The Kigali Amendment to the Montreal Protocol: HFC Phase-down

Photo by IISD/ENB | Kiara Worth

INTRODUCTION

The Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer reached agreement at their 28th Meeting of the Parties on 15 October 2016 in Kigali, Rwanda to phase-down hydrofluorocarbons (HFCs).

HFCs are commonly used alternatives to ozone depleting substances (ODS). While not ozone depleting substances themselves, HFCs are greenhouse gases which can have high or very high global warming potentials (GWPs), ranging from about 12[1] to 14,800.

The phase-down of HFCs under the Montreal Protocol has been under negotiation by the Parties since 2009 and the successful agreement on the Kigali Amendment (Decision XXVIII/1 and accompanying Decision XXVIII/2) continues the historic legacy of the Montreal Protocol.

This fact sheet summarises and highlights the main elements of the Amendment of particular interest to countries operating under Article 5 of the Protocol (Article 5 Parties).

OVERVIEW OF AMENDMENT

The Kigali Amendment adds to the Montreal Protocol the phase-down of the production and consumption of HFCs. The main features of the amendment are the following:

- The Kigali Amendment will enter into force on 1 January 2019, provided that it is ratified by at least 20 Parties to the Montreal Protocol (or 90 days after ratification by the 20th Party, whichever is later).
- There are two groups of Article 5 Parties with different baseline years and phase-down schedules *(see chart and graph on page 2).*
- Some non-Article 5 Parties have different baseline calculations and different initial phase-down steps from the main group of non- Article 5 Parties *(see chart and graph on page 3).*
- A new Annex F has been added to the Protocol. This lists the HFCs, separated into two groups:
  - **Annex F, Group I:** all HFCs (except HFC-23, and HFOs[1])
  - **Annex F, Group II**: HFC-23.
- Global warming potential values have been added to the Protocol text for HFCs, and selected HCFCs and CFCs (*see page 6*).
- Production, consumption, imports, exports and emissions as well as consumption baselines of HFCs shall be expressed in carbon dioxide (CO_2) equivalents.
- Baselines are to be calculated from both HFC and HCFC production/consumption.
- There is an exemption for high ambient temperature countries (*see page 5*).
- Import and export licencing systems for HFCs must be in place by 1 January 2019.[2]
- Trade with Parties that have not ratified the Amendment ("non-Parties") will be banned from 1 January 2033.[3]
- The Executive Committee is requested develop, within two years, guidelines for financing the phase-down of HFCs.

A timeline of the HFC phase-down is provided on page 4.

ARTICLE 5 PARTIES – HFC PHASE-DOWN

Article 5 Parties are divided into two groups:

Group 1: The majority of Article 5 Parties.

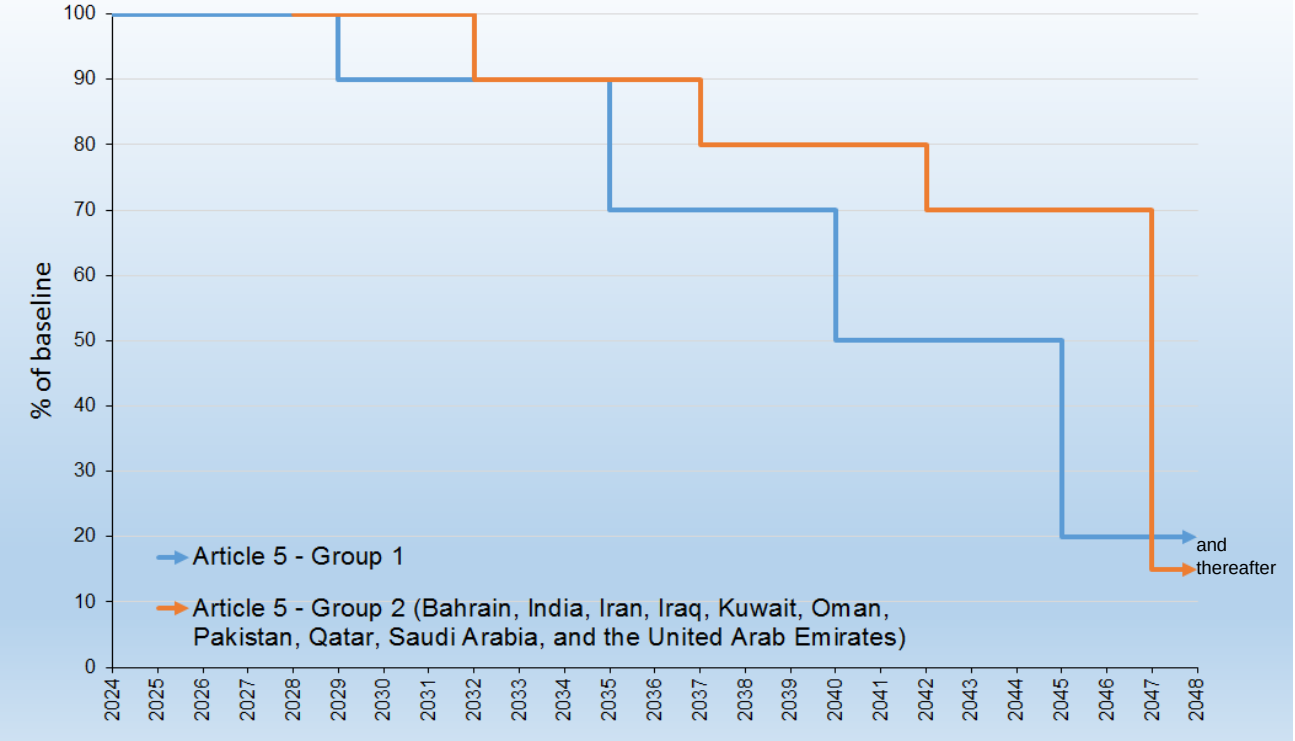
Group 2: Bahrain, India, Iran, Iraq, Kuwait, Oman, Pakistan, Qatar, Saudi Arabia, and the United Arab Emirates.

