



# The Changing World of HFC Regulation

**CHAPTER ONE**

## Executive Summary

Bottom line: Refrigerant regulations are changing.

**What is the same?** Refrigerants and the equipment that use refrigerants are heavily regulated due to the environmental, toxicity, and flammability properties of refrigerant. Refrigerant and equipment safety are considered and addressed in standards such as ASHRAE 15 and UL 60335-2-40.

**What is different?** The transition to low-global warming potential (GWP) alternatives that reduce the direct environmental impact of refrigerants has resulted in greater usage of alternative refrigerants. These include refrigerants that were traditionally used prior to the development of chlorofluorocarbons (CFCs), e.g., ammonia, carbon dioxide, and hydrocarbons like propane and butane, as well as new alternatives and blends that are low toxicity and mildly flammable (ASHRAE Class A2L).

**What do I need to know about it?** There are similarities and differences in refrigerant classes and the potential risks they introduce. Small charge volumes used in residential systems inherently reduce risks compared to larger charges in commercial settings. It is important to be aware of differences and to follow current best practices which apply to all refrigerants:

- Most refrigerants are heavier than air and can displace oxygen.<sup>1</sup> It is important for emergency and maintenance plans to ensure adequate ventilation and to measure refrigerant and oxygen concentrations in machine rooms and other confined spaces, especially in commercial systems, to minimize the risk of exposure. ASHRAE uses the Refrigerant Concentration Limit (RCL) metric, which sets the safety requirements and allowable charge limits for all refrigerants including A1 and A2L refrigerants. It includes set exposure limits for A1 refrigerant, and 25% of the lower flammability limit for flammable refrigerants.
- Nearly all refrigerants are either flammable or combustible. All fluorocarbon-based refrigerants produce hydrogen fluoride (HF) when burned and as compressed gases can cause frostbite if liquid refrigerant is sprayed on skin. All refrigerants should be isolated or removed from equipment where work is being performed to minimize releases and potential exposure.
- Proper personal protective equipment must be worn to minimize breathing vapors, exposure to HF, and risk of frostbite.
- This list is not all-inclusive. See refrigerant producers' Safety Data Sheets (SDSs), the equipment service manual, or reference training for more information.
- Although low-GWP refrigerants reduce emissions of greenhouse gases directly, high energy efficiency of systems and equipment are important to reduce indirect environmental impacts due to emissions from power generation.

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<sup>1</sup> Refrigeration and Air Conditioning Technology by Eugene Silberstein, Jason Obrzut, John Tomczyk

### The Writing Was on the Wall for HFC Regulations

The Montreal Protocol for Substances that Deplete the Ozone Layer<sup>2</sup> (Montreal Protocol), ratified in 1989, phased out ozone depleting refrigerants (chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs)). Hydrofluorocarbons (HFCs) replaced CFCs and HCFCs in many applications to reduce damage to the ozone layer, but HFCs are potent greenhouse gases. The most commonly used HFC refrigerants for air conditioning and commercial refrigeration (R-410A and R-404A) respectively have over two thousand times and nearly four thousand times the climate impact of carbon dioxide, which is the global warming potential (GWP) reference greenhouse gas with a GWP of 1.

The greenhouse gas impact of HFCs has been well understood for decades. In fact, the Kyoto Protocol first listed HFCs as controlled greenhouse gases prior to 1999. Countries, states, and local jurisdictions started regulating HFCs as short-lived climate pollutants (SLCPs) with a variety of actions since that time. Some countries adopted the goals outlined out in the Kyoto Protocol while others created their own regulatory structures as shown in the examples in the figure below.

