The EPA Administrator, Michael S. Regan, signed the following final rule on 10/05/23, and EPA is submitting it for publication in the *Federal Register* (FR). While we have taken steps to ensure the accuracy of this Internet version of the rule, it is not the official version of the rule for purposes of compliance or effectiveness. Please refer to the official version in a forthcoming FR publication, which will appear on the Government Printing Office's website (www.gpo.gov/fdsys/search/home.action) and on Regulations.gov (www.regulations.gov) in Docket No. EPA-HQ-OAR-2021-0643. Once the official version of this document is published in the FR, this version will be removed from the Internet and replaced with a link to the official version.

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6560-50-P

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 84

[EPA-HQ-OAR-2021-0643; FRL-8831-02-OAR]

Phasedown of Hydrofluorocarbons: Restrictions on the Use of Certain Hydrofluorocarbons under the American Innovation and Manufacturing Act of 2020

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: The U.S. Environmental Protection Agency is issuing regulations to implement certain provisions of the American Innovation and Manufacturing Act, as enacted on December 27, 2020. This rulemaking restricts the use of hydrofluorocarbons in specific sectors or subsectors in which they are used; establishes a process for submitting technology transitions petitions; establishes recordkeeping and reporting requirements; and addresses certain other elements related to the effective implementation of the American Innovation and Manufacturing Act. These restrictions on the use of hydrofluorocarbons address petitions granted on October 7, 2021, and September 19, 2022.

DATES: This rule is effective [**INSERT DATE 60 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER**].

FOR FURTHER INFORMATION CONTACT: Allison Cain, Stratospheric Protection Division, Office of Atmospheric Protection (Mail Code 6205A), Environmental Protection Agency, 1200 Pennsylvania Ave. NW, Washington, DC 20460; telephone

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number: 202-564-1566; email address: *cain.allison@epa.gov*. You may also visit EPA's website at *https://www.epa.gov/climate-hfcs-reduction* for further information.

SUPPLEMENTARY INFORMATION:

Throughout this document, whenever "we," "us," "the Agency," or "our" is used, we mean EPA. Acronyms and abbreviations that are used in this rulemaking that may be helpful include:

AC – Air Conditioning
ACIM - Automatic Commercial Ice Machine
AHAM – Association of Home Appliance Manufacturers
AHRI – Air-Conditioning, Heating, and Refrigeration Institute
AIM Act – American Innovation and Manufacturing Act of 2020
ANSI – American National Standards Institute
AR4 – Fourth Assessment Report of the Intergovernmental Panel on Climate Change
ASHRAE – American Society of Heating, Refrigerating and Air-Conditioning Engineers
CAA – Clean Air Act
CARB – California Air Resources Board
CBI – Confidential Business Information
CBP – U.S. Customs and Border Protection
CDR – Chemical Data Reporting
CFC – Chlorofluorocarbon
CH_4 – Methane
CO_2 – Carbon Dioxide
DOE – U.S. Department of Energy
DX – Direct Expansion
EAV – Equivalent Annualized Value
e-GGRT – Electronic Greenhouse Gas Reporting Tool
EEAP – Environmental Effects Assessment Panel
EIA – Environmental Investigation Agency
EPA – U.S. Environmental Protection Agency
EU – European Union
FDA – U.S. Food and Drug Administration
FR – *Federal Register*
GDP – Gross Domestic Product
GHG – Greenhouse Gas
GHGRP – Greenhouse Gas Reporting Program
GWP – Global Warming Potential
HCFC – Hydrochlorofluorocarbon
HCFO – Hydrochlorofluoroolefin
HCPA – Household and Commercial Products Association
HD – Heavy-duty
HFC – Hydrofluorocarbon
HFO – Hydrofluoroolefin

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IAM – Integrated Assessment Model
IAPMO – International Association of Plumbing and Mechanical Officials
ICC – International Code Council
ICR – Information Collection Request
IIAR – International Institute of Ammonia Refrigeration
IPR – Industrial Process Refrigeration
IPCC – Intergovernmental Panel on Climate Change
IT – Information Technology
ITEF – Information Technology Equipment Facilities
IWG – Interagency Working Group on the Social Cost of Greenhouse Gases
LD – Light-duty
LFL – Lower Flammability Limit
MAC – Marginal Abatement Cost
MDPV – Medium-duty Passenger Vehicle
$MMTCO_2e$ – Million Metric Tons of Carbon Dioxide Equivalent
MMTEVe – Million Metric Tons of Exchange Value Equivalent
MVAC – Motor Vehicle Air Conditioning
MY – Model Year
N_2O – Nitrous oxide
NAICS – North American Industry Classification System
NAMA – National Automatic Merchandising Association
NATA – National Air Toxics Assessment
NFPA –National Fire Protection Association
NRDC – Natural Resources Defense Council
NRTL – Nationally Recognized Testing Laboratory
OEM – Original Equipment Manufacturer
ODS – Ozone-depleting Substance
OMB – U.S. Office of Management and Budget
OSHA – Occupational Safety and Health Administration
PFAS – Per- and Polyfluoroalkyl Substances
PFC – Perfluorocarbon
PRA – Paperwork Reduction Act
PTAC – Packaged Terminal Air Conditioner
PTHP – Packaged Terminal Heat Pump
PV – Present Value
RACHP – Refrigeration, Air Conditioning, and Heat Pumps
RFA – Regulatory Flexibility Act
RIA – Regulatory Impact Analysis
RTOC – Refrigeration, Air Conditioning and Heat Pumps Technical Options Committee
SBREFA – Small Business Regulatory Enforcement Fairness Act
SC-GHG – Social Cost of GHGs
SC-HFCs – Social Costs of Hydrofluorocarbons
SF_6 – Sulfur Hexafluoride
SMRE – Semiconductor Manufacturing and Related Equipment
SNAP – Significant New Alternatives Policy
TEAP – Technology and Economic Assessment Panel
TFA – Trifluoroacetic Acid
TLV-TWA – Threshold Limit Value-Time-Weighted Average

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TOC – Technical Options Committee
TRI – Toxics Release Inventory
TSD – Technical Support Document
UL – Underwriters Laboratories Inc
VOCs – Volatile Organic Compounds
VRF – Variable Refrigerant Flow
WMO – World Meteorological Organization

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I. Executive Summary

A. What is the purpose of this regulatory action?

The U.S. Environmental Protection Agency (EPA) is issuing regulations to implement certain provisions of the American Innovation and Manufacturing Act of 2020, codified at 42 U.S.C. 7675 (AIM Act or the Act). The AIM Act authorizes EPA to address hydrofluorocarbons (HFCs) in three main ways: phasing down HFC production

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and consumption through an allowance allocation program;[1] promulgating certain regulations for purposes of maximizing reclamation and minimizing releases of HFCs from equipment; and facilitating sector-based transitions to next-generation technologies. This rulemaking focuses on the third area—facilitating the transition to next-generation technologies by restricting use of HFCs in the sectors or subsectors in which they are used.

Subsection (i) of the Act, entitled "Technology Transitions," authorizes EPA, by rulemaking, to restrict the use of regulated substances (used interchangeably with "HFCs" in this document) in sectors or subsectors where the regulated substances are used.[2] The Act also includes provisions for the public to petition EPA to initiate such a rulemaking. On October 7, 2021, and September 19, 2022, EPA granted 12 petitions and partially granted one petition (hereby referred to as "granted petitions") requesting restrictions on the use of HFCs in various sectors and subsectors (86 FR 57141, October 14, 2021). The Act directs EPA to promulgate a final rule within two years after the date on which the Agency grants a petition. This rulemaking, in part, addresses the granted petitions.

This rulemaking further addresses the framework for how EPA intends to implement its authority to restrict the use of HFCs in sectors and subsectors where they are used. It includes provisions to support implementation of, compliance with, and enforcement of statutory and regulatory requirements under subsection (i) of the Act. To

[1] EPA has issued regulations establishing and codifying a framework for phasing down HFC production and consumption through an allowance allocation program, "Phasedown of Hydrofluorocarbons: Establishing the Allowance Allocation and Trading Program Under the American Innovation and Manufacturing Act" (86 FR 55116, October 5, 2021). That rule is referred to as the "Allocation Framework Rule" throughout this document. EPA finalized a separate rulemaking to update certain aspects of that regulatory framework (see final rule at 88 FR 46836, July 20, 2023).

[2] The Act lists 18 saturated HFCs, and by reference any of their isomers not so listed, that are covered by the statute's provisions, referred to as "regulated substances" under the Act.

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provide the public with additional information about this new program, this document also includes a description of how EPA intends to implement certain aspects of the program, such as the processing of petitions to restrict the use of HFCs in sectors and subsectors in which they are used under subsection (i) of the Act.

B. What is the summary of this regulatory action?

EPA is establishing the process and information requirements for submitting petitions under subsection (i) of the AIM Act and describing how the Agency intends to evaluate those petitions. Upon receiving a petition, the Agency will consider, to the extent practicable, the factors listed in subsection (i)(4) of the AIM Act in making a determination to grant or deny the petition. Consistent with the Act, EPA considered these factors to the extent practicable in establishing the restrictions on the use of HFCs in this rulemaking.

EPA is restricting the use of HFCs, whether neat or used in a blend, with high global warming potentials (GWPs) within the refrigeration, air conditioning, and heat pump (RACHP), foam, and aerosol sectors. EPA is prohibiting the manufacture, import, or installation of certain equipment across approximately 40 subsectors, either based on overall GWP limits or restrictions on use of specific HFCs. The compliance dates for these restrictions vary depending on the subsector ranging from January 1, 2025, to January 1, 2028. The final rule prohibits the sale, distribution, and export of factory completed products that do not comply with the relevant restrictions three years after the prohibition on manufacture and import. EPA is not regulating at this time actions with respect to components needed to service or repair existing systems. EPA is finalizing labeling, annual reporting, and recordkeeping requirements for products and specified

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components that are imported or domestically manufactured that use or are intended to use an HFC.

C. What is the summary of the costs and benefits of this action?

EPA is providing a summary of the costs and benefits of restricting use of HFCs consistent with this rule. The full analyses, presented in the *American Innovation and Manufacturing Act of 2020 – Subsection (i)(4) Factors for Determination: Costs and Environmental Impacts*, referred to in this preamble as the Costs and Environmental Impacts technical support document (TSD) and in a regulatory impact analysis (RIA) addendum to the Allocation Framework RIA, are contained in the docket to this rule. These analyses—as summarized below—highlight economic costs and benefits, including benefits from HFC consumption and emission reductions.

EPA relied on previous analyses conducted for the Allocation Framework Rule (86 FR 55116, October 5, 2021) and the 2024 Allocation Rule, "Phasedown of Hydrofluorocarbons: Allowance Allocation Methodology for 2024 and Later Years" (88 FR 46836, July 20, 2023), as a starting point for the assessment of costs and benefits of this rule. In this way, EPA analyzed the incremental impacts of this rule, attributing benefits only insofar as they are additional to those already assessed in the Allocation Framework RIA and 2024 Allocation Rule RIA addendum (collectively referred to as "Allocation Rules" in this discussion.[3]

The additional benefits of this rule relative to the Allocation Rules may vary depending on the mix and timing of industry transitions made to achieve compliance in affected subsectors. In its analysis of the Allocation Rules, EPA estimated that regulated

[3] In a separate action, EPA has also issued a rule to amend the production baseline downwards by 0.005% to reflect corrected data (88 FR 44220, July 12, 2023).

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entities would adopt specific technology transition options to achieve compliance with the statutory allowance cap step-downs. Industry is already making many of these transitions, and we expect that achieving the allowance cap step-downs will require many of the same subsector-specific technology transitions that are also required by this rule. However, this rule may in some cases require regulated entities to further accelerate transitions in specific subsectors, relative to what EPA previously assumed in its analysis of the Allocation Rules. Conversely, entities in a discrete set of subsectors not covered by this rule could conceivably forgo or delay adopting abatement options that were assumed to be undertaken to comply with the Allocation Rules.

Given this uncertainty, EPA analyzed two scenarios to represent the range of potential incremental impacts resulting from this rule: a "base case" and "high additionality case." Both scenarios use the results from the Allocation Framework Rule as a starting point and count benefits in terms of reductions of consumption and emissions only in cases where this rule results in additional reductions in HFC consumption. The "base case" represents a conservative assessment of benefits and assumes that any industry activity not necessary for compliance is excluded. In other words, the scenario excludes consumption reductions not covered by a GWP restriction in this rule. By contrast, the "high additionality case" is a less conservative scenario and assumes that HFC consumption reduction activities not covered by this rule would remain consistent with the Allocation Framework Rule reference scenario (*i.e.*, neither increase nor decrease in response to this rule). Based on the results of these two scenarios, which are detailed further in the Costs and Environmental Impacts TSD and the RIA addendum, EPA estimates that additional emission reductions through 2050 would range from an annual average of 3 to 34 million metric tons of carbon dioxide

equivalent ($MMTCO_2e$)[4] in the base case and high additionality case, respectively. These emission reductions generally lag the anticipated incremental consumption reductions, which range from an annual average of 28 to 43 $MMTCO_2e$.

Table 1 summarizes the reductions in both consumption and emissions as described in the Costs and Environmental Impacts TSD and the RIA addendum for this final rule. The table shows the cumulative incremental reductions—that is, the difference in reductions compared with the Allocation Framework Rule reference scenario—from the final rule over the time period 2025 through 2050. Both the base case and high additionality case results show a net reduction in consumption and emissions on a cumulative basis through 2050.