Group 2 has a later freeze and phase-down steps compared with Group 1. The freeze date is four years later (2028 compared with 2024).

Summary

	Article 5 Parties: Group 1		Article 5 Parties: Group 2	
Baseline Years	2020, 2021 & 2022		2024, 2025 & 2026	
Baseline Calculation	Average production/consumption of **HFCs** in 2020, 2021, and 2022 *plus* 65% of **HCFC** baseline production/consumption		Average production/consumption of **HFCs** in 2024, 2025, and 2026 *plus* 65% of **HCFC** baseline production/consumption	
Reduction steps Freeze	2024		2028	
Step 1	2029	10%	2032	10%
Step 2	2035	30%	2037	20%
Step 3	2040	50%	2042	30%
Step 4	2045	80%	2047	85%

Phase-down schedule



NON-ARTICLE 5 PARTIES – HFC PHASE-DOWN

Non-Article 5 Parties do not have freeze in consumption; their first control measure is a 10%, or a 5% reduction.

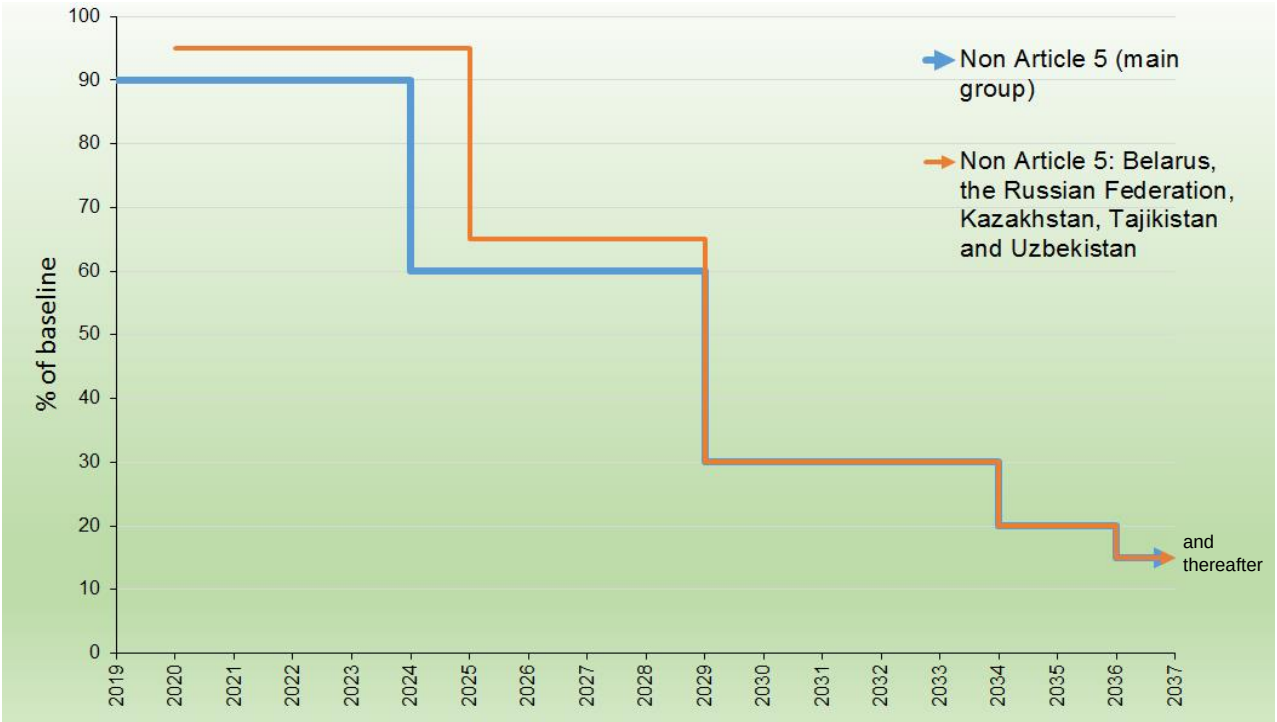
Several non-Article 5 Parties (Belarus, the Russian Federation, Kazakhstan, Tajikistan, and Uzbekistan) have a different formulation for the calculation of baseline (see summary below) and have different initial phase-down steps from the other non-Article 5 Parties (i.e. the first two steps).

