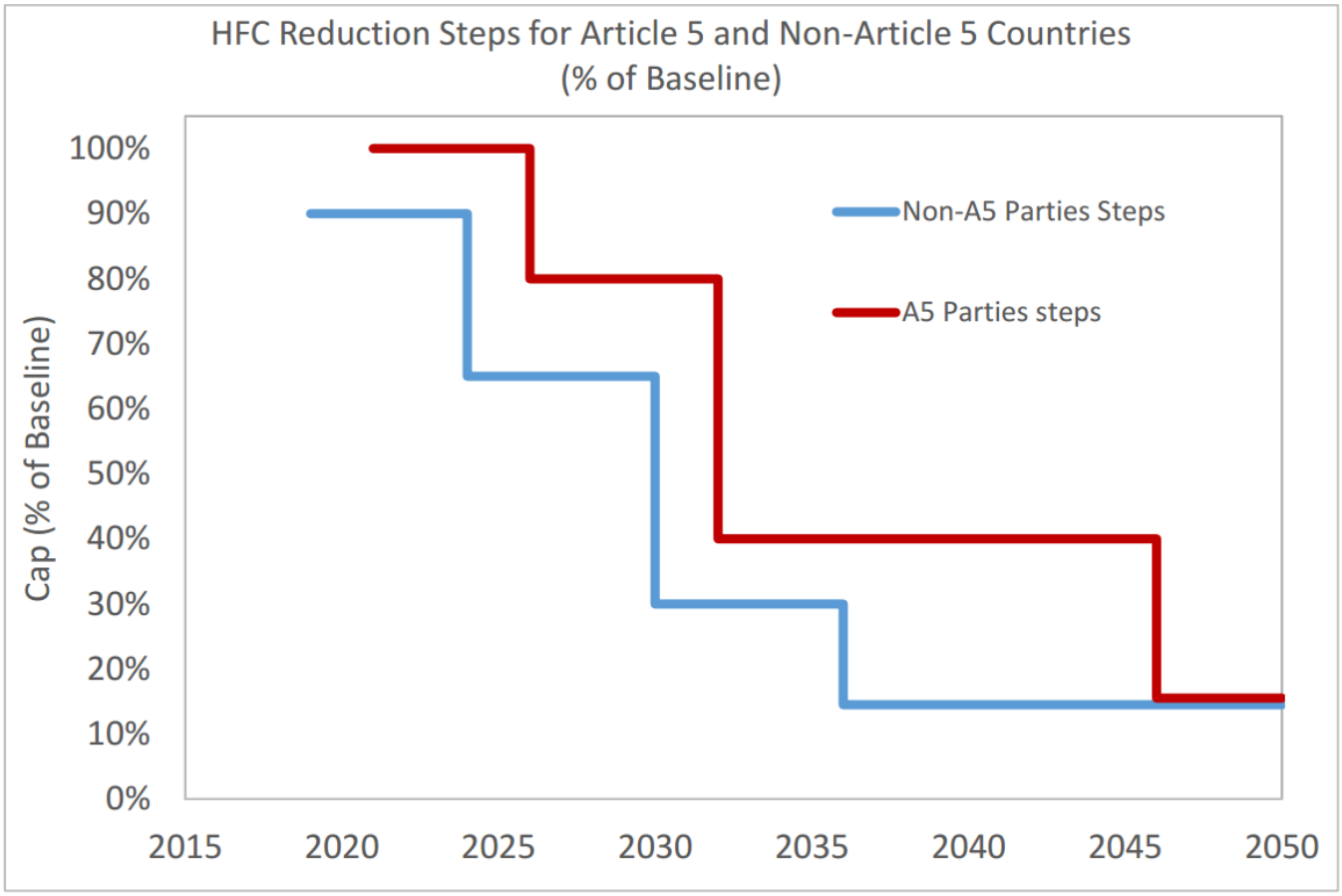
UNITED STATES

United States of America Refrigerant policy

HCFC Phaseout: U.S. Action to Meet the Montreal Protocol Phaseout Schedule [1][2]