Table 1–Incremental Consumption and Emission Reductions in the Technology Transitions Rule Base Case and High Additionality Case Compared to the Allocation Rule Reference Case

Cumulative Incremental Consumption Reductions ($MMTCO_2e$) — 2025–2050		**Cumulative Incremental Emission Reductions ($MMTCO_2e$) — 2025–2050**	
Technology Transitions Rule Base Case	*Technology Transitions High Additionality Case*	*Technology Transitions Rule Base Case*	*Technology Transitions High Additionality Case*
720	1,113	83	876

Although the base case is a reasonable projection of the potential impacts of this rule, there is reason to believe that it is a conservative one, and that the incremental emission reductions associated with this final rule could be far greater than reflected in the base case scenario. Previous regulatory programs to reduce chemical use in the affected industries show that regulated entities do not limit their response to the required compliance level; rather, regulated entities may take additional actions that transform

[4] The exchange values provided in the AIM Act are numerically equivalent to the 100-year integrated global warming potentials provided in IPCC (2007). EPA provides values in CO_2e and notes that the same values would be used if expressed in exchange value equivalents.

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industry practices for various reasons, including the anticipation of future restrictions, strengthening their competitive position, and supporting overall environmental goals. For example, U.S. production and consumption of ozone-depleting substances (ODS) during their phaseout was consistently below the limits established under the Montreal Protocol. For this reason, the high additionality case assumes certain abatement options not covered by the final rule—but which were assumed in the prior accounting of benefits for the Allocation Rules—continue to be undertaken. Based on the two scenarios, on a cumulative basis this rule is expected to yield incremental emission reductions ranging from 83 to 876 $MMTCO_2e$ through 2050 (respectively, about 2 percent and 20 percent of the total emission reductions over that same time period in the Allocation Rules analyses). In the RIA addendum, we estimate the present value of these incremental benefits to be between $3.01 billion and $50.4 billion in 2020 dollars.

EPA also estimates that this rule will result in potentially lower compliance costs relative to those previously assessed for the Allocation Rules. These additional savings stem largely from assumed energy efficiency gains and lower cost refrigerants associated with the technological transitions necessary to meet the requirements.[5] The present value of cumulative incremental costs or savings from 2025–2050 is estimated to be between $1 million in costs and $2.1 billion in savings, when using a 7 percent discount rate, or between $1.6 billion and $4.5 billion in savings, when using a 3 percent discount rate (in 2020 dollars). As with EPA's estimates of benefits for this rule, these estimated costs or

[5] As discussed in the RIA Addendum, incremental savings estimated for this rule stem largely from more rapid and more comprehensive transitions to cost-saving, lower-GWP technologies in certain subsectors than was previously estimated for the HFC Allocation Framework Rule. Similarly comprehensive transitions were not assumed in the Allocation Rules analysis, since it assumed that—absent regulatory requirements—newer technologies may still face some industry inertia and shift less rapidly regardless of potential energy savings or other benefits over time.

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savings reflect only what is incremental to EPA's previously estimated compliance pathway for the Allocation Rules.[6]

Table 2 summarizes key findings from the RIA addendum, including the present value (PV) and equivalent annualized value (EAV) of cumulative incremental climate benefits, costs, and net benefits of this rule over the 2025–2050 time period. Climate benefits are discounted at 3 percent, and costs are presented using both a 3 percent and 7 percent discount rate. The climate benefits and net benefits findings were not used for decisional purposes and are provided for informational and illustrative purposes only.

Table 2 – PV and EAV of Cumulative Incremental Climate Benefits, Costs, and Net Benefits for 2025 through 2050 (millions of 2020$, discounted to 2022)[a,b,c,d]

	Base Case					*High Additionality Case*				
	Incremental Climate Benefits (3%)	Annual Costs (negative values are savings)		Net Benefits (3% benefits, 3% or 7% costs)[e]		Incremental Climate Benefits (3%)	Annual Costs (negative values are savings)		Net Benefits (3% benefits, 3% or 7% costs)[e]	
Discount rate	**3%**	**3%**	**7%**	**3%**	**7%**	**3%**	**3%**	**7%**	**3%**	**7%**
PV	$3,013	($4,549)	($2,073)	$7,561	$5,086	$50,406	($1,601)	$1	$52,007	$50,405
EAV	$184	($278)	($215)	$462	$399	$3,081	($98)	$0	$3,179	$3,081

[a] Benefits include only those related to climate. Climate benefits are based on changes in HFC emissions and are calculated using four different estimates of the SC-HFCs (model average at 2.5 percent, 3 percent, and 5 percent discount rates; 95th percentile at 3 percent discount rate). For purposes of this table, we show the effects associated with the model average at a 3 percent discount rate, but the Agency does not have a single central SC-HFC point estimate. We emphasize the importance and value of considering the benefits calculated using all four SC-HFC estimates. As discussed in Chapter 5 of the RIA addendum a consideration of climate effects calculated using discount rates below 3 percent, including 2 percent and lower, is also warranted when discounting intergenerational impacts.
[b] Rows may not appear to add correctly due to rounding.
[c] The annualized present value of costs and benefits are calculated as if they occur over a 26-year period from 2025 to 2050.
[d] The PV for the 7% net benefits column is found by taking the difference between the PV of climate benefits at 3% and the PV of costs discounted at 7%. Due to the intergenerational nature of climate impacts the social rate of return to capital, estimated to be 7 percent in Office of Management and Budget's Circular A-4, is not appropriate for use in calculating PV of climate benefits.

[6] In the 2024 Allocation Rule RIA Addendum, EPA estimated present value net savings for the period of 2022–2050 of $9 billion discounted at 3 percent and $4.8 billion at 7 percent, in 2020 dollars, discounted to 2022. Estimated net savings for the TT Rule are incremental to these prior estimates.

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Some of the information regarding projected impacts of this rule, including cost estimates and anticipated environmental impacts, was considered by EPA in its assessment of certain factors listed in subsection (i)(4) of the AIM Act.[7] The cost and benefit information relied upon by EPA in its consideration of the subsection (i)(4) factors is compiled in the Costs and Environmental Impacts TSD. As discussed in section VI.E, EPA chose to use certain cost and environmental benefit information that it had generated in conducting its RIA addendum in considering certain factors under subsection (i)(4), but we expect that in future rulemakings we may consider different types of information to address the (i)(4) factors. In assessing the (i)(4) factors for this rule, as summarized in the Costs and Environmental Impacts TSD, EPA considered estimates of costs of the action, without incorporating the social costs of HFCs (SC-HFCs), and estimates of cumulative consumption and emission reductions for 2025–2050 of 720 to 1,113 $MMTCO_2e$ and 83 to 876 $MMTCO_2e$, respectively. The analysis demonstrates net positive incremental environmental impacts (*i.e.*, HFC consumption and emission reductions) and cost savings relative to the compliance pathway evaluated for the Allocation Rules. However, there was no specific quantitative threshold for positive incremental impacts used to evaluate the subsection (i)(4) factors. Rather, in its review, to the extent practicable, of the overall economic costs and environmental impacts, as compared to historical trends, the Agency issued the final restrictions after considering the general findings that: a) there are in fact positive incremental impacts expected from this rule, and b) that the overall impact of the regulations implemented under the AIM

[7] Subsection (i)(4) of the AIM Act contains a list of factors that the statute directs EPA to consider, to the extent practicable, when carrying out a rulemaking or making a determination to grant or deny a petition.

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Act to date (including both the Allocation Rules and this rule) remains net positive in terms of overall costs and environmental impacts.[8]

Although EPA is using SC-HFCs for purposes of some of the analysis in the RIA addendum, this action does not rely on those estimates of these costs as a record basis for the Agency action, and EPA would reach this rule's conclusions even in the absence of the social costs of HFCs.

Additional information on this analysis can be found in section IX of this preamble and in the Costs and Environmental Impacts TSD and RIA addendum contained in the docket.

II. General Information

A. Does this action apply to me?

You may be potentially affected by this rule if you manufacture, import, export, sell, distribute, or install equipment that uses or is intended to use HFCs, such as refrigeration and air-conditioning systems, foams, and aerosols. Potentially affected categories, by North American Industry Classification System (NAICS) code, are included in Table 3.

Table 3–NAICS Classification of Potentially Affected Entities

NAICS Code	NAICS Industry Description
238220	Plumbing, Heating, and Air Conditioning Contractors
311812	Commercial Bakeries
321999	All Other Miscellaneous Wood Product Manufacturing
322299	All Other Converted Paper Product Manufacturing
324191	Petroleum Lubricating Oil and Grease Manufacturing
324199	All Other Petroleum and Coal Products Manufacturing
325199	All Other Basic Organic Chemical Manufacturing
325211	Plastics Material and Resin Manufacturing

[8] We note, however, that subsection (i)(4)(C) plainly does not require a finding that the environmental impacts of a rule exceed the economic costs.

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NAICS Code	NAICS Industry Description
325412	Pharmaceutical Preparation Manufacturing
325414	Biological Product (except Diagnostic) Manufacturing
325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing
326150	Urethane and Other Foam Product
326299	All Other Rubber Product Manufacturing
327999	All Other Miscellaneous Nonmetallic Mineral Product Manufacturing
332812	Metal Coating, Engraving (except Jewelry and Silverware), and Allied Services to Manufacturers
332999	All Other Miscellaneous Fabricated Metal Product Manufacturing
333415	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing
333511	Industrial Mold Manufacturing
333912	Air and Gas Compressor Manufacturing
333999	All Other Miscellaneous General Purpose Machinery Manufacturing
334419	Other Electronic Component Manufacturing
335220	Major Household Appliance Manufacturing
336120	Heavy Duty Truck Manufacturing
336212	Truck Trailer Manufacturing
336214	Travel Trailer and Camper Manufacturing
3363	Motor Vehicle Parts Manufacturing
3364	Aerospace Product and Parts Manufacturing
336411	Aircraft Manufacturing
336611	Ship Building and Repairing
336612	Boat Building
336992	Military Armored Vehicle, Tank, and Tank Component Manufacturing
337214	Office Furniture (Except Wood) Manufacturing
339112	Surgical and Medical Instrument Manufacturing
339113	Surgical Appliance and Supplies Manufacturing
339999	All Other Miscellaneous Manufacturing
423120	Motor Vehicle Supplies and New Parts Merchant Wholesalers
423450	Medical, Dental, and Hospital Equipment and Supplies Merchant Wholesalers
423610	Electrical Apparatus and Equipment, Wiring Supplies, and Related Equipment Merchant Wholesalers
423620	Household Appliances, Electric Housewares, and Consumer Electronics Merchant Wholesalers
423690	Other Electronic Parts and Equipment Merchant Wholesalers
423720	Plumbing and Heating Equipment and Supplies (Hydronics) Merchant Wholesalers
423730	Warm Air Heating and Air-Conditioning Equipment and Supplies Merchant Wholesalers
423740	Refrigeration Equipment and Supplies Merchant Wholesalers
423830	Industrial Machinery and Equipment Merchant Wholesalers
423840	Industrial Supplies Merchant Wholesalers

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NAICS Code	NAICS Industry Description
423850	Service Establishment Equipment and Supplies Merchant Wholesalers
423860	Transportation Equipment and Supplies (except Motor Vehicle) Merchant Wholesalers
423990	Other Miscellaneous Durable Goods Merchant Wholesalers
424690	Other Chemical and Allied Products Merchant Wholesalers
424820	Wine and Distilled Alcoholic Beverage Merchant Wholesalers
443142	Electronics Stores
444190	Other Building Material Dealers
445110	Supermarkets and Other Grocery (except Convenience) Stores
445131	Convenience Retailers
445298	All Other Specialty Food Retailers
449210	Appliance Stores, Household-Type
453998	All Other Miscellaneous Store Retailers (except Tobacco Stores)
45711	Gasoline Stations With Convenience Stores
481111	Scheduled Passenger Air Transportation
531120	Lessors of Nonresidential Buildings (except Miniwarehouses)
541330	Engineering Services
541380	Testing Laboratories
541512	Computer Systems Design Services
541519	Other Computer Related Services
541620	Environmental Consulting Services
562111	Solid Waste Collection
562211	Hazardous Waste Treatment and Disposal
562920	Materials Recovery Facilities
621498	All Other Outpatient Care Centers
621999	All Other Miscellaneous Ambulatory Health Care Services
72111	Hotels (Except Casino Hotels) and Motels
72112	Casino Hotels
72241	Drinking Places (Alcoholic Beverages)
722513	Limited-Service Restaurants
722514	Cafeterias, Grill Buffets, and Buffets
722515	Snack and Nonalcoholic Beverage Bars
81119	Other Automotive Repair and Maintenance
811219	Other Electronic and Precision Equipment Repair and Maintenance
811412	Appliance Repair and Maintenance
922160	Fire Protection

Table 3 is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be regulated by this action. This table lists the types of entities that EPA expects could potentially be regulated by this action. Other types of entities not listed in the table could also be regulated. To determine whether your entity may be

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regulated by this action, you should carefully examine the regulatory text at the end of this document. If you have questions regarding the applicability of this action to a particular entity, consult the person listed in the **FOR FURTHER INFORMATION CONTACT** section.

