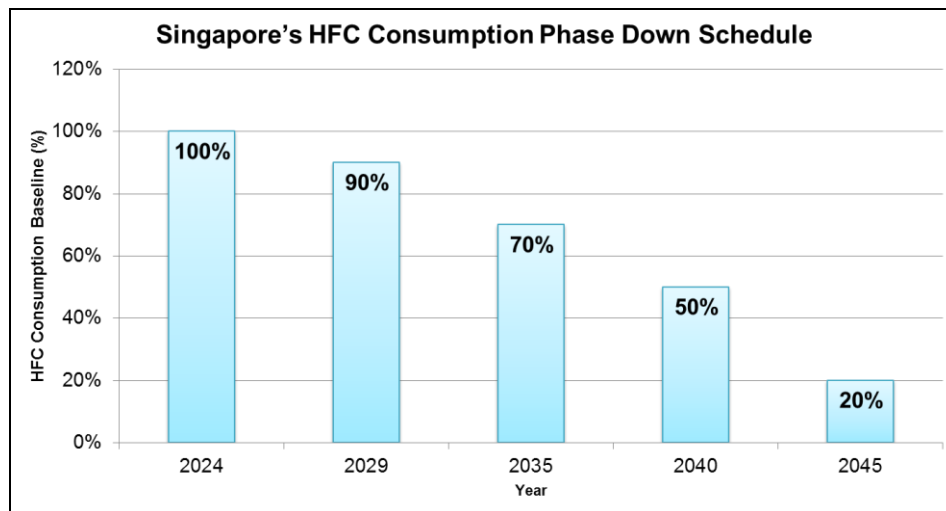


Fig.1 : HFC Consumption Phase Down Schedule for Singapore

7 National consumption baseline level: Referring to Fig. 1, the phase-down schedule will start in 2024 with a freeze at 100% of the national consumption baseline level. Singapore's consumption baseline level for HFCs is calculated in terms of carbon dioxide equivalent (CO<sub>2</sub>-equivalent) based on 2 components, namely (i) Average HFC consumption in Years 2020 to 2022 and (ii) 65% of HCFC baseline that has been established earlier.

8 Other obligations: Parties to the Kigali Amendment are required to establish and implement a domestic licensing system for import and export of new, used, recycled and reclaimed controlled HFCs. There is also a trade control provision (known as a trade ban) where Parties to the Amendment shall not trade the controlled substances with non-Parties, once the trade ban enters into force. The trade ban will enter into force earliest on 1 Jan 2033, provided that there are 70 instruments of ratification to the Amendment. In the event this condition is not fulfilled by 1 Jan 2033, the trade ban will enter into force on the 90<sup>th</sup> day following the date on which it has been fulfilled.

## **Proposed Regulatory Control**

9 To prepare Singapore for the ratification to the Kigali Amendment and to meet the related provisions, NEA proposes to include the 18 types of HFCs as Hazardous Substances in the Second Schedule of EPMA for licensing controls.

10 Companies that are importing and exporting the listed HFCs will be required to obtain a Hazardous Substance licence from NEA (Pollution Control Department) and comply with the stipulated licensing conditions.

11 NEA plans to gazette the control of HFCs under EPMA by 1 June 2018. A 6-month preparation period will be given to companies for new licence applications and inclusion of HFC in their existing licences. The licensing regime for HFC is expected to commence on **1 January 2019**. A circular will be issued to the traders and published on NEA website at a later date once the details are firmed up.

### Information on Hydrofluorocarbons (HFC)

#### (A) Hydrofluorocarbons that will be listed in Second Schedule of EPMA

Trade Name	Chemical Name	Chemical Formula	CAS No.
HFC-134	1,1,2,2-Tetrafluoroethane	CHF <sub>2</sub> CHF <sub>2</sub>	359-35-3
HFC-134a	1,1,1,2-Tetrafluoroethane	CH <sub>2</sub> FCF <sub>3</sub>	811-97-2
HFC-143	1,1,2-Trifluoroethane	CH <sub>2</sub> FCHF <sub>2</sub>	430-66-0
HFC-245fa	1,1,1,3,3-Pentafluoropropane	CHF <sub>2</sub> CH <sub>2</sub> CF <sub>3</sub>	460-73-1
HFC-365mfc	1,1,1,3,3-Pentafluorobutane	CF <sub>3</sub> CH <sub>2</sub> CF <sub>2</sub> CH <sub>3</sub>	406-58-6
HFC-227ea	1,1,1,2,3,3,3-Heptafluoropropane	CF <sub>3</sub> CHF <sub>2</sub> CF <sub>3</sub>	431-89-0
HFC-236cb	1,1,1,2,2,3-Hexafluoropropane	CH <sub>2</sub> FCF <sub>2</sub> CF <sub>3</sub>	667-56-5
HFC-236ea	1,1,1,2,3,3-Hexafluoropropane	CHF <sub>2</sub> CHF <sub>2</sub> CF <sub>3</sub>	431-63-0
HFC-236fa	1,1,1,3,3,3-Hexafluoropropane	CF <sub>3</sub> CH <sub>2</sub> CF <sub>3</sub>	690-39-1
HFC-245ca	1,1,2,2,3-pentafluoropropane	CH <sub>2</sub> FCF <sub>2</sub> CHF <sub>2</sub>	679-86-7
HFC-43-10mee	1,1,1,2,2,3,4,5,5,5-decafluoropentane	CF <sub>3</sub> CHFCH <sub>2</sub> CF <sub>2</sub> CF <sub>3</sub>	138495-42-8
HFC-32	Difluoromethane	CH <sub>2</sub> F <sub>2</sub>	75-10-5
HFC-125	Pentafluoroethane	CHF <sub>2</sub> CF <sub>3</sub>	354-33-6
HFC-143a	1,1,1-Trifluoroethane	CH <sub>3</sub> CF <sub>3</sub>	420-46-2
HFC-41	Fluoromethane (Methyl Fluoride)	CH <sub>3</sub> F	593-53-3
HFC-152	1,2-Difluoroethane	CH <sub>2</sub> FCH <sub>2</sub> F	624-72-6
HFC-152a	1,1-Difluoroethane	CH <sub>3</sub> CHF <sub>2</sub>	75-37-6
HFC-23	Trifluoromethane	CHF <sub>3</sub>	75-46-7

#### (B) Common Blends/ Mixtures that contain one or more of the above listed HFC

(Please note that the list is not exhaustive)

R-401A	R-407F	R-438A	R-452A
R-404A	R-410A	R-444B	R-507A
R-407A	R-417A	R-446A	R-508B
R-407C	R-422A	R-449A	R-513A