## The World Is Regulating HFCs

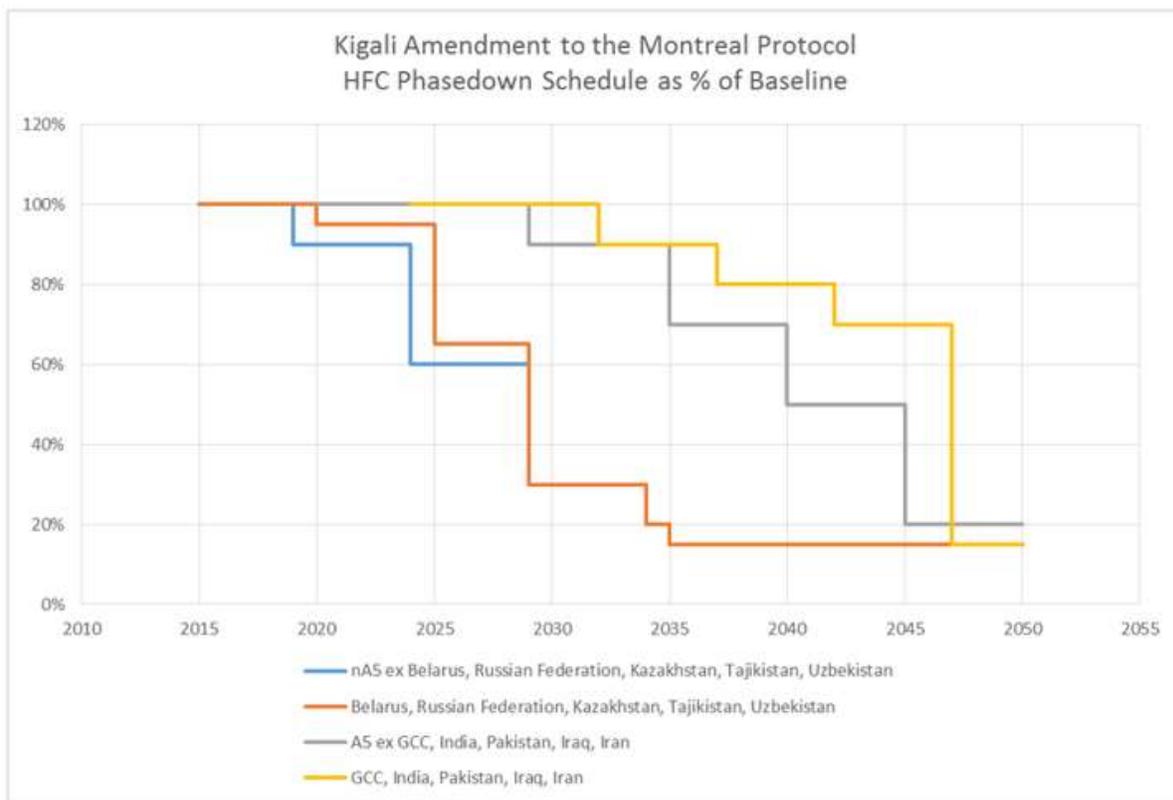


Seeing a pending patchwork of regional, country, state, and local regulations, the impacted industry agreed to support the global phasedown of HFCs and high-GWP gases using the same orderly approach as was used in the phase-out of ozone-depleting substances (ODS), by gradually reducing the use of controlled fluids. The industry knew that this would provide regulatory certainty and allow for appropriate preparation for the transition.

<sup>2</sup> The ozone layer reduces exposure to harmful ultraviolet radiation which causes skin cancer and damage to crops, etc. The international treaty to eliminate the use of certain substances that deplete the ozone layer is projected to result in the hole in the ozone layer to be reduced to pre-industrial levels by 2060. The treaty is hailed as the most successful treaty of its kind.

In 2016, in Kigali, Rwanda, the parties to the Montreal Protocol (197 countries in total) agreed to an amendment designed to phase down the use of HFCs. Among other concerns, they cited the continued increase in refrigerant usage and emissions as access to refrigeration and air conditioning grew in developed and developing nations. The Kigali Amendment to the Montreal Protocol, which is now in force and has been ratified by more than 90 countries, will reduce the production and consumption of these heat-trapping gases by more than 80 percent over the next 30 years. Regulations will be implemented to address refrigerant management and reduce leaks.<sup>3</sup> Each country will implement the phasedown in its own way. The next figure shows the phasedown schedule for Parties to the Amendment.

### 2016 Montreal Protocol Kigali HFC Amendment Phasedown Schedule



### Changes to the Use of Low-Global Warming Potential Refrigerants

Refrigerants in widespread commercial use that replace CFCs, HCFCs, and HFCs have different toxicity and flammability properties. It is important to understand how to mitigate potential hazards through proper handling, storage, and use of these refrigerants. The transition to low-GWP alternatives will result in greater usage of refrigerants that were traditionally used prior to the development of CFCs.