Montreal Protocol		**United States**	
Year to Be Implemented	% Reduction in HCFC Consumption and Production from Baseline	Year to Be Implemented	Implementation of HCFC Phaseout through Clean Air Act Regulations
2004	35.0%	2003	No production or import of HCFC-141b
2010	75.0%	2010	No production or import of HCFC-142b and HCFC-22, except for use in equipment manufactured before January 1, 2010
2015	90.0%	2015	No production or import of any other HCFCs, except as refrigerants in equipment manufactured before January 1, 2020
2020	99.5%	2020	No production or import of HCFC-142b and HCFC-22
2030	100.0%	2030	No production or import of any HCFCs

Proposed HFC Reduction Steps for Article 5 and Non-Article 5 Countries (% of baseline) [3][4]



HFC phasedown for US Montreal Protocol proposal and European F-Gas regulation [4][5]

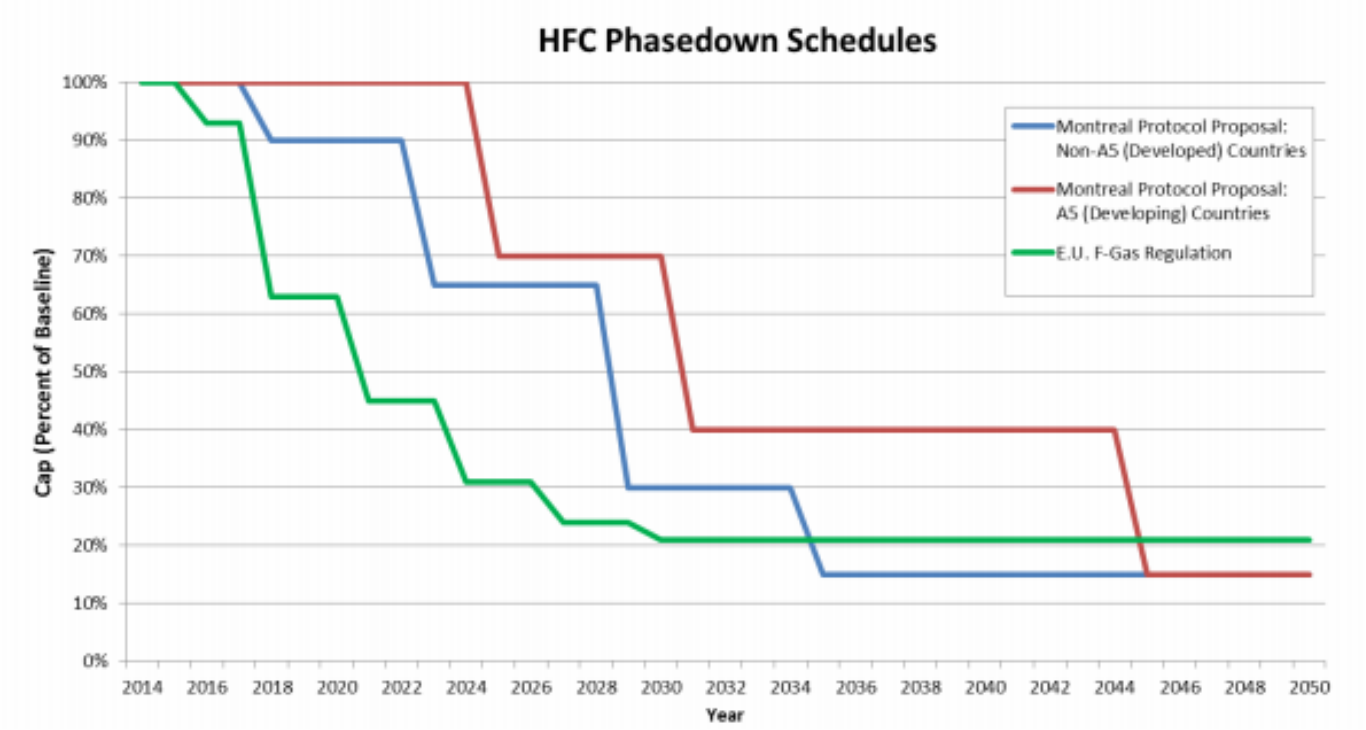


Figure 1.1: HFC phasedown schedules for North American Montreal Protocol proposal and European F-gas regulation

MEMORANDUM: Final Rule for HCFC Allowances in 2015-2019 [6]

- This final rule, titled "Adjustments to the Allowance System for Controlling HCFC Production, Import, and Export," covers the years 2015-2019.