B. What is EPA's authority for taking this action?

On December 27, 2020, the AIM Act was enacted as section 103 in Division S, Innovation for the Environment, of the Consolidated Appropriations Act, 2021 (codified at 42 U.S.C. 7675). Subsection (k)(1)(C) of the Act provides that Clean Air Act (CAA) sections 113, 114, 304, and 307 apply to the AIM Act and any regulations EPA promulgates under the AIM Act as though the AIM Act were part of title VI of the CAA. Accordingly, this rulemaking is subject to CAA section 307(d) (*see* 42 U.S.C. 7607(d)(1)(I)) (CAA section 307(d) applies to "promulgation or revision of regulations under subchapter VI of this chapter (relating to stratosphere and ozone protection)").

The AIM Act authorizes EPA to address HFCs by providing new authorities in three main areas: phasing down the production and consumption of listed HFCs; managing these HFCs and their substitutes; and facilitating the transition to next-generation technologies by restricting use of these HFCs in the sector or subsectors in which they are used. This rulemaking focuses on the third area: the transition to next-generation technologies by restricting use of these HFCs in the sector or subsectors in which they are used.

In subsection (k)(1)(A), the AIM Act provides EPA with the authority to promulgate necessary regulations to carry out EPA's functions under the Act, including its obligations to ensure that the Act's requirements are satisfied. Subsection (i) of the AIM Act, "Technology Transitions," provides that "the Administrator may by rule

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restrict, fully, partially, or on a graduated schedule, the use of a regulated substance in the sector or subsector in which the regulated substance is used." 42 U.S.C. 7675(i)(1). The Act lists 18 saturated HFCs, and by reference any of their isomers not so listed, that are covered by the statute's provisions, referred to as "regulated substances" under the Act.[9] (42 U.S.C. 7675(c)(1)). EPA is also authorized to designate additional substances that meet certain criteria as regulated substances (42 U.S.C. 7675(c)(3)). EPA has not so designated any additional substances, and the list of 18 regulated substances can also be found in appendix A of 40 CFR part 84. Through this rule, EPA is restricting the use of certain HFCs, whether neat or used in a blend, in specific sectors or subsectors, based on EPA's consideration of the factors listed in subsection (i)(4) of the AIM Act.

A rulemaking restricting the use of regulated substances in sectors or subsectors can be initiated by EPA on its own accord, or a person may petition EPA to promulgate such a rule. Specifically, subsection (i)(3)(A) states, "A person may petition the Administrator to promulgate a rule under [subsection (i)(1)] for the restriction on use of a regulated substance in a sector or subsector." Where the Agency grants such a petition submitted under subsection (i), the statute requires that "the Administrator shall promulgate a final rule not later than 2 years after the date on which the Administrator grants the petition." (42 U.S.C. 7675(i)(3)(C)(ii)). This rule addresses the granted petitions under subsection (i).

Furthermore, prior to proposing a rule, subsection (i)(2)(A) directs EPA to consider negotiating with stakeholders in the sector or subsector subject to the potential rule in accordance with negotiated rulemaking procedures established under subchapter

[9] As noted previously in this document, "regulated substance" and "HFC" are used interchangeably in this document.

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III of chapter 5 of title 5, United States Code (5 U.S.C. 563, commonly known as the "Negotiated Rulemaking Act of 1990"). A brief discussion on EPA's consideration of using negotiated rulemaking procedures and its decision not to use such procedures prior to proposal can be found in section VI.B of the proposed rule (87 FR 76775; December 15, 2022, hereafter "proposed rule").

EPA is also finalizing measures designed to assist with enforcement and to help ensure compliance with the HFC use restrictions, including recordkeeping, reporting, and labeling requirements. Reporting is also necessary to inform EPA of the transitions that are occurring in those sectors and subsectors addressed by this rule. EPA notes that subsection (k)(1)(C) of the AIM Act states that section 114 of the CAA applies to the AIM Act and rules promulgated under it as if the AIM Act were included in title VI of the CAA. Thus, section 114 of the CAA, which provides authority to the EPA Administrator to require recordkeeping and reporting in carrying out provisions of the CAA, also applies to and supports this rulemaking.

Subsection (i)(6) of the AIM Act states that "[n]o rule under this subsection may take effect before the date that is 1 year after the date on which the Administrator promulgates the applicable rule under this subsection." EPA interprets this provision as applying to the establishment of restrictions on use of HFCs under subsection (i)(1) of the Act. Therefore, EPA is establishing compliance dates for the restrictions on the manufacture and import of products and installation of systems that are at least one year from the date this rule is promulgated, in accordance with this statutory provision.

The provisions pertaining to program administration and petitions processing (*i.e.*, § 84.62) do not include a delayed compliance date, and those provisions will come into effect 60 days after publication of the final rule in the *Federal Register*. This approach is

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based on an interpretation that subsection (i)(6) does not apply to those administrative provisions because "applicable rules" in (i)(6) are limited to rules that apply use restrictions under (i)(1). As a practical matter, the regulated industry to which a use restriction rule is being applied may need a full year to come into compliance with that restriction. While a petitioner may need some amount of time to collect the information needed in a petition, 60 days is a reasonable timeframe in which to do so. EPA did not receive comments on this approach.

III. Background

A. What are HFCs?

HFCs are anthropogenic[10] fluorinated chemicals that have no known natural sources. HFCs are used in a variety of applications such as refrigeration and air conditioning, foam blowing agents, solvents, aerosols, and fire suppression. HFCs are potent greenhouse gases (GHGs) with 100-year GWPs (a measure of the relative climatic impact of a GHG) that can be hundreds to thousands of times that of carbon dioxide (CO_2).

HFC use and emissions have been growing worldwide due to the global phaseout of ODS under the Montreal Protocol and the increasing use of refrigeration and air-conditioning equipment globally.[11] HFC emissions had previously been projected to increase substantially over the next several decades. In 2016, in Kigali, Rwanda, countries agreed to adopt an amendment to the Montreal Protocol, known as the Kigali

[10] While the overwhelming majority of HFC production is intentional, EPA is aware that HFC-23 can be a byproduct associated with the production of other chemicals, including but not limited to hydrochlorofluorocarbon (HCFC)-22 and other fluorinated gases.
[11] World Meteorological Organization (WMO), Scientific Assessment of Ozone Depletion: 2022, GAW Report No. 278, 509 pp., WMO, Geneva, Switzerland, 2022. Available at: *https://ozone.unep.org/system/files/documents/Scientific-Assessment-of-Ozone-Depletion-2022.pdf*.

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Amendment, which provides for a global phasedown of the production and consumption of HFCs. The United States ratified the Kigali Amendment on October 31, 2022. Global adherence to the Kigali Amendment would substantially reduce future emissions, leading to a peaking of HFC emissions before 2040.[12,13]

Atmospheric observations of most currently measured HFCs confirm their abundances are increasing at accelerating rates. Total emissions of HFCs increased by 23 percent from 2012 to 2016[14] and a further 19 percent from 2016 to 2020.[15] The four most abundant HFCs in the atmosphere, in GWP-weighted terms, are HFC-134a, HFC-125, HFC-23, and HFC-143a.[16]

HFCs excluding HFC-23 accounted for a radiative forcing of 0.025 W/m^2 in 2016 rising to 0.037 W/m^2 in 2020. This radiative forcing was projected to increase by an order of magnitude to 0.25 W/m^2 by 2050. If the Kigali Amendment were to be fully implemented, it would be expected to reduce the future radiative forcing due to HFCs (excluding HFC-23) to 0.13 W/m^2 in 2050 which is a reduction of about 50 percent compared with the radiative forcing projected in the business-as-usual scenario of uncontrolled HFCs.[17]

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[12] Ibid.
[13] A recent study estimated that global compliance with the Kigali Amendment is expected to lower 2050 annual emissions by 3.0–4.4 million metric tons of carbon dioxide equivalent ($MMTCO_2e$). Guus J.M. Velders et al. Projections of hydrofluorocarbon (HFC) emissions and the resulting global warming based on recent trends in observed abundances and current policies. Atmos. Chem. Phys., 22, 6087–6101, 2022. Available at: *https://doi.org/10.5194/acp-22-6087-2022*.
[14] World Meteorological Organization (WMO), Scientific Assessment of Ozone Depletion: 2018, World Meteorological Organization, Global Ozone Research and Monitoring Project—Report No. 58, 588 pp., Geneva, Switzerland, 2018. Available at: *https://ozone.unep.org/sites/default/files/2019-05/SAP-2018-Assessment-report.pdf*.
[15] WMO, 2022.
[16] Ibid.
[17] Velders, 2022.

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There are hundreds of possible HFC compounds. The 18 HFCs listed as regulated substances by the AIM Act are some of the most commonly used HFCs (neat and in blends) and have high impacts as measured by the quantity of each substance emitted multiplied by their respective GWPs.[18] These 18 HFCs are all saturated, meaning they have only single bonds between their atoms and therefore have longer atmospheric lifetimes.

In the United States, HFCs are used primarily in refrigeration and air-conditioning equipment in homes, commercial buildings, and industrial operations (~75 percent of total HFC use in 2018) and in air conditioning in vehicles and refrigerated transport (~8 percent). Smaller amounts are used in foam products (~11 percent), aerosols (~4 percent), fire protection systems (~1 percent), and solvents (~1 percent).[19]

EPA estimated in the Allocation Rules that phasing down HFC production and consumption according to the schedule provided in the AIM Act will avoid cumulative consumption of 3,156 million metric tons of exchange value equivalent (MMTEVe) of HFCs in the United States for the years 2022 through 2036 (86 FR 55116, October 5, 2021). Annual avoided consumption was estimated at 42 $MMTCO_2e$ in 2022 and 282 $MMTCO_2e$ in 2036. To calculate the climate benefits associated with consumption abatement, the consumption changes were expressed in terms of emission reductions.

[18] The AIM Act uses exchange values which are numerically equivalent to the 100-year GWP of the chemical as given in the Errata to Table 2.14 of the IPCC's 2007 Fourth Assessment Report (AR4).
[19] Calculations based on EPA's Vintaging Model, which estimates the annual chemical emissions from industry sectors that historically used ODS, including refrigeration and air conditioning, foam blowing agents, solvents, aerosols, and fire suppression. The model uses information on the market size and growth for each end use, as well as a history and projections of the market transition from ODS to substitutes. The model tracks emissions of annual "vintages" of new equipment that enter into operation by incorporating information on estimates of the quantity of equipment or products sold, serviced, and retired or converted each year, and the quantity of the compound required to manufacture, charge, and/or maintain the equipment. Additional information on these estimates is available in U.S. EPA, April 2016. EPA Report EPA-430-R-16-002. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2014. Available at: *https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2014*.

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EPA estimated that for the years 2022–2050 that action will avoid emissions of 4,560 $MMTCO_2e$ of HFCs in the United States. The annual avoided emissions are estimated at 22 $MMTCO_2e$ in the year 2022 and 171 $MMTCO_2e$ in 2036. More information regarding these estimates is provided in the Allocation Framework RIA in the docket.

B. How do HFCs affect public health and welfare?

Elevated concentrations of GHGs including HFCs are and have been warming the planet, leading to changes in the Earth's climate including changes in the frequency and intensity of heat waves, precipitation, and extreme weather events; rising seas; and retreating snow and ice. The changes taking place in the atmosphere as a result of the well-documented buildup of GHGs due to human activities are changing the climate at a pace and scale that threatens human health, society, and the natural environment. This section provides some scientific background on climate change to offer additional context for this rulemaking and to help the public understand the environmental impacts of GHGs such as HFCs.

Extensive additional information on climate change is available in the scientific assessments and the EPA documents that are briefly described in this section, as well as in the technical and scientific information supporting them. One of those documents is EPA's 2009 Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act (74 FR 66496, December 15, 2009).[20] In the 2009 Endangerment Finding, the Administrator found under section 202(a) of the CAA that elevated atmospheric concentrations of six key well-mixed GHGs—CO_2, methane (CH_4), nitrous oxide (N_2O), HFCs, perfluorocarbons (PFCs), and sulfur hexafluoride

[20] In describing these 2009 Findings in this notice, EPA is neither reopening nor revisiting them.

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(SF_6)—"may reasonably be anticipated to endanger the public health and welfare of current and future generations" (74 FR 66523, December 15, 2009), and the science and observed changes have confirmed and strengthened the understanding and concerns regarding the climate risks considered in the Finding. The 2009 Endangerment Finding, together with the extensive scientific and technical evidence in the supporting record, documented that climate change caused by human emissions of GHGs (including HFCs) threatens the public health of the U.S. population. It explained that by raising average temperatures, climate change increases the likelihood of heat waves, which are associated with increased deaths and illnesses (74 FR 66497, December 15, 2009). While climate change also increases the likelihood of reductions in cold-related mortality, evidence indicates that the increases in heat mortality will be larger than the decreases in cold mortality in the U.S. (74 FR 66525, December 15, 2009). The 2009 Endangerment Finding further explained that compared with a future without climate change, climate change is expected to increase tropospheric ozone pollution over broad areas of the U.S., including in the largest metropolitan areas with the worst tropospheric ozone problems, and thereby increase the risk of adverse effects on public health (74 FR 66525, December 15, 2009). Climate change is also expected to cause more intense hurricanes and more frequent and intense storms of other types and heavy precipitation, with impacts on other areas of public health, such as the potential for increased deaths, injuries, infectious and waterborne diseases, and stress-related disorders (74 FR 66525, December 15, 2009). Children, the elderly, and the poor are among the most vulnerable to these climate-related health effects (74 FR 66498, December 15, 2009).