<sup>3</sup> It should be noted that properly installed equipment leaks very little.

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These include ammonia, carbon dioxide, and hydrocarbons (e.g. propane and butane), as well as new alternatives with different properties than products currently used today.

Refrigerants are classified by ASHRAE based on toxicity testing and flammability characteristics. Even refrigerants with low toxicity (ASHRAE toxicity classification A) and no flame propagation (ASHRAE flammability classification 1) can displace oxygen and create a risk of asphyxiation. This is why systems containing large charge sizes in commercial buildings are kept in machine rooms with refrigerant sensors that alarm if a leak is detected. Safety standard ASHRAE 15 also has requirements to initiate ventilation if a concentration well below those immediately dangerous to life and health (IDLH) is detected to prevent unsafe concentrations even in an unoccupied space. Most, if not all, refrigerants are potential asphyxiants, including those A1 refrigerants commonly used today (e.g. carbon dioxide, R-410A, R-22, and R-404A), as well as new proposed A1 refrigerants like R-466A.<sup>4</sup>

ASHRAE has developed Refrigerant Concentration Limits (RCLs), for all ASHRAE 34 listed refrigerants based on toxicity and flammability properties. Building codes have traditionally adopted ASHRAE 34, ASHRAE 15, and other safety standards that provide mitigation guidance if the charge size of the refrigerant will be installed in a space where the RCL would be exceeded. For A1 refrigerants, the RCL is set in ASHRAE 34 based on exposure limits, but for flammable refrigerants it is conservatively set at 25% of the lower flammability limit (LFL). For example, if the concentration might exceed the RCL limit in a machine room, sensors and ventilation or other mitigation are required. These requirements were already in ASHRAE 15 prior to the evaluation of low-GWP refrigerants and have been modified and updated in the new ASHRAE 15-2019 as a result of industry research and testing.

### Environmental Protection Agency (EPA) Significant New Alternatives Policy (SNAP) Program

The EPA SNAP Program is required by statute to maintain a list of “acceptable” and “unacceptable” substitutes for ODS, including refrigerants replacing HCFC-22. In 2015 and 2016, the EPA promulgated regulations (SNAP Rule 20 and 21) changing the status of several high-GWP refrigerants to “unacceptable.” In *Mexichem Fluor vs. EPA*, Mexichem Fluor and Arkema challenged the legitimacy of SNAP Rules 20 and 21. The D.C. Circuit Court determined that EPA was still responsible for maintaining the list of substitutes for ODS, but could not regulate the use of previously accepted alternatives that were not ODS. The SNAP Rules 20 and 21 were remanded back to EPA to be rewritten in compliance with the Court’s decision. EPA informed the public that the rules would not be enforced until further notice.

As will be discussed later, EPA SNAP Rules 20 and 21 remain important as several states are adopting the requirements in those regulations directly or as mandated by statute.

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<sup>4</sup> See refrigerant manufacturers Safety Data Sheets (SDSs) for safety details regarding refrigerants.

## EPA SNAP Sectors in the original Rules 20 & 21

End Use	Effective Date	End Use	Effective Date
Supermarket Systems (Retrofitted)	July 20, 2016	Cold Storage Warehouses (New)	January 1, 2023
Supermarket Systems (New)	January 1, 2017	Retail food refrigeration – refrigerated food processing and dispensing equipment (new)	January 1, 2021
Remote Condensing Units (Retrofitted)	July 20, 2016	Centrifugal chillers (new)	January 1, 2024
Remote Condensing Units (New)	January 1, 2018	Positive displacement chillers (new)	January 1, 2024
Stand-Alone Retail Food Refrigeration Equipment (Retrofitted)	July 20, 2016	Household refrigerators and freezers	January 1, 2021
Stand-Alone Medium-Temperature Units with a compressor capacity below 2,200 Btu/hour and not containing a flooded evaporator (New)	January 1, 2019		
Stand-Alone Medium-Temperature Units with a compressor capacity equal to or greater than 2,200 Btu/hour and Stand-Alone Medium-Temperature Units containing a flooded evaporator (New)	January 1, 2020		
Stand-Alone Low-Temperature Units (New)	January 1, 2020		
Vending Machines (Retrofitted)	July 20, 2016		
Vending Machines (New)	January 1, 2019		

Note: Although there is much uncertainty as to how EPA might regulate HFCs going forward, designated sectors remain important as some states are adopting transition dates based on SNAP.