Federal Regulation Rules and Regulation July 2015 on HFC [7]

- This action changes the status from acceptable to unacceptable; acceptable, subject to use conditions; or acceptable, subject to narrowed use limits for a number of substitutes, pursuant to the U.S. Environmental Protection Agency's Significant New Alternatives Policy program. This action also changes the status from acceptable to unacceptable for certain hydrochlorofluorocarbons being phased out of production under the Montreal Protocol on Substances that Deplete the Ozone Layer and section 605(a) of the Clean Air Ac

Clean Air Act (CAA) of 1990 [8][9]

The Act calls for states and EPA to solve multiple air pollution problems through programs based on the latest science and technology information. Congress amended the Clean Air Act in 1990 to add provisions (under Title VI) for protecting the ozone layer. As required under Title VI of the Clean Air Act, EPA is responsible for developing and implementing programs that protect the stratospheric ozone layer. Title 40, Part 82 of the Code of Federal Regulations contains EPA's regulations to protect the ozone layer.The Montreal Protocol provided the basis for Title VI, which included additional requirements to phase out the production of substances that deplete the ozone layer. The U.S. has already phased out many substances and is now phasing out HCFCs (Class II substances) starting with those that have the greatest ozone depletion potential.

Baseline allowances, consumption and production caps [3][14]

In 2003 EPA issued baseline allowances for production and import of HCFC-22 and HCFC-142b and revised in 2011. EPA allocated 100 percent of the U.S. consumption and production caps by allocating both consumption and production allowances to individual companies for HCFC-141b, HCFC-22, and HCFC-142b.

Phasing Out Ozone-Depleting Substances

To protect the ozone, ozone-depleting substances (ODS) are being phased out of production and use in the United States. EPA regulates the phaseout under Title VI of the Clean Air Act, which is based on the Montreal Protocol on Substances that Deplete the Ozone Layer.

Ozone-depleting substances (ODS) are regulated as class I or class II controlled substances. Class I substances have a higher ozone depletion potential and have been completely phased out in the U.S.; with a few exceptions, this means no one can produce or import class I substances. Class II substances are all hydrochlorofluorocarbons (HCFCs), which are transitional substitutes for many class I substances. New production and import of most HCFCs will be phased out by 2020. The most common HCFC in use today is HCFC-22 or R-22, a refrigerant still used in existing air conditioners and refrigeration equipment.

Phaseout of Class I Ozone-Depleting Substances [2]

Section 604 of the Clean Air Act establishes the phaseout targets for Class I ODS. The ban on production and import of halons took effect on January 1, 1994. The ban on production and import of other Class I ODS (excluding methyl bromide) took effect on January 1, 1996. There are several exemptions from the phaseout, such as Laboratory testing purposes and others.

Table 1: Phaseout Schedule for Class I Substances

Date (Jan. 1)	CFCs	Halons	Carbon Tetrachloride	Methyl Chloroform	Methyl Bromide
1994	75%	100%	50%	50%	0%
1995	75%		85%	70%	0%
1996	100%		100%	100%	0%
1997					0%
1998					0%
1999					25%
2000					25%
2001					50%
2002					50%
2003					70%
2004					70%
2005					100%

Phaseout of Class II Ozone-Depleting Substances [3]

"Class II" ozone-depleting substances (ODS) have an ozone depletion potential less than 0.2, and are all hydrochlorofluorocarbons (HCFCs). HCFCs were developed as transitional substitutes for Class I ODS and are subject to a later phaseout schedule than Class I ODS.

As a Party to the Montreal Protocol, the United States must incrementally decrease HCFC consumption and production, culminating in a complete HCFC phaseout in 2030. HCFC usage must be reduced to at least 90 percent below baseline levels in 2015 and to at least 99.5 percent below baseline levels in 2020.

Section 605 of the Clean Air Act establishes the U.S. phaseout targets for Class II substances. In 1993, EPA established the phaseout framework and the "worst-first" approach, which focused first on HCFC-22, HCFC-141b, and HCFC-142b because they have the highest ozone depletion potentials of all HCFCs.
The U.S. schedule for meeting the Montreal Protocol phaseout requirements is summarized in the following table. [1]

U.S. Action to Meet the Montreal Protocol Phaseout Schedule

Implementation of HCFC Phaseout through CAA Regulations	Year to Be Implemented	Consumption and Production Reduction from Baseline
No production or import of HCFC-141b	2004	35.0%
No production or import of HCFC-142b and HCFC-22, except for use in equipment manufactured before January 1, 2010	2010	75.0%
No production or import of any other HCFCs, except as refrigerants in equipment manufactured before January 1, 2020	2015	90.0%
No production or import of HCFC-142b and HCFC-22	2020	99.5%
No production or import of any HCFCs	2030	100.0%

The phase-out restricts the use of these HCFCs, and EPA continues to evaluate HCFC alternatives through its Significant New Alternatives Policy (SNAP) program.