The final phase-down dates are the same for all Non-Article 5 Parties (production and consumption).

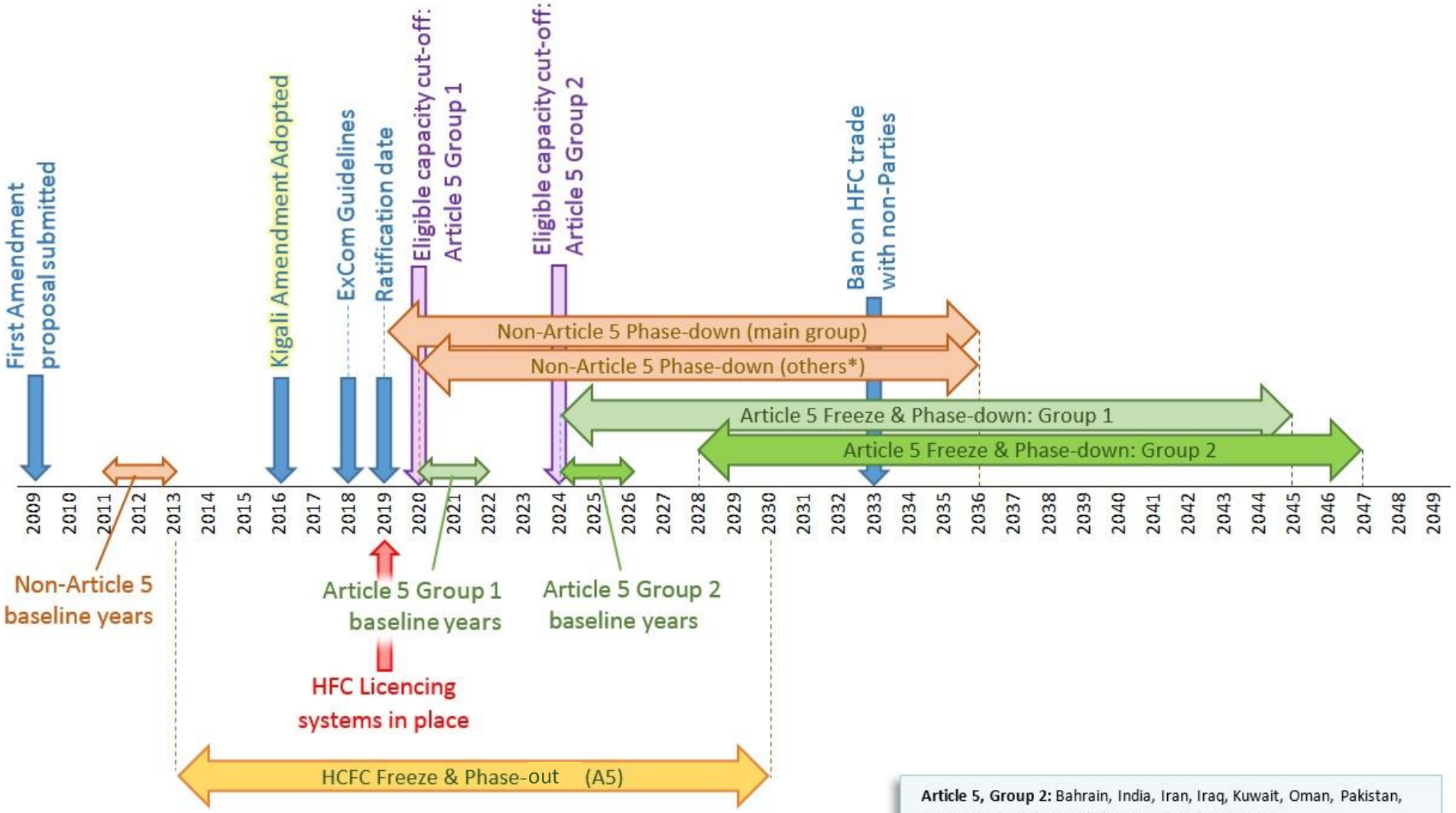
Summary

	Non- Article 5 (Main Group)		Non- Article 5: Belarus, the Russian Federation, Kazakhstan, Tajikistan & Uzbekistan	
Baseline Years	2011, 2012 & 2013		2011, 2012 & 2013	
Baseline Calculation	Average production/consumption of HFCs in 2011, 2012 & 2013 *plus* **15%** of HCFC baseline production/consumption		Average production/consumption of HFCs in 2011, 2012 & 2013 *plus* **25%** of HCFC baseline production/consumption	
Reduction steps				
Step 1	**2019**	**10%**	**2020**	**5%**
Step 2	**2024**	**40%**	**2025**	**35%**
Step 3	2029	70%	2029	70%
Step 4	2034	80%	2034	80%
Step 5	2036	85%	2036	85%

Phase-down schedule



HFC PHASE-DOWN TIMELINE



Article 5, Group 2: Bahrain, India, Iran, Iraq, Kuwait, Oman, Pakistan, Qatar, Saudi Arabia, and the United Arab Emirates

* Belarus, the Russian Federation, Kazakhstan, Tajikistan, and Uzbekistan

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HFC BASELINES

Baselines will be calculated from past HCFC consumption/production baselines plus the HFC consumption/production in 2020-2022 or 2024-2026 for Article 5 Parties, and 2011-2013 for non-Article 5 Parties. The basis for including both HFCs and a percentage of HCFCs is because, while HCFCs are being phased-out through already-approved HCFC Phase-out Management Plans (HPMPs), HFCs may be used as alternatives for some portion of HCFCs. The HCFC component is intended to account for this portion in the baseline.