### EPA Refrigerant Management Section 608

EPA also updated Section 608 of the Clean Air Act (CAA) to include requirements around venting, leak reduction, and reporting for HFCs in 2016. The National Environment Development Association Clean Air Project (NEDACAP) and the Air Permitting Forum (APF) petitioned the courts to review the recent changes to Section 608. In response, EPA published a new rule in 2020 rescinding leak requirements for HFCs.

According to the United Nations Environment Program (UNEP) Ozone Secretariat Workshop on HFC management, 52% of the emissions related to HFCs on a carbon dioxide equivalent basis are due to leaking air conditioning, heat pump, and refrigeration equipment.<sup>5</sup>

California adopted refrigerant management regulations required under CAA Section 608, including the HFC provisions as they were required in January 2017<sup>6</sup>. (Other states have indicated in HFC stakeholder meetings that they are considering adopting similar regulations.

### The Paris Climate Agreement

Parties to the Paris Climate Agreement agreed to limit global temperature rise to 2°C with an aspirational goal of limiting the increase to 1.5°C. Sixty-five countries committed to address high-global warming potential HFCs in Individual Nationally Determined Contributions (INDCs) to the Paris Agreement.

<sup>5</sup> Technical issues Bangkok, 20 and 21 April 2015 Factsheet 2 “Overview of HFC Markets.” 86% of equivalent GWP is used for the HVACR sectors and 60% of that is used to top up leaking equipment

<sup>6</sup> Details can be found at <https://ww2.arb.ca.gov/our-work/programs/refrigerant-management-program>

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It has been estimated that the Kigali Amendment to the Montreal Protocol will reduce temperature rise between 0.3°C to 0.5°C. The current temperature rise is estimated at 0.94°C. According to the National Oceanic and Atmospheric Administration's (NOAA) Annual Global Climate Report, the year "2019 was the second hottest year on record for the planet, and the hottest year ever recorded for ocean heat content," and "nine of the ten hottest years globally have occurred since 2005, with 2016 being the hottest on record."<sup>7</sup>

Although much of this temperature rise is predicted to impact oceans, the practical difference between 1.5°C and 2°C temperature rise is significant to people as well.<sup>8</sup>

- 250 million more people exposed to drought and its consequences
- 1.7 billion more people exposed to extreme temperatures (> 1/5 of the current global population)

### U.S. Climate Alliance

On August 4, 2017, the U.S. deposited notification of withdrawal from the Paris Climate Agreement, withdrawing, at the earliest, November 4, 2020.<sup>9</sup> The [United States Climate Alliance](#) States committed to reduce emissions commensurate with the original U.S. commitment. A total of 444 "Climate Mayors," as of May 2020, also committed to the Paris Climate Agreement reductions.<sup>10</sup> Since the U.S. has not yet ratified the Kigali HFC Amendment, some states have included HFCs in this effort.

There is increasing global activity to transition to more climate-friendly refrigerants to meet the growing demand. In the U.S., as of May 29, 2020, 16 member states of the Climate Alliance have attempted or committed to address consumption and/or emissions of HFCs as part of their efforts to reduce greenhouse gas emissions.<sup>11,12</sup> California has taken the lead in this effort with passage of Senate Bill 1383 to reduce emissions of greenhouse gases by 40% compared to 2013 emissions levels by 2030. This HFC reduction goal may be one of the most accelerated in the world.

- California, Washington, New Jersey, Colorado, and Vermont have adopted HFC transition dates based on EPA SNAP Rules 20 and 21, with some delays and exceptions.

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<sup>7</sup> Climate Council, "More Bad News for Australia: Global Report." Accessed at <https://www.climatecouncil.org.au/resources/more-bad-news-for-australia-global-report/> on 10/29/20.