Overview of SNAP (Significant New Alternatives Policy)

Under Section 612 of the Clean Air Act (CAA), EPA's Significant New Alternatives Policy (SNAP) program reviews substitutes within a comparative risk framework in the Refrigeration & Air Conditioning sectors. [10]
The SNAP program does not provide a static list of alternatives but instead, evolves the list as EPA makes decisions that are informed by its overall understanding of the environmental and human health impacts as well as its current knowledge about available substitutes. Section 612 also provides that EPA must prohibit the use of a substitute where EPA has determined that there are other available substitutes that pose less overall risk to human health and the environment. [10]
EPA's decision on the acceptability of new substitutes proposed by manufacturers, formulators, or users is based primarily on the potential human health and environmental risks posed by the substitutes as compared other substitutes available for a particular end-use. EPA's evaluation of each substitute in an end-use is based on the following types of information: ***Atmospheric effects, Exposure assessments, Toxicity data, Flammability, and Other environmental impact.*** [10]

Unacceptable Substitute Refrigerants for ODS in Refrigerantion and Air Conditioning [1][2]
EPA reviews substitutes on the basis of environmental and health risks, including factors such as ozone depletion potential, global warming potential, toxicity, flammability, and exposure potential. Lists of acceptable and unacceptable substitutes are updated several times each year. Alternatives are listed as unacceptable where other available, or potentially available, substitutes pose a lower overall risk to human health and the environment.

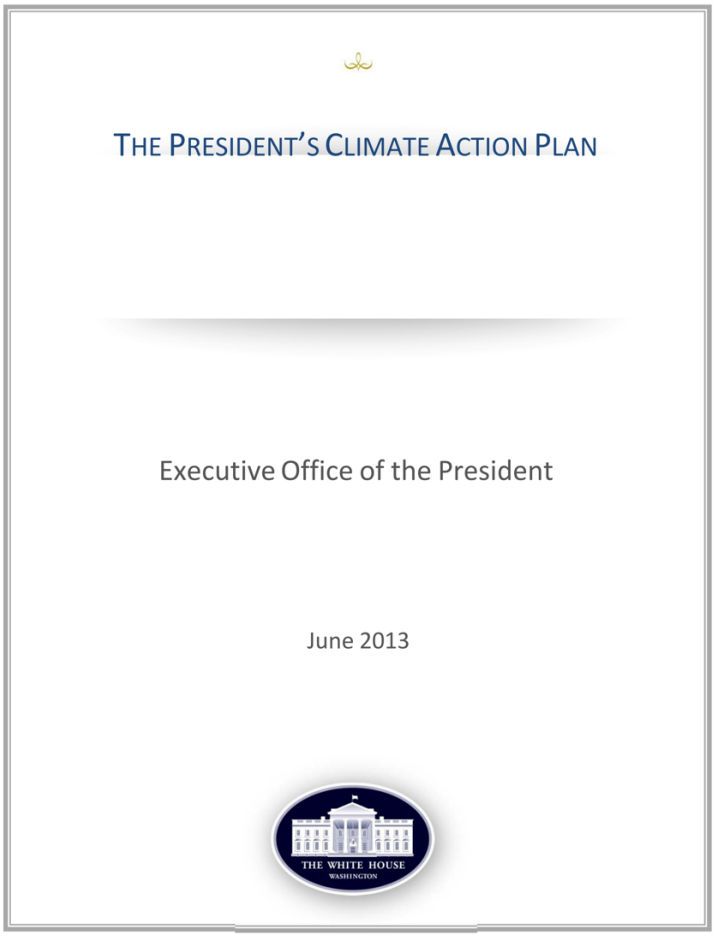
Substitute (Name Used in the Federal Register)	ODS Being Replaced	End-uses	Reason
All flammable refrigerants, including OZ-12® (Hydrocarbon Blend A), HC-12a® (Hydrocarbon Blend B), and Duracool 12a except HFC-152a and HFO-1234yf in new MVACs	CFC-12	Motor vehicle air conditioning, retrofit and new	Lack of adequate assessment that characterizes incremental flammability risk
OZ-12® (Hydrocarbon Blend A), HC-12a® (Hydrocarbon Blend B), and Duracool 12a	CFC-12	All end-uses other than industrial process refrigeration, retrofit and new	Lack of adequate assessment that characterizes incremental flammability risk
R-141b	CFC-11	centrifugal chillers, new	High ODP; other substitutes with lower overall risk have been identified
R-176 (R-176 contains CFC-12, HCFC-22, and HCFC-142b. It is a different product from RB-276, typically sold under the name "Free Zone.")	CFC-12	All end-uses, retrofit and new	Contains CFC-12
R-403B	R-502	All end-uses, retrofit and new	Contains a perfluorocarbon that exhibits extremely high GWP and very long lifetime
R-405A	CFC-12	All end-uses, retrofit and new	Contains a perfluorocarbon that exhibits extremely high GWP and very long lifetime
MT-31	all CFCs and HCFCs	All end-uses, retrofit and new	Toxicity of a constituent
Hexafluropropylene (HFP) and blends containing it	all CFCs and HCFCs	All end-uses, retrofit and new	HFP is toxic
NARM-22	HCFC-22	All end-uses, retrofit and new	Contains HCFC-22
Self-Chilling Cans using HFC-134a or HFC-152a	CFC-12, HCFC-22, R-502	Household Refrigeration, Transport Refrigeration, Vending Machines, Cold Storage Warehouses and Retail Food Refrigeration; retrofit and new	Unacceptably high greenhouse gas emissions from direct release of refrigerant to the atmosphere