The 2009 Endangerment Finding also documented, together with the extensive scientific and technical evidence in the supporting record, that climate change touches

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nearly every aspect of public welfare[21] in the U.S. including: changes in water supply and quality due to increased frequency of drought and extreme rainfall events; increased risk of storm surge and flooding in coastal areas and land loss due to inundation; increases in peak electricity demand and risks to electricity infrastructure; predominantly negative consequences for biodiversity and the provisioning of ecosystem goods and services; and the potential for significant agricultural disruptions and crop failures (though offset to some extent by carbon fertilization). These impacts are also global and may exacerbate problems outside the U.S. that raise humanitarian, trade, and national security issues for the United States (74 FR 66530, December 15, 2009).

In 2016, the Administrator similarly issued Endangerment and Cause or Contribute Findings for GHG emissions from aircraft under section 231(a)(2)(A) of the CAA (81 FR 54422, August 15, 2016).[22] In the 2016 Endangerment Finding, the Administrator found that the body of scientific evidence amassed in the record for the 2009 Endangerment Finding compellingly supported a similar endangerment finding under CAA section 231(a)(2)(A) and also found that the science assessments released between the 2009 and the 2016 Findings "strengthen and further support the judgment that GHGs in the atmosphere may reasonably be anticipated to endanger the public health and welfare of current and future generations" (81 FR 54424, August 15, 2016).

Since the 2016 Endangerment Finding, the climate has continued to change, with new records being set for several climate indicators such as global average surface

[21] The CAA states in section 302(h) that "[a]ll language referring to effects on welfare includes, but is not limited to, effects on soils, water, crops, vegetation, manmade materials, animals, wildlife, weather, visibility, and climate, damage to and deterioration of property, and hazards to transportation, as well as effects on economic values and on personal comfort and well-being, whether caused by transformation, conversion, or combination with other air pollutants." 42 U.S.C. 7602(h).

[22] In describing these 2016 Findings in this notice, EPA is neither reopening nor revisiting them.

temperatures, GHG concentrations, and sea level rise. Moreover, heavy precipitation events have increased in the Eastern United States, while agricultural and ecological drought has increased in the Western United States along with more intense and larger wildfires.[23] These and other trends are examples of the risks discussed in the 2009 and 2016 Endangerment Findings that have already been experienced. Additionally, major scientific assessments continue to demonstrate advances in our understanding of the climate system and the impacts that GHGs have on public health and welfare both for current and future generations. According to the Intergovernmental Panel on Climate Change's (IPCC) Sixth Assessment Report, "it is unequivocal that human influence has warmed the atmosphere, ocean and land. Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred."[24] These updated observations and projections document the rapid rate of current and future climate change both globally and in the United States.[25,26,27,28]

IV. What is the petition process under the Technology Transitions program?

Subsection (i)(3) of the AIM Act states that a person may petition EPA to promulgate a rule to restrict the use of a regulated substance in a sector or subsector in accordance with the Agency's authority to issue such a rule under subsection (i)(1) of the

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[23] An additional resource for indicators can be found at *https://www.epa.gov/climate-indicators*.
[24] IPCC, 2021: Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson- Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Pe´an, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekc¸i, R. Yu and B. Zhou (eds.)]. Cambridge University Press. In Press: 4.
[25] USGCRP, 2018: Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 1515 pp. doi: 10.7930/NCA4.2018. Available at: *https://nca2018.globalchange.gov*.
[26] IPCC, 2021.
[27] National Academies of Sciences, Engineering, and Medicine, 2019. Climate Change and Ecosystems. Washington, DC: The National Academies Press. Available at: *https://doi.org/10.17226/25504*.
[28] NOAA National Centers for Environmental Information, State of the Climate: Global Climate Report for Annual 2020, published online January 2021. Available at: *https://www.ncdc.noaa.gov/sotc/global/202013*.

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AIM Act. If EPA receives a petition under subsection (i)(3), the AIM Act states that "[t]he Administrator shall grant or deny a petition…not later than 180 days after the date of receipt of the petition" (42 U.S.C. 7675(i)(3)(B)) and make the petition available to the public no later than 30 days after receiving the petition (42 U.S.C. 7675(i)(3)(C)(iii)). For petitions that are denied, EPA must publish in the *Federal Register* an explanation of the denial (42 U.S.C. 7675(i)(3)(C)(i)). If EPA grants a petition, the statute requires EPA to promulgate a final rule not later than two years from the date the Agency grants the petition (42 U.S.C. 7675(i)(3)(C)(ii)).

This section describes the process for submitting a petition under subsection (i) to the Agency, which includes direction on how technology transition provisions should be submitted to EPA; the necessary content of petitions; and how EPA will respond once petitions are received. EPA received comments in support of the Agency's interpretation of the petition process under the AIM Act. Commenters did not suggest any changes to the proposed petition process. EPA is finalizing the petition process as proposed.

Subsection (i)(3)(A) of the AIM Act states that "a person may petition the Administrator to promulgate a rule under [subsection (i)(1) of the AIM Act] for the restriction on use of a regulated substance in a sector or subsector, which shall include a request that the Administrator negotiate with stakeholders…" EPA views "person" for the purpose of a technology transitions petition submittal as having the same meaning as how the term is defined in 40 CFR 84.3 (the definition established in the Allocation Framework Rule); that is, to mean "any individual or legal entity, including an individual, corporation, partnership, association, state, municipality, political subdivision of a State, Indian Tribe; any agency, department, or instrumentality of the United States; and any officer, agent, or employee thereof." Using this definition in 40 CFR 84.3 for purposes of

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petition submittal under subsection (i) ensures consistency of how this term is used across these two regulatory programs developed under the AIM Act. This definition of "person" also captures the Agency's intended meaning of this term for purposes of the Technology Transitions program. Therefore, any person who fits the Allocation Framework Rule definition may submit a technology transitions petition to EPA. We further note that the plain text of subsection (i)(3)(A) also limits this provision to requests for restrictions on the use of a regulated substance in a sector or subsector. Other types of requests—such as exemptions from existing or anticipated restrictions—are therefore not properly presented under the (i)(3)(A) petition process, although parties are always welcome to communicate to the Agency informally, to provide comments on a proposed rule that considers such restrictions on use, or to generally petition for rulemaking under the Administrative Procedures Act.

All the petitions considered in this rulemaking were submitted to EPA via email. EPA is requiring that future petitions also be submitted electronically. The Agency's preferred method is for petitioners to use the email address that is available on EPA's webpage at: *https://www.epa.gov/climate-hfcs-reduction/technology-transition-petitions-under-aim-act*.

A. What must be included in a technology transitions petition?

EPA is requiring standard content that must be included in a technology transitions petition. Standardizing the information requirements will assist petitioners in preparing their petitions and enhance EPA's ability to review and respond to them promptly. A technology transitions petition must include the elements described in the following paragraphs.

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Petitions must indicate either a GWP limit or the specific name(s) of the regulated substance(s) or blend(s) that use the regulated substance(s) to be restricted and their GWPs. Petitioners specifying specific regulated substances should use as the GWP the exchange values for the regulated HFCs listed in subsection (c) of the AIM Act and codified as appendix A to 40 CFR part 84.[29] For blends containing regulated substances, petitioners should identify all components of the blend using the composition-identifying designation as listed in American National Standards Institute/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ANSI/ASHRAE) Standard 34-2022,[30] Designation and Safety Classification of Refrigerants (*e.g.*, HFC-134a, hydrofluoroolefin (HFO-1234ze(E)). If blends are not listed in ASHRAE Standard 34, petitioners should provide the nominal composition of the blend, specifying all components with the ASHRAE Standard 34 designation for the components. If the components or substances are not listed in ASHRAE Standard 34, petitioners should provide the chemical name, the applicable CAS Registry Number, and the chemical formula and structure (*e.g.*, $CHF=C=CF_2$ rather than C_3F_3H).

EPA is providing a table at 40 CFR 84.64 listing the GWPs of commonly used constituents to allow petitioners to determine the GWP of blends containing regulated substances for purposes of this rulemaking. EPA also intends to maintain a list of commonly used blends containing HFCs and the GWPs of those blends at EPA's Technology Transitions web page. EPA is using the following hierarchy to identify the GWPs of these constituents. For the regulated substances used in the blend, and as

[29] EPA noted in section III.A of this preamble that the exchange values for the regulated HFCs listed in subsection (c) of the AIM Act are numerically identical to the 100-year GWPs of each substance, as given in the Errata to Table 2.14 of the IPCC's Fourth Assessment Report (AR4) and Annexes A, C, and F of the Montreal Protocol. Available at: *https://www.ipcc.ch/site/assets/uploads/2018/05/ar4-wg1-errata.pdf.*
[30] Hereafter referred to as ASHRAE Standard 34.

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previously noted, EPA is using the exchange value provided in subsection (c) of the AIM Act and codified as appendix A to 40 CFR part 84 as the GWP. For purposes of this rulemaking EPA is using the 100-year GWP values from the IPCC's Fourth Assessment Report (AR4) for all substances or components of blends. For hydrocarbons listed in Table 2-15 of AR4, EPA is using the net GWP value. For substances for which no GWP is provided in AR4, EPA is using the 100-year GWP listed in World Meteorological Organization (WMO) 2022.[31] EPA proposed using the 2018 edition but to use the best available data, EPA is finalizing the use of the most up-to-date version of this report at the time of the publication of this rule. For any substance not listed in these sources, EPA is using the GWP of the substance in Table A-1 to subpart A of 40 CFR part 98, as it exists on [**INSERT DATE OF PUBLICATION IN THE FEDERAL REGISTER**], the date this rule is published in the *Federal Register* as a final rule, if such substance is specifically listed in that table. EPA proposed GWPs for two substances that might be used as components of blends that are not listed in those three sources: trans-dichloroethylene (HCO-1130(E)) and hydrochlorofluoroolefin (HCFO-1224yd(Z)) at five[32] and one,[33] respectively, for purposes of this rulemaking. EPA is finalizing those GWPs as proposed. For any other substance not listed in the above three source documents, EPA is using the default GWPs as shown in Table A-1 to subpart A of 40 CFR part 98, as it exists on the date this final rule is published in the *Federal Register*. Lastly, if the substance is not listed in any of the other sources, EPA is using the GWP of that constituent described in a listing of an acceptable substitute under EPA's SNAP program. In any case where a GWP value is preceded with a less than (<), very less than

[31] WMO, 2022.
[32] 81 FR 32244 (May 23, 2016).
[33] 84 FR 64766 (November 25, 2019).

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(<<), greater than (>), approximately (~), or similar symbol in the source document, which is used to determine the GWP, EPA is using the value shown. The GWP of a blend would then be calculated as the sum of the nominal composition (in mass proportions) of each component multiplied by the GWP of each component.

In the event that the hierarchy outlined in this section does not provide a GWP (*i.e.*, the substance in question is not listed in the three documents, is not one of the two for which EPA is establishing GWPs, is not listed in Table A-1 to subpart A of 40 CFR part 98 and does not fit within any of the default GWPs provided in Table A-1 to subpart A of 40 CFR part 98), EPA proposed that the petitioner should use a GWP of zero. One commenter suggested that using a value of zero would result in an artificially lower GWP value. Although EPA anticipates this situation to be rare, and unlikely to materially affect the status of a blend, the Agency is not assuming a value of zero for as yet unknown constituents in this final rule. Rather, EPA will take a more conservative approach and exclude that component, and its mass proportion, from the calculation of GWP.

Petitioners must also indicate the sector or subsector for which restrictions on use of the regulated substance would apply. EPA is not limiting sectors or subsectors to a specific list, recognizing there may be additional uses of HFCs today or that may be developed in the future, and thus additional sectors or subsectors for which it could be appropriate to restrict use.

Petitioners must specify a date that the requested restrictions would go into effect and provide information explaining why the date is appropriate. Petitioners should recognize that subsection (i)(6) of the AIM Act restricts the effective date of rules promulgated under subsection (i) to no earlier than one year after the date of the final rule.

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Before proposing a rule for the use of a regulated substance for a sector or subsector under subsection (i)(1), subsection (i)(2)(A) directs EPA to consider negotiating with stakeholders in accordance with the Negotiated Rulemaking Act of 1990 (*i.e.*, negotiated rulemaking procedure). Subsection (i)(3)(A) requires petitioners to "include a request that the Administrator negotiate with stakeholders in accordance with paragraph (2)(A)" (42 U.S.C. 7675(i)(3)(A)). EPA sought comment on whether it is reasonable for the Agency to interpret subsection (i)(3) as requiring petitioners to *address* whether EPA use the negotiated rulemaking procedure, rather than requiring them to affirmatively request that the Agency pursue negotiated rulemaking. Several commenters responded in support of EPA's interpretation that petitioners must simply address whether EPA should consider negotiated rulemaking in their petition and not that they must request a negotiated rulemaking. Most petitions addressed in this rule complied with the statute's requirement to request that EPA use negotiated rulemaking; however, those petitioners unanimously expressed a preference that EPA *not* use this procedure in promulgating its restrictions. Allowing petitioners to express their views as to whether EPA should engage in negotiated rulemaking for a subsection (i) rulemaking, as opposed to requiring them to request something they may disagree with, provides more value to EPA as we consider, per subsection (i)(2)(A), whether to use the negotiated rulemaking procedure before proposing a restriction under subsection (i). Otherwise, EPA could be misled as to the petitioners' views and could elect to use the negotiated rulemaking procedure when no stakeholder sought that outcome. The unwarranted use of time and resources to undergo that procedure could be counterproductive to meeting the statutory deadlines to complete a final rule. Petitioners must provide an explanation of their position on the use of the negotiated rulemaking procedure and any considerations that

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would either support or disfavor the use of that process. If a petition is granted, EPA intends to consider the petitioner's statement on negotiated rulemaking as it determines whether to use the procedure.