<sup>8</sup> Kowalzig, Jan "Climate, Poverty, and Justice: What the Poznan UN climate conference needs to deliver for a fair and effective global deal" Oxfam Briefing Paper 2008

<sup>9</sup> The depository notification could be found here in October 2019: <https://treaties.un.org/doc/Publication/CN/2017/CN.464.2017-Eng.pdf>

<sup>10</sup> Climate Mayors website. <http://climatemayors.org/actions/paris-climate-agreement/> October 29, 2019

<sup>11</sup> <https://www.reuters.com/article/us-un-climate-usa-paris/u-s-submits-formal-notice-of-withdrawal-from-paris-climate-pact-idUSKBN1AK2FM>  
<https://qz.com/999142/paris-agreement-all-of-the-us-cities-counties-states-universities-companies-and-investors-defying-trumps-stance-on-climate-deal/>  
[www.usclimatealliance.org](http://www.usclimatealliance.org)

<sup>12</sup> The Climate Alliance, as of 8/1/2019 consisted of 24 states and Puerto Rico, have stated they will meet the commitments of the Paris Climate Agreement after the U.S. Administration announced the United States will withdraw from the Paris Climate Agreement in 2020.

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- Connecticut, Delaware, Maryland, New York, Massachusetts, Rhode Island, Pennsylvania, and Virginia have made commitments and/or taken steps toward adopting regulatory programs or legislation. Final regulations are expected in 2020.
- Oregon, Hawaii, and Maine attempted legislation in 2020 that will likely not move forward.

### California Air Resources Board (CARB)

Senate Bill 1383, signed into law in 2016, mandates that CARB create regulations to meet its goals. The rest of the world regulates based on refrigerant production and consumption rather than emissions. Since California's goals are based on emissions from equipment that has been in place for 15 to 30 years, California's goals are 5-10 years ahead of the Kigali Amendment.<sup>13</sup>

In order to meet this ambitious goal, California adopted the EPA SNAP rules by regulation and legislation, and the EPA CAA Section 608 Refrigerant Management rules by regulation. CARB proposed a transition date for air conditioning (AC) equipment to low-GWP refrigerants in 2021. In response to the 2017 proposal, AHRI, its members, and the Natural Resources Defense Council proposed to CARB to delay the transition date to 2023 to align with U.S. Department of Energy's new energy efficiency requirements, avoiding an additional transition.<sup>14,15</sup>

As of January 2020, CARB is drafting regulations that may require a transition of commercial refrigeration refrigerants to those below 150 GWP in 2022 and air conditioning refrigerants to those below 750 GWP by 2023.<sup>16</sup> California is also considering banning the use of refrigerants above 1500 GWP for service equipment (see figure below).

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<sup>13</sup> Public Workshop on Rulemaking Proposal: High Global Warming Potential Refrigerant Emissions Reductions California Air Resources Board October 24, 2017

[https://ww3.arb.ca.gov/cc/shortlived/meetings/10242017/public\\_workshop\\_snap-california\\_10-24-17\\_presentation.pdf?\\_ga=2.182187808.621576105.1573738237-276427812.1565094831](https://ww3.arb.ca.gov/cc/shortlived/meetings/10242017/public_workshop_snap-california_10-24-17_presentation.pdf?_ga=2.182187808.621576105.1573738237-276427812.1565094831)

<sup>14</sup> Public Workshop on Rulemaking Proposal: High Global Warming Potential Refrigerant Emissions Reductions California Air Resources Board, October 24, 2018.

[https://ww3.arb.ca.gov/cc/shortlived/meetings/10242017/public\\_workshop\\_snap-california\\_10-24-17\\_presentation.pdf?\\_ga=2.182187808.621576105.1573738237-276427812.1565094831](https://ww3.arb.ca.gov/cc/shortlived/meetings/10242017/public_workshop_snap-california_10-24-17_presentation.pdf?_ga=2.182187808.621576105.1573738237-276427812.1565094831)

<sup>15</sup> September 14, 2018 letter to the California Air Resources Board from AHRI and NRDC were found here as of October 29, 2020

[http://www.ahrinet.org/Portals/\\_Appleseed/documents/news/AHRI\\_NRDC\\_CARB\\_Letter\\_regarding\\_SLCP\\_HFC\\_measures.pdf](http://www.ahrinet.org/Portals/_Appleseed/documents/news/AHRI_NRDC_CARB_Letter_regarding_SLCP_HFC_measures.pdf)