Reducing Hydrofluorocarbon (HFC) Use and Emissions

HFCs have high global warming potential, raising concern about their impacts as they become increasingly used as replacements for ozone-depleting substances (ODS) that are being phased out under the Clean Air Act (CAA). President Obama's Climate Action Plan (CAP) that was announced in June 2013, calls for international and domestic action to reduce GHGs, including HFCs.

The President Climate Action Plan [11]

President Obama's Climate Action Plan (CAP) that was announced in June 2013, calls for international and domestic action to reduce GHGs, including HFCs. Among other things, the President's CAP calls for his administration to reduce emissions of HFCs by purchasing alternatives whenever feasible and transitioning to equipment that uses safer and more sustainable alternatives to HFCs.



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The President's Climate Action Plan, consists of a wide variety of executive actions and has three key pillars. One of these is:

1) Cut Carbon Pollution in America: In 2012, U.S. carbon emissions fell to the lowest level in two decades even as the economy continued to grow. To build on this progress, the Obama Administration is putting in place tough new rules to cut carbon pollution – just like we have for other toxins like mercury and arsenic – so we protect the health of our children and move our economy toward American-made clean energy sources that will create good jobs and lower home energy bills. (page 6)

On the page 10 of The President's Climate Action Plan is the section about Reducing Other Greenhouse Gas Emissions.

IV. Reducing Other Greenhouse Gas Emissions (found on page 10)

Curbing Emissions of Hydrofluorocarbons: Hydrofluorocarbons (HFCs), which are primarily used for refrigeration and air conditioning, are potent greenhouse gases. In the United States, emissions of HFCs are expected to nearly triple by 2030, and double from current levels of 1.5 percent of greenhouse gas emissions to 3 percent by 2020.

To reduce emissions of HFCs, the United States can and will lead both through international diplomacy as well as domestic actions. In fact, the Administration has already acted by including a flexible and powerful incentive in the fuel economy and carbon pollution standards for cars and trucks to encourage automakers to reduce HFC leakage and transition away from the most potent HFCs in vehicle air conditioning systems. Moving forward, the Environmental Protection Agency will use its authority through the Significant New Alternatives Policy Program to encourage private sector investment in low-emissions technology by identifying and approving climate-friendly chemicals while prohibiting certain uses of the most harmful chemical alternatives. In addition, the President has directed his Administration to purchase cleaner alternatives to HFCs whenever feasible and transition over time to equipment that uses safer and more sustainable alternatives.