Petitioners must also submit, to the extent practicable, information related to the "Factors for Determination" listed in subsection (i)(4) of the AIM Act to facilitate EPA's review of the petition. Given the relatively short 180-day statutory timeframe for EPA to grant or deny a petition, this requirement will ensure that information is available to EPA at the start of its review, to the extent the petitioner has relevant available information. EPA may deny a petition where no information has been provided that would allow the Agency to act on the petition. Therefore, petitioners must, to the extent practicable, provide best available data on substitutes that could be used in lieu of the petitioned substance(s), addressing the subfactors (*e.g.*, technological achievability, safety, commercial demands, etc.) that may affect the availability of those substitutes. Other relevant information includes estimates of the economic costs and environmental impacts of the petitioner's requested restriction on use in the sector or subsector. In particular, providing EPA with a sense of the scale of impacts (*e.g.*, whether the suggested restriction would have a significant environmental impact, or whether the suggested restriction would be likely to impose costs or savings on regulated entities or consumers) using best available, quantitative, accurate data to support that assessment will be more likely to result in a timely, well-reasoned response to the petitioner's request. One commenter suggested that EPA require that petitions include information on the expected outcome of requests made in the petition with respect to the consumption and emissions of regulated substances. The commenter indicated that this could be done by sharing assumptions regarding equipment charge size, leak rate, lifespan, and national sales.

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While EPA agrees that this information may be useful for assessing petitioners' requests as they relate to environmental impacts and other (i)(4) factors, the Agency disagrees that this information should be a mandatory element of the petitions, as many petitioners may not know the expected outcome of their petition requests as it relates to the consumption and emissions of regulated substances.

B. What happens after a petition is submitted?

Subsection (i)(3)(C)(iii) instructs EPA to make petitions publicly available within 30 days after receipt. EPA intends to continue to post technology transitions petitions at *www.regulations.gov*, in Docket ID No. EPA-HQ-OAR-2021-0289, as well as on the Agency's website at *https://www.epa.gov/climate-hfcs-reduction/technology-transition-petitions-under-aim-act*. Making the petitions available allows the public to provide additional data and relevant material to aid in EPA's evaluation of petitions, based on the factors specified in subsection (i) of the AIM Act.

In accordance with the statutory directive, EPA intends to act on petitions no later than 180 days after the date of receipt of the petition. In making a determination to grant or deny a petition, subsection (i)(4) of the AIM Act requires EPA to consider, to the extent practicable:

1. The best available data;
2. The availability of substitutes for use of the regulated substance that is the subject of the rulemaking or petition, as applicable, in a sector or subsector, taking into account technological achievability, commercial demands, affordability for residential and small business consumers, safety, consumer costs, building codes, appliance efficiency standards, contractor training costs, and other relevant

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factors, including the quantities of regulated substances available from reclaiming, prior production, or prior import;

3. Overall economic costs and environmental impacts, as compared to historical trends; and
4. The remaining phase-down period for regulated substances under the final rule issued under subsection (e)(3) of the AIM Act, if applicable.

Subsection (i)(4) applies both to EPA's action on subsection (i) petitions and to EPA's rulemakings under subsection (i). Requiring EPA to grant or deny petitions within 180 days of receipt inherently limits the scope and depth of any potential analysis. EPA's timeframe for promulgating a rule subject to a granted petition is two years from the date of a petition grant, and in undertaking a rulemaking the Agency will undoubtedly be able to perform a more in-depth analysis of the (i)(4) factors. Granting a petition under subsection (i) of the AIM Act therefore does not necessarily mean the Agency will propose or finalize requirements identical to a petitioner's request. Rather, granting a petition means that the requested restriction warrants further consideration through rulemaking. During this rulemaking process, EPA will determine what restrictions on the use of HFCs to propose and finalize based on multiple considerations, including its consideration of the "Factors for Determination" listed in subsection (i)(4) to the extent practicable. This approach provides interested stakeholders with the opportunity to review and comment on a regulatory proposal restricting the use of HFCs prior to restrictions going into effect.

C. Can I revise or resubmit my petition?

Receipt of a completed petition triggers two statutory deadlines: the posting of the petition within 30 days and the granting or denying of the petition within 180 days.

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Because there is little purpose in EPA continuing to take action on the original petition when the petitioner has revised (*i.e.*, makes edits to an original request) or resubmitted (*i.e.*, makes edits to an original request and presents it as a new petition) it, EPA's view is that a petition revision or resubmittal made by petitioners is typically intended to supersede or replace the original petition and would thus restart these timelines. However, depending on the timing of the resubmission and the nature of the revision and the request, EPA may be able to act more quickly on a revised or resubmitted petition, for example, if the Agency had already developed familiarity with the request through its consideration of the original petition. Therefore, EPA intends to address petition revisions and resubmittals on a case-by-case basis. If petitioners do not intend for their submission to supersede or replace their original petition, rather they are submitting information to revise or augment their initial petition without significantly altering its scope, they should be clear that they are submitting supplemental or clarifying information regarding their petitions to the docket related to petitions under consideration. On a case-by-case basis the Agency will consider and act accordingly on supplemental or clarifying information as part of its consideration of the initial petition. If EPA finds that in fact what was submitted constitutes a new petition or revised petition, new timelines will apply. In making a determination to grant or deny petitions, EPA plans to consider relevant and timely information provided in this docket, as the Agency did with the granted petitions that led to this rulemaking, including information provided by petitioners and from other stakeholders, for those petitions under review. Once a petition is granted or denied, any revised or resubmitted petitions will likely be treated as a new petition.

V. How is EPA considering negotiated rulemaking?

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This section provides a summary of the AIM Act's directive to consider negotiating with stakeholders prior to proposing a rule under subsection (i) of the Act. This section also provides information regarding how EPA intends to consider negotiating with stakeholders for future rulemakings.

A. Summary of the AIM Act's directive on negotiated rulemaking

Prior to proposing a rule, subsection (i)(2)(A) of the Act directs EPA to consider negotiating with stakeholders in the sector or subsector subject to the potential rule in accordance with negotiated rulemaking procedures established under the "Negotiated Rulemaking Act of 1990." If EPA makes a determination to use the negotiated rulemaking procedures, subsection (i)(2)(B) requires that EPA, to the extent practicable, give priority to completing that rulemaking over completing rulemakings under subsection (i) that are not using that procedure. For additional information on negotiated rulemaking procedures, see 5 U.S.C. 563. If EPA does not use the negotiated rulemaking process, subsection (i)(2)(C) requires the Agency to publish an explanation of the decision to not use that procedure before commencement of the rulemaking process.

B. How does EPA intend to consider negotiating with stakeholders under the AIM Act?

Prior to proposing this rulemaking, EPA issued a document informing the public of the Agency's consideration of using the negotiated rulemaking procedure and the Agency's decision to not use these procedures for this rulemaking (86 FR 74080, December 29, 2021). The Agency found that using negotiated rulemakings was not in the best interest of the public and thus decided not to use negotiated rulemaking. In making this decision, EPA considered information provided by the petitions, including statements made by petitioners on the use of negotiated rulemaking procedures, and information provided by other stakeholders on the petitions. The Negotiated Rulemaking Act of 1990,

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5 U.S.C. 563, provides seven criteria that the head of an agency should consider when determining whether a negotiated rulemaking is in the public interest. These criteria are informative for purposes of making a determination under AIM Act subsection (i) of whether to use the procedures set out in the Negotiated Rulemaking Act for proposed rulemakings and therefore, also considered these criteria in its decision.

Going forward, EPA intends to use a similar process in making its determination on whether to use negotiated rulemaking procedures for any rulemaking being considered under subsection (i) in response to granted petitions. This includes reviewing the petitions themselves and statements from petitioners on the use of negotiated rulemaking procedures, considering information provided by stakeholders commenting on petitions, and considering the seven criteria listed in the Negotiated Rulemaking Act of 1990, 5 U.S.C. 563, that the head of an agency should consider when determining whether a negotiated rulemaking is in the public's interest. For rulemakings initiated by EPA (*i.e.*, not in response to granted petitions), EPA anticipates that our review would focus on just these seven criteria.

Furthermore, where appropriate, EPA will also consider recent Agency actions and decisions related to restrictions on the use of HFCs in sectors and subsectors for its consideration on using negotiated rulemaking procedures. For example, EPA received four petitions that were not included in the Agency's consideration of using negotiated rulemaking procedures for petitions granted on October 7, 2021.[34] However, these petitions requested restrictions on the use of HFCs in the same sectors and subsectors covered by petitions granted on October 7, 2021, for which EPA made a determination

[34] These petitions were received from AHRI and IIAR and are discussed in section VI.D of this preamble. Copies of these petitions are located at *www.regulations.gov*, under Docket ID No. EPA-HQ-OAR-2021-0289, or at *https://www.epa.gov/climate-hfcs-reduction/technology-transition-petitions-under-aim-act*.

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not to use negotiated rulemaking. Subsection (i)(2)(A) states that, "[b]efore proposing a rule for a sector or subsector under paragraph (1), the Administrator shall consider negotiating with stakeholders in the sector or subsector subject to the potential rule…" EPA will not issue a separate notice to consider using negotiated rulemaking for these four petitions because these petitions were received well ahead of this final action, and the requested restrictions are in the same sectors and subsectors contained in petitions granted on October 7, 2021, for which the Agency considered and decided not to use negotiated rulemaking procedures. Nothing in these four petitions caused EPA to reconsider that decision. Therefore, it is unnecessary for the Agency to reconsider whether to use negotiated rulemaking procedures for this rulemaking. EPA encourages future petitioners to consider petitions under review or recently granted before submitting a new petition and to consider submitting information to the docket for an existing petition in lieu of submitting a new petition on the same uses of HFCs that are already under consideration by the Agency.

One commenter requested that EPA conduct a negotiated rulemaking in instances where the Agency grants a petition but then would seek to propose more stringent aspects of the request, such as an earlier compliance date or lower GWP limit. EPA disagrees with this comment. A decision by the Agency to grant, or partially grant, a petition under subsection (i) of the AIM Act does not mean the Agency must propose requirements identical to a petitioner's request. Rather, granting a petition means that the requested restriction warrants further consideration through rulemaking. Furthermore, given the interests of all stakeholders including potentially other petitioners, it would not be appropriate to consider a negotiated rulemaking only when EPA is considering a more stringent proposal. EPA therefore may consider whether any deviation from a petition

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merits a negotiated rulemaking in its analysis of the public's interest, but a deviation on its own is insufficient to require the Agency to do so.

VI. How is EPA restricting the use of HFCs?

This section details the Agency's restrictions on the use of HFCs in accordance with the granted petitions, including defining terms that are new to 40 CFR part 84; describing the form and applicability of the prohibitions; providing EPA's interpretation and application of the "Factors for Determination" contained in subsection (i)(4) of the AIM Act; and listing the specific restrictions on the use of HFCs by sector and subsector.

A. What definitions is EPA establishing in subsection (i)?

The Allocation Framework Rule established regulatory definitions at 40 CFR part 84, subpart A to implement the regulatory phasedown of HFCs under the AIM Act. To maintain consistency, except as otherwise explained in this rule, EPA intends to use terms in this rulemaking, and in the new subpart B established by this rule, as they were defined in the Allocation Framework Rule. Thus, for terms not defined in this subpart but that are defined in 40 CFR 84.3, the definitions in 40 CFR 84.3 shall apply. EPA is also establishing definitions for new terms that are applicable to 40 CFR part 84, subpart B and do not have a counterpart in the definitions under 40 CFR part 84, subpart A.

1. Export, exporter, import, and importer

A few terms (export, exporter, and importer) currently exist in 40 CFR 84.3 in the context of bulk regulated substances. EPA is establishing definitions under subpart B for those terms to clarify how they apply under subpart B to regulated substances that are used in equipment subject to this rule.

Export. For purposes of subpart B, EPA is defining this term to mean the transport of a product or specified component using a regulated substance from inside the United

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States or its territories to persons outside the United States or its territories, excluding United States military bases and ships for onboard use.

Exporter. For purposes of subpart B, EPA is defining this term to mean the person who contracts to sell any product or specified component using a regulated substance for export or transfers a product or specified component using a regulated substance to an affiliate in another country.

Importer. For purposes of subpart B, EPA is defining this term to mean any person who imports any product or specified component using or intended for use with a regulated substance into the United States. Importer includes the person primarily liable for the payment of any duties on the merchandise or an authorized agent acting on his or her behalf. The term also includes:

(1) The consignee;

(2) The importer of record;

(3) The actual owner; or

(4) The transferee, if the right to withdraw merchandise from a bonded warehouse has been transferred.