<sup>16</sup> CARB's draft regulations could be found here as of February 15, 2020

<https://ww2.arb.ca.gov/sites/default/files/2020-01/2020-01-28%20CA%20SNAP%20Amendments%20-%20Reg%20Text-TP-KT.pdf>

## California Air Resources Board: Additional Measures

40% Reduction = 10% SNAP rules + 10% Kigali phase down + 20% additional measures

Proposal presented October 2018

Additional measures: Stationary refrigerant limits in new systems	GWP Limit	Date
Air conditioning systems (excluding chillers)	750	2023
New commercial refrigeration systems (>50 lbs)	150	2022

Service Ban*	GWP Limit	Date
	1500	2022

\*Potential exemptions: Reclaimed refrigerant and R-410A for stationary AC

### Bottom Line:

California emissions goals are driving regulations beyond SNAP and refrigerant management rules

- Additional commercial refrigeration measures
- AC measures



- EPA SNAP Rules 20 and 21: EPA regulations that changed the status of specific HFCs to unacceptable for specific sectors and equipment (e.g., R-404A for New Supermarket Systems January 1, 2017)

Example of “sector-based controls:”

- EPA Section 608 Refrigerant Management Regulation: Leak reduction, reclaim, administrative controls to reduce leaking equipment
- California Cooling Act: “The Lara Bill” – California statute adopted language from SNAP Rules 20 and 21 and granted CARB the authority to list and de-list refrigerants.
- CaSNAP: A CARB regulation that adopted the content of SNAP 20 & 21, with amended dates and included disclosure and recordkeeping requirements for enforcement.

Published December 27, 2018, with the first compliance date January 1, 2019.

- CARB HFC Emissions Reduction Measures I & II: A set of anticipated regulations sometimes called “CARB 1” and “CARB 2” or “Rulemaking I” and “Rulemaking 2.” Rulemaking I addresses stationary AC and is expected to set GWP limits at 750 in 2023; Rulemaking II addresses commercial refrigeration and is expected to set GWP limits as low as 150 for some products. This rulemaking will also initiate a substantial refrigerant management program to mitigate leaks.

HFC Commitments, Proposals, and Regulations by Other Climate Alliance States

For the most up-to-date information on HFC regulations adopted or under consideration by Climate Alliance states, see <http://www.ahrinet.org/Resources/Regulatory-Support/Refrigerant-Resources>.

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### Implementation Varies by Country

As noted earlier, under the Montreal Protocol each country can adopt its own regulations. There are generally four primary strategies used to regulate fluorocarbons, which are sometimes combined:

- Carbon taxes (used in Australia from 2012 – 2014)
- Quota and allocation system (Canada, Europe, Japan)
- GWP limits by sector (Canada, Europe, Japan)
- Refrigerant ban by sector (U.S. and most countries, for ODS)

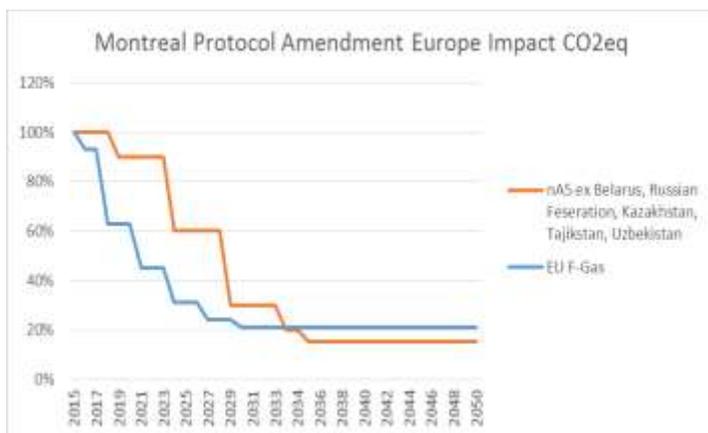
There are some variations to these and some ancillary requirements:

- Australia has a step down every two years instead of every five years as required under the Kigali HFC Amendment.
- Australia requires a refrigerant deposit, which is refunded for returned HFCs to encourage good refrigerant management.
- Japan has reclaim refrigerant requirements.