When calculating levels of production, consumption, imports, exports and emissions of HFCs and HCFCs these will be expressed in CO_2 equivalents and each Party shall use the GWP values in Annexes C and F of the Protocol to calculate these.

HIGH AMBIENT TEMPERATURE EXEMPTION

There is an exemption for Parties with high ambient temperature conditions where suitable alternatives do not exist for the specific sub-sector of use. This exemption allows for a delay in the HFC freeze date and initial control obligations by an initial duration of four years.

The exemption applies to the following Parties: Algeria, Bahrain, Benin, Burkina Faso, Central African Republic, Chad, Cote d'Ivoire, Djibouti, Egypt, Eritrea, Gambia, Ghana, Guinea, Guinea-Bissau, Iran, Iraq, Jordan, Kuwait, Libya, Mali, Mauritania, Niger, Nigeria, Oman, Pakistan, Qatar, Saudi Arabia, Senegal, Sudan, Syria, Togo, Tunisia, Turkmenistan and United Arab Emirates.

It applies to the following equipment:

- Multi-split air conditioners (commercial and residential);
- Split ducted air conditioners (residential and commercial);
- Ducted commercial packaged (self-contained) air conditioners.

ELIGIBLE CAPACITY CUT-OFF DATE

The cut-off date for eligible capacity is 1 January 2020 for those Parties with baseline years from 2020 to 2022 (Group 1) and 1 January 2024 for those Parties with baseline years from 2024 to 2026 (Group 2).

GWP VALUES

Following the 2016 Kigali Amendment, the Montreal Protocol has adopted standard 'reporting values' for GWPs of listed[4] HFCs and selected HCFCs and CFCs which have been incorporated into the text of the Protocol in Annexes A, C and F.