This definition of importer, specifically paragraphs (3) and (4), varies in non-substantive ways from that in subpart A of 40 CFR part 84 to align with the definition of "importer" at 19 CFR 101.1. No difference in interpretation between subparts is intended. As EPA explained in the Allocation Framework Rule, whether products using or containing HFCs are admitted into or exiting from a foreign-trade zone or other duty deferral program under U.S. Customs and Border Protection (CBP) regulations does not affect whether they are being imported or exported for purposes of part 84. *See* 86 FR

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55133 (October 5, 2021) (discussing definitions of export and import under 40 CFR 84.3).

Comment: Some commenters requested that EPA narrow the scope of the term "import" to exclude a transportation vehicle in international service, such as refrigerated containers that are imported into the United States and intended for export. Another commenter requested that the definition of import include equipment that was intended to be imported by the date but was delayed by weather or port delays.

Response: EPA disagrees with these suggestions. Congress defined "import" for purposes of the AIM Act in subsection (b)(6) as "to land on, bring into, or introduce into, or attempt to land on, bring into, or introduce into, any place subject to the jurisdiction of the United States, regardless of whether that landing, bringing, or introduction constitutes an importation within the meaning of the customs laws of the United States." The Agency did not propose to redefine that term in this subpart. EPA addresses the concern raised by the first commenter in Section VI.C.2.a. Furthermore, to be consistent with subpart A of part 84, EPA considers the date of import to be the time a ship berths for vessel arrivals, border crossings for land arrivals, and first point of terminus in U.S. jurisdiction for arrivals via air. Determining an importer's intent for their timing, which frequently can change, would be challenging for the Agency to determine and enforce.

2. Blend containing a regulated substance, sector, subsector, and substitute

EPA is finalizing definitions for these four terms as proposed. The Agency did not receive comment recommending changes.

Blend containing a regulated substance. EPA is establishing restrictions on the use of HFCs, whether neat or used in a blend. Blends containing a regulated substance are used in multiple sectors and subsectors including refrigeration, air conditioning and

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heat pumps, foams, and fire suppression. EPA is defining this term as "any mixture that contains one or more regulated substances." EPA considers any quantity of a regulated substance within a mixture to qualify the mixture as a "blend containing a regulated substance." A blend that uses one or more regulated substances is itself not a regulated substance. Rather, the use restrictions apply to the regulated substance(s) used in certain blends, such that the use restriction on the regulated substance(s) also affects use of that blend. Most HFCs used in the sectors and subsectors addressed by this rule are components of blends that contain other HFCs, HFOs, and hydrocarbons. As discussed in section IV.A, where the proportion of a regulated substance multiplied by its GWP, along with the proportion of the other components multiplied by their respective GWPs, causes the blend to exceed the GWP limit, the use of that HFC in that blend is prohibited.

Sector. EPA is defining this term as "a broad category of applications including but not limited to: refrigeration, air conditioning and heat pumps; foams; aerosols; chemical manufacturing; cleaning solvents; fire suppression and explosion protection; and semiconductor manufacturing." These categorizations and groupings are similar to how the term "sector" is used in other contexts, such as EPA's Significant New Alternatives Policy (SNAP) Program, the Montreal Protocol Parties' Technology and Economic Assessment Panel (TEAP), and EPA's Vintaging Model. Entities potentially subject to rulemakings under subsection (i) of the AIM Act are often the same entities affected by CAA title VI, including the CAA section 612 SNAP program, and may be familiar with the way EPA traditionally categorizes and groups sectors in that context. The TEAP is a globally recognized advisory body to the Montreal Protocol Parties, which provides technical information related to alternative technologies that use HFCs in sectors and subsectors. Entities with a global market presence and other stakeholders may

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be familiar with how the TEAP defines sectors, and EPA's definition of sector is relatable to their understanding of the term.

Subsector. EPA is defining this term as "processes, classes of applications, or specific uses that are related to one another within a single sector or subsector." Where appropriate, each sector can be subdivided into different subsectors that more narrowly highlight how the HFC is used. Entities potentially subject to rulemakings under subsection (i) of the AIM Act are often the same entities affected by CAA title VI, including the CAA section 612 SNAP program, and may be familiar with the way EPA categorizes and groups sectors and subsectors in that context. The term "subsectors" includes the concepts of "end-uses" and "applications" under SNAP (40 CFR 82.172). An example subsector is cold storage warehouses within the RACHP sector. Another example is the integral skin polyurethane subsector within the foams sector.

Substitute. EPA is defining this term as "any substance, blend, or alternative manufacturing process, whether existing or new, that may be used, or is intended for use, in a sector or subsector with a restriction on the use of regulated substances and that has a lower global warming potential than the GWP limit or restricted list of regulated substances and blends in that sector or subsector." Under this definition, substitutes include regulated substances (*e.g.*, HFC-32 used in lieu of R-410A in commercial unitary AC), blends containing regulated substances (*e.g.*, R-454B used in lieu of R-410A in residential unitary AC), blends that do not use a regulated substance (*e.g.*, R-441A used in lieu of R-410A in window ACs), substances that are not HFCs (*e.g.*, HFOs, hydrocarbons, R-717, and R-744 (CO_2)), and not-in-kind technologies (*e.g.*, finger-pump bottles in lieu of aerosol cans, or vacuum panels in lieu of foam insulation).

3. Manufacture, install, and system

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Many commenters expressed concerns about the proposed definitions for the terms "manufacture" and "products." For the reasons discussed in this section, EPA is distinguishing in this final rule between factory-completed and field-assembled appliances by defining and using the terms "products" and "systems," respectively. EPA is also distinguishing between the "manufacture" of products, which occurs in a factory, and the "installation" of systems, which occurs in the field. Together these changes more clearly represent the intent of the restrictions using more familiar terminology.

EPA proposed to define "manufacture" as "to complete a product's manufacturing and assembly processes such that it is ready for initial sale, distribution, or operation. For equipment that is assembled and charged in the field, manufacture means to complete the circuit holding the regulated substance, charge with a full charge, and otherwise make functional for use for its intended purpose." This proposed definition was intended to apply similarly to how EPA applied this term in certain other use restrictions under title VI of the CAA and 40 CFR part 82. EPA had previously established restrictions on products, including appliances, foams, and aerosols under section 610 of the CAA (Nonessential Products Bans). EPA also established use prohibitions under section 605(a) of the CAA that addressed the use of certain ODS as a refrigerant in the manufacture of new appliances, including field-charged appliances. *See e.g.,* 40 CFR 82.15(g)(4)(i), 40 CFR 82.15(g)(5)(i); *see also* 74 FR 66437 (December 15, 2009) and 85 FR 15267 (March 17, 2020) (describing the use restriction and when a field-charged appliance is manufactured). Because those restrictions bear certain similarities to the proposed restrictions under subsection (i), EPA looked to its past experience in implementing those provisions in defining "manufacture."

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Comment: Commenters were generally supportive of the first sentence of the proposed definition of "manufacture" as applied to factory-completed products. Most of those who commented on the proposed definition expressed concerns about the second sentence, which would apply to field-assembled equipment. These included concerns that the definition would effectively accelerate the timeline of the prohibition and render the one-year sell-through moot. Commenters stated that the Agency should be placing the prohibition on the manufacture of components that would later be assembled and not the installation. Commenters also suggested EPA use the approach taken by California in defining "date of manufacture." In California, the date of manufacture for chillers and air-conditioning and refrigeration equipment that is not assembled on site is "the date that the manufacturer affixed an equipment label indicating the equipment's date of manufacture." For refrigeration and air-conditioning equipment completed on site, the date of manufacture is "the date that the refrigerant circuit was completed and initially filled with refrigerant." One equipment manufacturer urged harmonizing the Federal and California definitions to simplify manufacturers' obligations and reduce inadvertent noncompliance. The commenter noted that the definition resulted from substantial regulated industry discussions with and comments to the California Air Resources Board (CARB) during the State rulemaking process. Commenters acknowledged the need to address installation of field-charged equipment, but one commenter asserted that using the term "manufacture" created confusion about which entity would be considered the manufacturer of field-charged equipment, who would be both affected by the prohibition and subject to recordkeeping and reporting obligations.

Response: EPA is finalizing the term "manufacture" so as to only include the first sentence, but is modifying the definition to include specified components for reasons

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discussed in the next section. Therefore, manufacture means: "to complete the manufacturing and assembly processes of a product or specified component such that it is ready for initial sale, distribution, or operation."

This final rule also establishes and defines a separate term for "install" to replace the term "manufacture" for systems assembled in the field. EPA discussed in the proposed rule that a field-charged system is "manufactured at the point when *installation* of all the components and other parts are completed" (emphasis added). Providing a separate term will reduce confusion, improve implementation, and allow the Agency to better address the commenters' concerns.

Though a new term, the definition for "install" is substantively similar to the second sentence of the proposed definition of "manufacture." EPA is defining "install" as "to complete a field-assembled system's circuit, including charging with a full charge, such that the system can function and is ready for use for its intended purpose." As stated in the proposed rule, this definition is intended to address field-charged equipment beyond appliances in the RACHP sector to include fire suppression systems or other systems that are assembled and charged on-site. EPA appreciates the commenter's desire to harmonize State and Federal regulations where possible. However, EPA is not establishing definitions for "date of manufacture" of various systems in this final rule as they do not necessarily align with the structure of this regulation. EPA also does not find it necessary to specify the exact date of manufacture because compliance is determined by the year of manufacture. EPA discusses the adoption of other aspects of California's approach in section VI of this notice.

The definition of "install" includes references to "systems" to distinguish equipment assembled in the field from those made in a factory. One commenter

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recommended that the Agency include a definition of "appliance." EPA agrees with the need to distinguish field-assembled and factory-made equipment but disagrees that using the term appliance is the correct approach, as it can include both factory-charged and field-charged equipment. To better support the distinction, EPA is finalizing the term "system" and defining it as "an assemblage of separate components that typically are connected and charged in the field with a regulated substance or substitute to perform a function or task." This new definition pertains to the system as a whole (*e.g.,* supermarket or industrial process refrigeration (IPR)) from the components assembled into a system (*e.g.,* evaporator or reach-in cooler).

4. Product, Regulated Product, Specified Components

As with the term manufacture, EPA based the proposed definition of "product" on the regulations established under title VI of the CAA in 40 CFR part 82, subparts C and E. EPA stated in the proposed rule that the Agency's view of what constitutes a product for purposes of use restrictions under subsection (i) mirrors its meaning under those provisions and that using the same definition would provide clarity for the regulated community.

Comment: A few commenters stated that the proposed definition of "product" was too broad and would place all forms of regulated categories into one definition from large refrigeration equipment to aerosol cans containing a few ounces of propellant. Other commenters expressed concern about including components and subcomponents as examples within the definition of product. They noted that restricting components in the same manner as a completed product would prevent the manufacture or later sale of parts for normal service and warranty purposes. One commenter noted that the term "product" does not account for complex equipment that incorporates components using regulated

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substances (*e.g.*, process chillers) within much larger equipment and requested clarification.

Response: EPA agrees that including components within the definition of product, and thus the restrictions thereof, would hinder the manufacture and import of replacement parts intended for repairs. These restrictions could also unintentionally impact components that are capable of being used with multiple refrigerants or across multiple subsectors and thus are permissible in some new systems as well. EPA did not intend to restrict the manufacture, import, and sale of components in the same manner as completed products or the installation of new systems. EPA is therefore removing the examples of "components and subcomponents" from the final definition of "product." EPA is also removing "equipment" as an example because this rulemaking uses that as a general term to broadly encompass items in addition to products (*e.g.*, systems, components, appliances) and not as a subset.

EPA is clarifying that the definition of "product" pertains to equipment that is completed or otherwise functional upon leaving the factory. This includes self-contained refrigeration and air conditioning appliances; foam that is blown; a manufactured item containing blown foam such as an appliance, car, or boat; a fully formulated polyol;[35] and filled aerosols. When products are incorporated into larger equipment, the new, larger equipment is subject to this rule. Thus, a manufactured item such as a refrigerator that contains insulation foam or a car that contains a motor vehicle air conditioner (MVAC) is subject to the restrictions of this rule, as are process chillers, when incorporated into

[35] The Foams Technical Options Committee advising the Parties to the Montreal describes the term "fully formulated polyol" to mean a blend of polyols with a variety of additives such as catalysts, surfactants, water, flame retardants (not typically in appliances), including the blowing agent. UNEP, 2010. Guidance on the Process for Selecting Alternatives to HCFCs in Foams.

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larger equipment. The final definition of product also modifies the examples of fire suppression systems and foam blowing systems to avoid conflict with the new definition of "system" the Agency is finalizing.

EPA is defining the term "product" as "an item or category of items manufactured from raw or recycled materials which performs a function or task and is functional upon completion of manufacturing. The term includes, but is not limited to: appliances, foams, fully formulated polyols, self-contained fire suppression devices, aerosols, pressurized dispensers, and wipes."

In removing components from the term "product," the Agency does not intend to remove components from all provisions of this rule. For example, remote condensing units used for retail food refrigeration is one of the subsectors subject to a GWP limit in this rule. A single component may also be a major element of the entire system, such as a remote condensing unit for residential split system air conditioning. One commenter requested that EPA add a definition for "component" and clarify that it is any and all equipment required for the refrigeration system to function properly. The commenter suggested this would include but not be limited to display cases, condensing units, condensers, compressors, compressor rack systems, evaporator units, evaporators, piping, filter dryers, valves, etc.