### The European Union

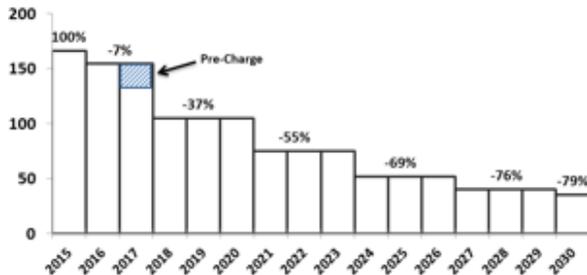
The European Union (EU) has accelerated its phasedown to be faster than the Kigali Amendment. Although the EU has GWP limits, they are much later than the phasedown steps. This has created a chaotic transition compared to the U.S. orderly ODS transition that implemented bans in other sectors prior to the phasedown of HCFC-22. If the EPA SNAP Rules 20 and 21 remained intact and provided bans prior to the start of the HFC phasedown, a more orderly transition would have been likely.

### European HFC Regulations: Quota and Allocation and GWP Limits



AHRI Refrigerant Forum, February 28, 2019.

**Cap basis: CO<sub>2</sub> Eq MT**  
CO<sub>2</sub>e sales 2009-2012



**• Equipment Ban:**

- **2015:** HFC ≥ 150; refrigerators/freezers – foam & refrigerant
- **2015:** HFC ≥ 2500; commercial refriger/freezers
- **2020:** HFC ≥ 2500; stationary refrigeration  
HFC ≥ 150; movable room air conditioners
- **2020:** HFC ≥ 150; XPS FOAM
- **2022:** HFC ≥ 150; commercial refrigerators/freezers
- **2023:** HFC ≥ 150; PU FOAM
- **2025:** HFC ≥ 750; single split air conditioners

**• Service Ban:**

- **2020:** Prohibit Service and maintenance of refrigeration equipment with a min charge size of 40 tonnes CO<sub>2</sub>-equivalent with refrigerants ≥ 2500 GWP

**Canada**

Canada also uses a combined quota and allocation system, but the significant steps down in Canada will be preceded by sector-based GWP limits to ensure a more orderly transition.

**CANADA – In Effect April 2018**

**Stationary**

- Stand-alone medium temperature commercial refrigeration systems: 2020, GWP limit of 1400
- Stand-alone low temperature commercial refrigeration systems: 2020, GWP limit of 1500
- Centralized refrigeration systems: 2020, GWP limit of 2200
- Chiller, GWP Limit 700 2025
- Transport refrigeration systems: 2025, GWP limit of 2200

MAC: 2021 150 GWP  
Aerosol: 2018 GWP 150  
Foams: 2021 GWP 150

Consumption and production baselines modeled after the Montreal Protocol HFC Amendment

Consumption Baseline / Production Baseline  
Baseline = 100% HFC + 75% of HCFC baseline

HFC Consumption Allowances

HFC consumption allowances pro-rata based on a company's average consumption in the years 2014 and 2015. Allowances distributed based on percentage of overall consumption multiplied by the Canadian baseline

There will be a review for interim changes before 2035 to consider A2L limits and other technical advancements

<https://www.ec.gc.ca/tcpe-cepa/eng/regulations/DetailReg.cfm?intReg=240>  
<http://www.gazette.gc.ca/rp-pr/p2/2017/2017-10-18/html/sor-dors216-eng.html>

**Kigali Amendment Ratified 2017**

- Import/Export permits needed for HFCs
- Consumption reporting needed for HFCs



Despite the well-planned transition in Canada, the province of Quebec finalized new HFC regulations in 2020: “Quebec Amendment to the Halocarbon Regulation” Government Decree 201-2020 March 18, 2020. The final regulation was published in the Gazette officielle du Québec April 1, 2020.<sup>17</sup>

<sup>17</sup> <http://www2.publicationsduquebec.gouv.qc.ca/dynamicSearch/telecharge.php?type=1&file=72114.pdf>