When calculating a country's annual levels of production, consumption, imports, exports and emissions of HFCs and HCFCs (and CFCs) these will be expressed in CO_2 equivalents (GWP-weighted tonnes) and each Party will need to use the GWP values in Annexes A, C and F to calculate these.

For substances (e.g. HCFCs) where no GWP is indicated in the respective Annex, the default value of zero (0) applies until a GWP value is included.

HFCs

Substance	GWP value (100 year)
HFC-134	1100
HFC-134a	1430
HFC-143	353
HFC-245fa	1030
HFC-365mfc	794
HFC-227ea	3220
HFC-236cb	1340
HFC-236ea	1370
HFC-236fa	9810
HFC-245ca	693
HFC-43-10mee	1640
HFC-32	675
HFC-125	3500
HFC-143a	4470
HFC-41	92
HFC-152	53
HFC-152a	124
HFC -23	14 800

HCFCs

Substance	GWP value (100 year)
HCFC-21	151
HCFC-22	1810
HCFC-123	77
HCFC-124	609
HCFC-141b	725
HCFC-142b	2310
HCFC-225ca	122
HCFC-225cb	595

CFCs

Substance	GWP value (100 year)
CFC-11	4750
CFC-12	10 900
CFC-113	6130
CFC-114	10 000
CFC-115	7370

The GWP values above are for single component refrigerants. In the case of refrigerants which are mixtures (or blends) of more than one refrigerant, the GWP is calculated as a mass-weighted average of the individual components. That is, to calculate the GWP of a blend, one simply adds the GWPs of the individual components in proportion to their mass.

Want to know more?

For more information on the calculation of blend GWPs, please see OzonAction factsheet: *Refrigerant Blends*: *Calculating Global Warming Potentials (post-Kigali update).*

For an overview of GWPs in the context of the Montreal protocol see OzonAction factsheet: *Global Warming Potential (GWP) of Refrigerants: Why are Particular Values Used? (post-Kigali update).*

See overleaf for links

NOTES AND REFERENCES

1. Hydrofluoroolefins (HFOs) are a new class of unsaturated HFC refrigerants which have lower GWPs and shorter atmospheric lifetimes when compared to other HFCs. HFOs are not included as substances to be phased down in the Kigali Amendment.

2. …or three months after the Amendment is ratified by 20 countries.

3. …or when Article 4 of the Protocol (control of trade with non-Parties) has been ratified by 70 countries (whichever is later). Parties shall ban the export of HFCs to countries, and ban the import of HFCs from countries which are not Party to the Amendment ("non-Parties")

4. Not all HFCs are covered by the Kigali Amendment. For example HFC-161 (GWP=12) is not listed in Annex F and is therefore not controlled. See also footnote 1 above on HFOs.

OzonAction Factsheet: Refrigerant Blends: Calculating Global Warming Potentials (post-Kigali update)
http://www.unep.fr/ozonaction/information/mmcfiles/7786-e-Calculating_GWPofBlends_post_Kigali.pdf

OzonAction Factsheet: Global Warming Potential (GWP) of Refrigerants: Why are Particular Values Used? (post-Kigali update).
http://www.unep.fr/ozonaction/information/mmcfiles/7789-e-GWP_of_Refrigerants_post_Kigali.pdf

For more information please see:

Final text of the Kigali Amendment to the Montreal Protocol (available in all the six official UN languages)
http://ozone.unep.org/en/handbook-montreal-protocol-substances-deplete-ozone-layer/41453

Frequently asked questions relating to the Kigali Amendment to the Montreal Protocol *(Ozone Secretariat document)*
http://ozone.unep.org/sites/ozone/files/pdfs/FAQs_Kigali_Amendment.pdf

Decision XXVIII/1: Further amendment to the Montreal Protocol
http://conf.montreal-protocol.org/meeting/mop/mop-28/final-report/English/Kigali_Amendment-English.pdf

Decision XXVIII/2: Decision related to the amendment phasing down hydrofluorocarbons
http://ozone.unep.org/en/handbook-montreal-protocol-substances-deplete-ozone-layer/41493

MOP 28 Meeting report and documents:
http://conf.montreal-protocol.org/meeting/mop/mop-28/final-report/English/MOP-28-12E.docx

Cover page & page 6 photos by IISD/Kiara Worth **(**www.iisd.ca/ozone/resumed-oewg38-mop28/8oct.html**)**

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