To allow the Agency to better describe how the restrictions apply to different equipment types, EPA is establishing the term "specified component." EPA declines to finalize the definition requested by the commenter because it broadly describes how a component functions and the concept merits public input depending on the policy goals. For example, refrigerant piping or thermal expansion valves are components needed for a system to function. However, thermal expansion valves contain small amounts of

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refrigerant and operate differently from other components on the circuit. Refrigerant piping may not be replaced during a repair given it is not refrigerant specific and may be inaccessible. Instead, EPA is specifying components that are the major mechanical elements of all RACHP systems. These components tend to be replaced over the life of a system, are often refrigerant-specific, and can contain larger amounts of refrigerant when manufactured or imported. EPA is defining "specified component" as "for purposes of equipment in the refrigeration, air conditioning, and heat pump sector, means condensing units, condensers, compressors, evaporator units, and evaporators." These components also align with those specified in section VI.C regarding what level of modification of a system effectively constitutes a "new" system subject to the GWP limits.

EPA also proposed to establish a defined term, "regulated product," that would broadly encompass all equipment that uses HFCs, whether they are higher-GWP HFCs that are prohibited or lower-GWP HFCs that are subject to labeling and reporting provisions. EPA is electing not to finalize this definition.

5. Retrofit

The AIM Act defines "retrofit" in subsection (i)(7) as "to upgrade existing equipment where the regulated substance is changed, which—(i) includes the conversion of equipment to achieve system compatibility; and (ii) may include changes in lubricants, gaskets, filters, driers, valves, o-rings, or equipment components for that purpose." EPA is adopting the definition contained in subsection (i)(7)(A) of the AIM Act with the addition of examples of equipment. The definition in the AIM Act is similar to but broader than EPA's definition of retrofit that was codified in 40 CFR part 82, subpart F. The AIM Act definition refers to "regulated substance" and "equipment," whereas the regulatory definition in 40 CFR part 82 refers to "refrigerant" and "appliances." As such,

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in this context, EPA finds it reasonable to interpret this term as applying not just to refrigeration and air-conditioning appliances, but all equipment that uses a regulated substance. EPA is adding a non-inclusive list of examples – such as air conditioning and refrigeration, fire suppression, and foam blowing equipment – recognizing that petitioners may seek, or EPA may establish, restrictions on other types of equipment using HFCs in the future.

One commenter recommended that the definition of "retrofit" not be limited to just a refrigerant change as that will allow piece-meal system replacements without moving from a high-GWP refrigerant. The commenter suggested that a system be considered retrofitted after a threshold number of components are replaced. EPA disagrees with the comment that a retrofit be triggered without replacing the refrigerant type. As noted, the statutory definition contained in subsection (i)(7)(A) of the AIM Act is predicated on a change in refrigerant, and it reasonable to maintain this condition when the equipment uses a refrigerant.

6. Use

EPA proposed to define this term as "for any person to take any action with or to a regulated substance, regardless of whether the regulated substance is in bulk, contained within a product, or otherwise, except for the destruction of a regulated substance. Actions include, but are not limited to, the utilization, deployment, sale, distribution, offer for sale or distribution, discharge, incorporation, transformation, or other manipulation."

Comment: Many commenters stated that EPA's proposed definition of the term "use" is overly broad and inappropriately allows the Agency to regulate the sale or distribution of products. Another commenter was concerned that the definition could

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extend liability to importers and distributors of bulk HFCs when used in non-compliant products even though that is outside of their control. One commenter stated that the full definition of 'use' is only clear in the context of the additional discussion in the Applicability section and recommended that elements of that discussion be added to the definition. Specifically, the commenter stated it would be useful to distinguish actions that occur at the market or industry level, as was intended, from the operation of equipment by an owner. Another commenter noted that while "use" is not synonymous with sale or distribution, "use" is closer to the point in time when a product is sold and received by the ultimate customer rather than the point in time when the product is manufactured and that EPA's restriction on the manufacture of a product bears little relationship to when products containing HFCs will actually be used by their owners.

Response: EPA fully responds to these comments in section VI.C of this notice.

7. Other

Many commenters requested EPA to establish definitions clarifying when an appliance is newly manufactured and/or newly installed and thus subject to the GWP-limits. Commenters explicitly or indirectly referenced terminology used in California's regulations for "new refrigeration equipment," "new air conditioning equipment," and "new facility," as well as "date of manufacture of self-contained equipment" and "date of manufacture of remote equipment." Another commenter requested EPA define "new" to match the methodology used in New York State. EPA responds to these comments in section VI.C of this notice.

B. How is EPA restricting the use of HFCs in the sector or subsector in which they are used?

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Subsection (i) authorizes EPA to by rule restrict, fully, partially, or on a graduated schedule, the use of a regulated substance in the sector or subsector in which the regulated substance is used. The provision grants EPA authority to fashion restrictions on the use of regulated substances in the sectors that use those substances and does not specify a particular approach as to how restrictions must be structured but lists considerations EPA is to factor in, to the extent practicable, when promulgating restrictions. EPA is finalizing two approaches to structuring those restrictions, a GWP-limit and a list of prohibited regulated substances or blends, while recognizing that other approaches could be considered in the future that would also fit within the authority granted by this statutory provision. EPA also proposed to prohibit the use of all regulated substances in new products within particular subsectors, but some commenters noted that the Agency generated confusion by imprecisely describing it as a GWP- limit of zero. As discussed in Section VI.F.3, EPA is not finalizing an approach that completely prohibits the use of regulated substances in new products in any sector or subsector in this rulemaking and again maintains that the Agency has the authority to do so in a subsequent rulemaking.

In establishing the two approaches contained in this final rule, EPA has taken into account the statutory text, feasibility, consistency with similar programs being implemented in the States and internationally, impacts on the regulated community and on innovation, efficiency of implementation, and other factors. Subsection (i)(4)'s "Factors for Determination" provides factors that EPA is to consider "[i]n carrying out a rulemaking" under subsection (i)(1). As a general matter, we interpret subsection (i)(1) to apply where EPA is deciding *whether* to impose a restriction on the use of a regulated substance in a sector or subsector and *what* that restriction should be (*e.g.*, a full

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restriction or a partial restriction and on what timeframe). However, the factors listed in subsection (i)(4) are also informative in our consideration of how to structure restrictions, as some approaches may provide advantages with respect to some of the factors over others.

Furthermore, while subsection (i)(1) identifies that EPA may restrict the use of a regulated substance "in the sector or subsector in which the regulated substance is used," given EPA's authority to issue partial restrictions, EPA interprets this provision as allowing the Agency to establish restrictions for particular uses of HFCs, such as products or applications, and that such restrictions need not apply uniformly across entire sectors or subsectors. Interpreting EPA's authority in this manner allows the Agency to tailor restrictions in accordance with the best available data and to consider relevant differences in, for example, the availability of substitutes with respect to technological achievability or affordability. For example, EPA is establishing restrictions for HFCs used in chillers for IPR. However, EPA is excluding chillers for IPR with exiting fluid temperatures less than -58 °F because lower-GWP substitutes for HFCs are not yet adequately technologically achievable and therefore not available at this time.

The two approaches to structuring subsection (i) restrictions used in this rule were identified in the petitions granted by the Agency to date. They are either to set GWP limits for HFCs used within a sector or one or more subsectors or to restrict specific HFCs, whether neat or used in a blend, by sector or one or more subsectors.[36] EPA is primarily employing the GWP limit approach in this rulemaking, with some exceptions where the specific -listing approach is more appropriate.

[36] The restrictions on the use of an HFC under subsection (i) of the AIM Act established in this rulemaking are intended to complement and not conflict with existing restrictions established through other authorities. Other authorities still apply.

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For most sectors and subsectors in this rule, EPA is establishing GWP limits for HFCs, whether neat or used in a blend. Under this approach only HFCs with GWPs below the limit or HFCs used in blends with GWPs below the limit may be used in that sector or subsector. If used neat, HFCs with GWPs at or above the GWP limit are prohibited from use in that sector or subsector. For HFCs used in a blend in the sector or subsector, compliance with the GWP limit is determined based on the GWP of the blend. If a blend meets two criteria (it contains an HFC and the GWP of the blend is at or above the GWP limit) the HFCs in the blend are subject to the prohibition on use, and accordingly the blend may not be used in that sector or subsector. References and descriptions of how the restrictions apply to blends throughout this notice incorporate this framework and have only been shortened for readability. A blend or other substitute that does not contain a regulated substance is not subject to the GWP limit.

In general, this approach also provides a more efficient and streamlined process for companies to employ lower-GWP substitutes for new uses, because the existing restrictions make clear what substitutes are permissible. In contrast, promulgating restrictions under subsection (i) using only a substance-specific listing approach could create hesitancy to innovate because it would be less clear whether EPA might restrict a particular blend containing an HFC *after* a company had already invested resources in developing it for a particular use.

To determine the GWP of a blend that uses an HFC, all components of the blend are incorporated, whether an HFC, HFO, hydrocarbon or other constituent, using the 100-year integrated AR4 values.[37] We note that the 100-year integrated GWP values in Table

[37] This rule does not change in any way the calculation established under 40 CFR part 84, subpart A for determining the quantity of production and consumption allowances required for regulated substances used in blends.

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2.15 of AR4 for the HFCs are equivalent to the exchange values listed in the AIM Act and thus what we plan to use here without change. Further details about determining the GWP of compounds that are not listed in AR4 are found in section IV.A of this preamble.

For refrigerants, the blend includes the components in amounts as a weight percentage, consistent with the refrigerant designation in ASHRAE Standard 34, "Refrigerant Designations and Safety Classifications" or the SNAP listing. The refrigerant blend considered in the GWP calculation does not include other additives such as compressor oil or stabilizers. For foams, the blend includes components that are part of the blowing agent as a weight percentage. The blowing agent blend considered in the GWP calculation does not include other parts of the foam formulation such as plastic resin, catalysts, flame retardants, or stabilizers. In general, aerosols do not use blends as propellants, but multiple HFCs may be used together in an aerosol solvent blend, in which case the blend would include the component solvents and propellants in amounts as a weight percentage. Other parts of the aerosol formulation are not considered in calculating the aerosol's GWP, such as water, fragrances, emulsifiers, pigments, anti-bacterial agents, pesticides, or polymers.

In most cases it is the specific HFC and the proportion of that HFC within the blend that determines the GWP of the blend as a whole. EPA is not restricting the use of any specific HFC when used in blends. For instance, for sectors or subsectors with a GWP limit of 150, HFC-134a neat, which has a GWP of 1,430, cannot be used, while R-451A, which is a blend of HFC-134a and HFO-1234yf, has a GWP of 147 and may be used. In other words, an HFC with a GWP above the limit may continue to be used when it is used in a blend, such that the total GWP of the blend is below the limit. There may be certain characteristics associated with a higher-GWP HFC that make use of that

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substance in a blend particularly advantageous, and in some cases increase the availability of that substitute for use, such as improving safety by reducing flammability. The GWP limit approach, which allows for the continued use of certain higher-GWP substances in blends, rather than strictly prohibiting the use of those higher-GWP substances in a sector or subsector, can smooth the glide path to transition, support innovation, and achieve beneficial environmental impacts sooner than waiting for the development of a substitute that contains no amount of a higher-GWP regulated substance.

Comment: Multiple commenters, including those representing users of regulated substances across different sectors, agreed that establishing GWP limits provides regulatory certainty and encourages the continued development and implementation of HFC substitutes with lower GWPs. A few commenters agreed that using a similar approach allows for harmonization across jurisdictions. Commenters also noted that using GWP limits is easy for downstream equipment users to understand, easier for the Agency to implement, and provides flexibility. One commenter supported GWP limits as it more clearly articulates EPA's intention to reduce the warming impact of HFCs and that it provides a more straightforward way for EPA to tighten restrictions by ratcheting down the GWP limits in the future.

One commenter strongly favored the specific-listing approach over the GWP limit approach. The commenter stated that the GWP limit approach poses huge noncompliance issues and dangers to users of products containing regulated substances by shifting the obligation to assess the safety of a substitute to the end-user. The commenter noted that the basis for their concern is that the Agency would no longer update SNAP listings. The commenter also recognized the downsides of a specific-listing approach but still found

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specific-listing to be preferable if the GWP approach meant the Agency was not assessing the risks associated with substitutes.

Response: EPA acknowledges the broad support for using GWP limits as the method for restricting the use of certain HFCs by sector or subsector and for the reasons discussed in the proposed rule is primarily using that approach in this final rule. Additionally, the GWP listing approach is not a replacement for SNAP listings or reviews of environmental, health, and safety impacts. Congress provided separate authority under subsection (i)(5) of the AIM Act for EPA to evaluate substitutes for HFCs in a sector or subsector, taking into account technological achievability, commercial demands, safety, overall economic costs and environmental impacts, and to make the evaluation public, including the factors associated with the safety of those substitutes. EPA intends to continue providing information on its evaluation of alternatives to HFCs.