US Federal Regulation and Refrigerant Alternatives

US Federal Regulation

Systems	Refrigerant	Decision
Retrofitted supermarket systems	R–404A, R–407B, R–421B, R–422A, R– 422C, R–422D, R–428A, R–434A, and R–507A	Unacceptable as of July 20, 2016
New supermarket systems	HFC– 227ea, R–404A, R–407B, R–421B, R–422A, R–422C, R–422D, R–428A, R– 434A, and R–507A	Unacceptable as of Jan 1, 2017
Retrofitted remote condensing units	R–404A, R–407B, R–421B, R–422A, R–422C, R–422D, R–428A, R– 434A, and R–507A	Unacceptable as of July 20, 2016
Retrofitted stand-alone retail food refrigeration equipment	R–404A and R–507A	Unacceptable as of July 20, 2016
New stand-alone medium temperature units with a compressor capacity below 2,200 Btu/hr and not containing a flooded evaporator	FOR12A, FOR12B, HFC–134a, HFC–227ea, KDD6, R–125/290/134a/600a (55.0/1.0/42.5/1.5), R–404A, R–407A, R–407B, R–407C, R–407F, R–410A, R– 410B, R–417A, R–421A, R–421B, R–422A, R–422B, R–422C, R–422D, R– 424A, R–426A, R–428A, R–434A, R–437A, R–438A, R–507A, RS–24 (2002 formulation), RS–44 (2003 formulation), SP34E, and THR–03	Unacceptable as of January 1, 2019

New stand-alone medium temperature units with a compressor capacity equal to or greater than 2,200 Btu/hr and stand-alone medium temperature units containing a flooded evaporator	FOR12A, FOR12B, HFC– 134a, HFC–227ea, KDD6, R–125/290/ 134a/600a (55.0/1.0/42.5/1.5), R–404A, R–407A, R–407B, R–407C, R–407F, R– 410A, R–410B, R–417A, R–421A, R– 421B, R–422A, R–422B, R–422C, R–422D, R–424A, R–426A, R–428A, R–434A, R–437A, R–438A, R–507A, RS–24 (2002 formulation), RS–44 (2003 formulation), SP34E, and THR–03	Unacceptable as of January 1, 2020
New stand-alone low-temperature units	HFC–227ea, KDD6, R–125/290/134a/600a (55.0/1.0/42.5/1.5), R–404A, R–407A, R–407B, R–407C, R–407F, R–410A, R–410B, R–417A, R–421A, R–421B, R–422A, R–422B, R–422C, R–422D, R–424A, R–428A, R–434A, R– 437A, R–438A, R–507A, and RS–44 (2003 formulation)	Unacceptable as of January 1, 2020

US Refrigerant Alternative by Federal Regulation

Systems	Refrigerant	Alternatives
Retrofitted supermarket systems and Retrofitted remote condensing units	R–404A, R–407B, R–421B, R–422A, R– 422C, R–422D, R–428A, R–434A, and R–507A	FOR12A, FOR12B, HFC–134a, IKON A, IKON B,KDD6, R–125/290/134a/600a (55.0/1.0/42.5/1.5), R–407A, R–407C, R–407F, R–417A, R–417C, R–421A, R–422B, R–424A, R–426A, R–427A, R–437A, R–438A, R–448A, R–449A, R–450A, R–513A, RS–24 (2002 formulation), RS-44 (2003 formulation), SP34E, THR–02,and THR–03
New supermarket systems and New remote condensing units	HFC– 227ea, R–404A, R–407B, R–421B, R–422A, R–422C, R–422D, R–428A, R– 434A, and R–507A	FOR12A, FOR12B, HFC–134a, IKON A, IKON B, KDD6, R–125/290/134a/600a (55.0/1.0/42.5/1.5), R–407A, R–407C, R–407F, R–410A, R–410B, R– 417A, R–421A, R–422B, R–424A, R–426A, R–437A, R–438A, R–448A, R–449A, R–450A, R–513A, R–744, RS–24(2002 formulation), RS–44 (2003 formulation), SP34E, THR–02, and THR–03. In addition, R–717 is as acceptable when used as the primary refrigerant in a secondary loop system.
Retrofitted vending machines	R–404A and R–507A	FOR12A, FOR12B, HFC–134a, IKON A, IKON B, KDD6, R–125 290/134a/600a (55.0/1.0/42.5/1.5), R–407C, R–417A, R–417C, R–421A, R–422B, R–422C, R–422D, R–426A, R–437A, R–438A, R–448A, R–449A, R–450A, R–513A, RS-24 (2002formulation), SP34E, and THR-02.83
New vending machines	FOR12A, FOR12B, HFC–134a, KDD6, R–125/290/134a/600a (55.0/1.0/42.5/1.5), R–404A, R–407C, R–410A, R–410B, R–417A, R–421A, R–422B, R–422C, R–422D, R–426A, R–437A, R–438A, R–507A, RS–24 (2002 formulation), and SP34E	acceptable or acceptable subject to use; IKON A, IKON B, R–290, R–441A, R–450A, R–513A, R–600a, R–744, and THR-02