Application	Activity	GWP limit	Effective Date
Food conservation refrigeration Equipment (>50kW)	Installation	150	Jan 1, 2021
Refrigeration Equipment	Sales, distribution & installation	1500	Jan 1, 2021
Transport Refrigeration Equipment	Sales, distribution & installation	2200	Jan 1, 2021
Chillers	Sales, distribution & installation	750	Jan 1, 2025

### Safe Refrigerant Transition

Differences in the properties of low-GWP refrigerants (e.g., flammability and toxicity) may require changes to current practices to minimize risk while meeting climate regulations. Some low-GWP refrigerants are historic products that have not been used in some time or that will be used with larger charge sizes (e.g. ammonia and hydrocarbons). Some other low-GWP refrigerants are in earlier stages of commercial use (R-32 in EU, Japan and Australia air conditioning; R-1234yf in automotive air conditioning in US, Canada, EU, Japan, and Korea), and other low-GWP refrigerants are being proposed for commercialization.

According to Samantha Lile in “HVAC Industry Begins Adoption of R-32 Refrigerant,” published January 9, 2020, 25% (more than 25 million) of all residential units sold in Japan in 2018 contained R-32, a lower flammability refrigerant.<sup>18</sup> She also notes that according to Daikin Industries, R-32 is used in more than 84 million residential units in 70 different countries.

In 2012, an Australian carbon tax of \$23 Australian dollars per ton carbon dioxide was the impetus for a very fast conversion to low-GWP refrigerants, resulting in approximately \$10 and \$20 tax per pound of R-410A and R-404A respectively.<sup>19</sup> Despite the repeal of the carbon tax in 2014, in six years, a significant portion of the air conditioning in Australia has been converted to lower GWP refrigerants classified as lower flammability, A2L refrigerants

<sup>18</sup> <https://www.motili.com/author/samantha-lileicloud-com/>

<sup>19</sup> “Carbon tax: a timeline of its tortuous history in Australia” <https://www.abc.net.au/news/2014-07-10/carbon-tax-timeline/5569118> October 29, 2019; “The Carbon Tax in Australia” <https://www.centreforpublicimpact.org/case-study/carbon-tax-australia/> October 29, 2019; Australian - US Dollar Exchange Rate (AUD USD) - Historical Chart <https://www.macrotrends.net/2551/australian-us-dollar-exchange-rate-historical-chart> October 29, 2020.

Members of the Air-Conditioning, Heating, and Refrigeration Institute note that it has yet to find incidents related to A2L refrigerants; however, there have been reported incidents related to A3 or highly flammable refrigerants.<sup>20</sup> The difference may be in part attributed to the analysis completed by stakeholders of the Australian supply chain and the new requirement that a license is required to purchase an HFC.

Inspired by the success in Australia, the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) initiated the *Safe Refrigerant Transition Task Force* in 2019 to evaluate the end-to-end supply chain for conversion readiness with all interested stakeholders, determine needs, and resolve issues or make recommendations (e.g. policy changes) to enable the safe commercialization of low-GWP refrigerants in a timely manner. It is working to establish a structure to ensure ongoing improvement in incident investigation; continuous maintenance standards; and training upgrades. The Task Force is also leveraging learnings around the world, including the widespread use of A2L refrigerants in HVACR products in the European Union, Japan, India, and Australia, as well as the auto industry (including US and Canada).

The **Safe Transition Task Force** has seven working groups that are open to interested participants:

- Communications
- Safety Training
- Codes and Standards
- Transportation/Storage/Packaging/Handling
- Bulk Storage and Manufacturing Facilities
- Installation/Operation/Maintenance
- Recovery/Reclaim/Destruction

Interested in the Safe Refrigerant Transition Task Force? Visit <http://www.ahrinet.org/SafeRefrigerant> or contact:

Helen Water-Terrinoni - [HWalter-Terrinoni@ahrinet.org](mailto:HWalter-Terrinoni@ahrinet.org)

Christophe Bresee - [CBresee@ahrinet.org](mailto:CBresee@ahrinet.org)

Gregory Baker – [GBaker@ahrinet.org](mailto:GBaker@ahrinet.org)

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<sup>20</sup> For example: “Hydrocarbon Gas Blamed for Fatal Explosion <https://www.coolingpost.com/world-news/hydrocarbon-gas-blamed-for-fatal-explosion>; October 29, 2030