Retrofitted stand-alone retail food refrigeration equipment	R–404A and R–507A	FOR12A, FOR12B, HFC–134a, IKON A, IKON B, KDD6, R–125/290/134a/600a (55.0/1.0/42.5/1.5), R–407A, R–407B, R–407C, R–407F, R–417A, R–417C, R–421A, R–421B, R–422A, R–422B, R–422C, R–422D, R–424A, R–426A, R–427A, R–428A, R–434A, R–437A, R–438A, R–450A, R–513A, RS–24 (2002 formulation), RS–44(2003 formulation), SP34E, THR-02, andTHR-03. R–448A and R–449A
New stand-alone medium temperature units with a compressor capacity below 2,200 Btu/hr and not containing a flooded evaporator	FOR12A, FOR12B, HFC–134a, HFC–227ea, KDD6, R–125/290/134a/600a (55.0/1.0/42.5/1.5), R–404A, R–407A, R–407B, R–407C, R–407F, R–410A, R– 410B, R–417A, R–421A, R–421B, R–422A, R–422B, R–422C, R–422D, R– 424A, R–426A, R–428A, R–434A, R–437A, R–438A, R–507A, RS–24 (2002 formulation), RS–44 (2003 formulation), SP34E, and THR–03	R–290, R–600a and R– 441A acceptable subject to use conditions . R–450A, R–513A, R–744, IKON A, IKON B and THR–02 are acceptable substitutes without use conditions
New stand-alone medium temperature units with a compressor capacity equal to or greater than 2,200 Btu/hr and stand-alone medium temperature units containing a flooded evaporator	FOR12A, FOR12B, HFC– 134a, HFC–227ea, KDD6, R–125/290/ 134a/600a (55.0/1.0/42.5/1.5), R–404A, R–407A, R–407B, R–407C, R–407F, R– 410A, R–410B, R–417A, R–421A, R– 421B, R–422A, R–422B, R–422C, R– 422D, R–424A, R–426A, R–428A, R–434A, R–437A, R–438A, R–507A, RS–24 (2002 formulation), RS–44 (2003 formulation), SP34E, and THR–03	
New stand-alone low-temperature units	HFC–227ea, KDD6, R–125/290/134a/600a (55.0/1.0/42.5/1.5), R–404A, R–407A, R–407B, R–407C, R–407F, R–410A, R–410B, R–417A, R–421A, R–421B, R–422A, R–422B, R–422C, R–422D, R–424A, R–428A, R–434A, R–437A, R–438A, R–507A, and RS–44 (2003 formulation)	In addition, HFC–134a, FOR12A, FOR12B, R–426A, RS–24 (2002 formulation), SP34E and THR–03 remain acceptable without use conditions and are not subject to a change of status date. R–448A and R–449A acceptable without use conditions for new standalone low-temperature equipment

Sources:

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- [2] “Phaseout of Class I Ozone-Depleting Substances”: (US Environmental Protection Agency website) https://www.epa.gov/ods-phaseout/phaseout-class-i-ozone-depleting-substances
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- [11] “THE PRESIDENT’S CLIMATE ACTION PLAN”: www.whitehouse.gov/sites/default/files/image/president27sclimateactionplan.pdf
- [12] “Submissions by parties on the implementation of decision XIX/6 Submission by the United States of America”: http://conf.montreal-protocol.org/meeting/oewg/oewg-34/presession/Information%20Documents%20are%20available%20in%20English%20onl/OEWG-34-INF4-Add1.pdf
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US Refrigerant Policies and Regulations

- MEMORANDUM: Final Rule for HCFC Allowances in 2015-2019
- Federal Regulation RULES and REGULATION July 2015 on HFC
- Protection of Stratospheric Ozone: Update to the Refrigerant Management Requirements Under the Clean Air Act – 2015
- The President's Climate Action Plan – 2013
- HFC Policy Analysis Report – 2014