Furthermore, contrary to commenter's suggestion, EPA continues to promulgate rules under SNAP. Section 612(c) of the CAA requires EPA to promulgate rules making it unlawful to replace ODS with any substitute that it determines may present adverse effects to human health or the environment where it has identified an alternative that (1) reduces the overall risk to human health and the environment and (2) is currently or potentially available. Section 612(c) further requires EPA to "publish a list of (A) the substitutes prohibited under this subsection for specific uses and (B) the safe alternatives identified under this subsection for particular specific uses." Under SNAP, EPA evaluates substances that can be used as alternatives based on multiple criteria and accordingly lists them as acceptable, unacceptable, acceptable subject to use conditions, acceptable subject to narrowed use limits, or pending. *See* 40 CFR 82.180(a)(7) (listing criteria for review) and 40 CFR 82.180(b) (describing types of listing decisions). EPA has considered more

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than 500 alternatives for eight industry sectors and more than 40 end uses since 1994.[38] EPA will continue to evaluate alternatives in the sectors and subsectors where ozone-depleting substances have been and are being used.[39] EPA recently finalized SNAP Rule 25 listing lower-GWP alternatives as acceptable, subject to use conditions, for chillers–comfort cooling, residential dehumidifiers, residential and light commercial air conditioning and heat pumps. SNAP Rule 25 also listed ethylene as acceptable, subject to use conditions and narrowed use limits, in very low temperature refrigeration. (88 FR 26382; April 28, 2023). EPA also recently proposed SNAP Rule 26 which would list lower-GWP alternatives as acceptable, subject to use conditions, for retail food refrigeration, commercial ice machines, IPR, cold storage warehouses, and ice-skating rinks. (88 FR 33722, May 24, 2023). As discussed in section VI.E.2 of this preamble and the *American Innovation and Manufacturing Act of 2020—Subsection (i)(4) Factors for Determination: Safety*, referred to in this preamble as the "Safety TSD," assessments of safety and other characteristics under SNAP are duly considered in our examination of availability (as it relates to safety and other factors) under AIM Act subsection (i)(4)(B).

Therefore, EPA is primarily finalizing the use restrictions in this action by employing a GWP limit approach because this approach supports innovation, transition, and compliance. Furthermore, for the reasons discussed in the proposed rule and based on the comments received, EPA is in most instances not employing a specific listing

[38] As noted in section VI.A of this preamble, there is significant overlap between the sectors and subsectors identified in this proposal and how sectors and "end-uses" are categorized under the SNAP program.
[39] After a court challenge, the D.C. Circuit partially vacated SNAP Rule 20 (80 FR 42870, July 20, 2015) "to the extent it requires manufacturers to replace HFCs with a substitute substance," and remanded to EPA for further proceedings. *Mexichem Fluor, Inc. v. EPA*, 866 F.3d 451, 464 (D.C. Cir. 2017) ("*Mexichem I*"). However, the court upheld EPA's decisions in that rule to change the listings for certain HFCs in certain SNAP end-uses from acceptable to unacceptable as being reasonable and not arbitrary and capricious. *Id.* at 462-64. The same court later issued a similar partial vacatur for portions of the SNAP Rule 21 (81 FR 86778, December 1, 2016). *See Mexichem Fluor, Inc. v. EPA*, 760 Fed. Appx. 6 (Mem) (per curiam) (D.C. Cir. 2019) ("*Mexichem II*").

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approach in its use restrictions, except in limited circumstances. For example, we find the specific listing approach can be preferable where the subsector has not yet identified favored lower-GWP substitutes to transition to, but is in a position, per subsection (i)(4), to transition away from using the highest-GWP regulated substances. It allows additional time before establishing a GWP limit (which, to serve regulatory certainty and innovation, the Agency would prefer not to repeatedly revisit) while still restricting those substances that have the highest environmental impact. This approach would allow for the adoption of multiple transitional substitutes and allow for the development of additional substitutes before issuing a GWP-limit-based restriction. As such, EPA is using both approaches in combination, with some subsectors having a GWP limit and others where specific substances are restricted.

C. Applicability

HFCs are used in a wide variety of sectors, including refrigeration and air conditioning, foams, aerosols, and fire suppression. In these sectors, HFCs are used as a refrigerant, foam-blowing agent, solvent, propellant, and fire suppression agent and may be contained within or emitted from equipment such as a product or system. HFCs are also used in processes such as semiconductor manufacturing and chemical manufacturing. Subsection (i) of the AIM Act provides that the Administrator may by rule restrict, fully, partially, or on a graduated schedule, the use of a regulated substance in the sector or subsector in which the regulated substance is used. EPA interprets its authority under subsection (i) to cover a broad chain of sector and subsector activities associated with equipment that uses regulated substances.

EPA designed the restrictions of this rule to apply at certain points in this chain of activities, consistent with the Act's direction that EPA "may by rule restrict, fully,

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partially, or on a graduated schedule." In light of the fact that the restrictions in this final action are the first to be issued under subsection (i), EPA views restrictions on the incorporation of higher-GWP HFCs into new products and systems and on the introduction and circulation of those products in the market as the most efficient and effective way to encourage a subsector to transition from the use of those HFCs. This rule therefore 1) restricts the use of HFCs in the manufacture and import of new products;2) restricts the subsequent sale or distribution, offer for sale and distribution, purchase or receipt for sale or distribution, or export of those products; and 3) restricts the installation of new systems and the significant modification of existing systems.

In general, these restrictions apply primarily to original equipment manufacturers (OEMs) and importers, as these are the entities that introduce such products and components of such systems into the U.S. market. The restrictions in this rule that apply to distributors (including online platforms), retailers, and exporters are intended to reinforce the manufacture and import restrictions, and to ensure that incentives throughout the market chain are aligned toward transitioning a subsector from regulated substances where available substitutes exist. Entities that install new systems, including those that assemble, contract for, or take possession of the system are also subject to these restrictions.

EPA is cognizant of the continued need in the covered sectors and subsectors for components to service and maintain existing systems that use higher-GWP HFCs. This rule therefore allows for the continued manufacture, import, sale, distribution, and export of components, subject to labeling, reporting, and recordkeeping requirements. EPA is generally not applying restrictions on the use of HFCs in existing products or systems or used products, except, for example, in limited circumstances such as the import of used

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products or modification of a system to the point that it constitutes replacement (*see* section VI.C.3 of the preamble). To that end, this rule does not restrict the use of HFCs in ordinary repair and servicing of products or systems, nor is EPA applying the restrictions to the use of HFCs in retrofit applications.

1. What is EPA's statutory authority for this action?

Summary of the Proposed Rule

Subsection (i) grants EPA authority to restrict the use of a regulated substance in the sector or subsector in which the regulated substance is used, and the Act does not define "use." For several reasons, summarized below, EPA proposed to define "use" in the context of subsection (i) as including actions taken with respect to regulated substances that occur at the market or industry level, such as manufacture, distribution, sale, and offer for sale—*i.e.*, to cover the presence of HFCs in products and processes in the U.S. market—as a way of addressing their use in sectors and subsectors. EPA's interpretation of its authority under this section is grounded in the statutory text and purposes.

First, sectors and subsectors are not defined in the AIM Act, but those terms suggest groupings or categories of related activity at an industry level. EPA is defining "sectors" and "subsectors" consistent with historical usage of those terms in other programs—grouping together similar or related industrial or market uses into distinct sectors; for example, refrigeration and air conditioning, foams, or aerosols. The AIM Act language, "use of a regulated substance in the sector or subsector in which the regulated substance is used," makes plain that the grant of authority under subsection (i) was intended to cover a *sector or subsector's use* of a regulated substance. The inclusion of a

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regulated substance in a product[40] or system to achieve a particular purpose—*e.g.*, using an HFC as a refrigerant in a refrigerator or in an air conditioner—is a prototypical use for sectors in which regulated substances are used.

Second, because subsection (i) and the subsection (i)(4) factors are focused on broad, sector-level information, we proposed that it is reasonable to interpret "use" broadly, in a way that would reach uses on a sector-level basis. The subsection is titled "Technology Transitions," and in subsection (i)(4), the Act directs EPA to consider certain factors, to the extent practicable, in issuing a rulemaking or making a determination to grant or deny a petition regarding use restrictions. The factors listed under subsection (i)(4) task the Agency with examining information relevant to industry-level sectors or subsectors that would inform consideration of the feasibility and advisability of establishing requirements for a transition away from the use of a regulated substance in that sector or subsector, as well as consideration of whether that transition should be full, partial, or on a graduated schedule. For example, subsection (i)(4)(B) directs EPA to factor in "the availability of substitutes for use of the regulated substance that is the subject of the rulemaking or petition, as applicable, in a sector or subsector, taking into account technological achievability, commercial demands, safety, consumer costs, building codes, appliance efficiency standards, contractor training costs, and other relevant factors, including quantities of regulated substances available from reclaiming, prior production, or prior import." The various subfactors in (i)(4)(B) help EPA to determine whether there are adequate available substitutes for a regulated substance that a

[40] Similarly, subsection (i)'s authority extends to regulated substances contained in a blend and the use of that regulated substance within a blend by the sector or subsector in a product or process to achieve a particular purpose. To address the regulated substance within a blend, it is appropriate to establish requirements that apply to use of the blend, although the blend itself is not a regulated substance.

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sector or subsector could use, indicating feasibility, readiness, advisability, and degree of a sector or subsector's transition away from the regulated substances in use. Similarly, the other factors in (i)(4)—to use best available data, to consider overall economic costs and environmental impacts as compared to historical trends, and to consider the remaining phasedown period for regulated substances under the phasedown rule issued under subsection (e), if applicable—also fit with this understanding of EPA's task: to determine whether, when, and to what degree it is appropriate to establish a use restriction to facilitate the transition of a sector or subsector from the use of regulated substances.

Third, we explained in the proposed rule that Congress provided EPA authority to issue restrictions that are full, partial, or on a graduated schedule. Fully restricting the use of a regulated substance in the sector or subsector in which it is used, by its terms, implies a full transition away from the use of that regulated substance in the given sector or subsector. We therefore understand EPA's ability to restrict "use of a regulated substance in the sector or subsector in which it is used" to be broad enough to achieve a full transition such that the regulated substance would no longer be present in any portion of the sector or subsector. To effectuate a full transition, we would have to be able to address all the aspects where the regulated substance is present in that sector or subsector of the market. There may be situations where a restriction is best targeted at points in the life cycle or market chain of the regulated substance that are subsequent to the incorporation of the regulated substance in a product or process, as well as points in the chain that are proximate to ultimate use. Thus, we interpret the term "use," and EPA's authority under AIM Act subsection (i), as being broad enough to reach points such as transport or offer for sale.

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EPA therefore proposed to interpret use of a regulated substance in the sector or subsector for purposes of subsection (i) as "for any person to take any action with or to a regulated substance, regardless of whether the regulated substance is in bulk, contained within a product, or otherwise, except for the destruction of a regulated substance. Actions include, but are not limited to, the utilization, deployment, sale, distribution, discharge, incorporation, transformation, or other manipulation." EPA's proposed definition of "use" therefore covered all of the links on the chain representing how regulated substances are introduced, incorporated into products or processes, circulated, and made available in the U.S. market.

We explained in the proposed rule that even though the Act grants EPA broad authority to achieve a full transition from regulated substances in a sector or subsector, there are many actions not included within the scope of the restrictions covered by this final rule, including actions associated with steps in the disposal chain such as recovery, recycling, and reclamation of a regulated substance; the ordinary utilization or operation of a system or product by a consumer; [41] and the six specific applications with a current qualification for application-specific allowances under 40 CFR 84.13. As explained in the proposed rule, given that we are at the outset of the phasedown of regulated substances, the restrictions in this action are aimed at limiting the introduction of new products that use regulated substances to the market and restricting the circulation of those products (*e.g.*, sale or distribution) before they reach the consumer. In that vein, the final rule includes "offer for distribution" in addition to offer for sale in the definition of use. Similarly, we proposed to restrict the installation of new systems using HFCs under the

[41] Noting, however, that in some cases the consumer may have purchased a product where the first incorporation of the regulated substance occurs when the product is in the consumer's ownership, and in those cases that incorporation would be covered by the requirements.

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proposal by defining manufacture to include the installation of new systems. EPA is finalizing its definition of "use" under subsection (i), with these clarifications, consistent with the interpretation of "use in the sector or subsector in which the regulated substance is used" articulated in the proposed rule and described above.

Comment: Most of the comments the Agency received in response to its proposed interpretation of EPA's scope of authority under subsection (i) and of EPA's definition of "use of the regulated substance in the sector or subsector in which the regulated substance is used" related to the proposed prohibition on the sale, distribution, and offer for sale or distribution of many regulated products that would go into effect on January 1, 2026 (*i.e.*, the sell-through period). Many commenters objected based on their view of the practical consequences of a one-year sell-through period, raising concerns about the economic harm of stranded inventory, and in particular, the high likelihood of stranded seasonal inventory such as air conditioners. Others commented on the difficulties of implementing any prohibition on the sale of parts of equipment that contain regulated substances, where those parts would continue to be needed for servicing and repair of existing equipment. Another commenter argued that prohibiting the sale of any inventory that was not sold by the sell-through prohibition date would constitute a "taking" without just compensation under the U.S. Constitution. These comments are summarized and addressed in section VI.C.2.c of this preamble.

A smaller subset of commenters alleged that EPA lacked statutory authority to promulgate a sell-through limitation under the AIM Act. One commenter claimed that the AIM Act only provides EPA with authority to prohibit the "manufacture" of high-GWP equipment, and that had Congress intended to allow EPA to have broader authority to regulate under subsection (i), it would have employed the same language that is used in

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subsection (h) of the AIM Act, which uses the terms "any practice, process, or activity." This commenter claimed that the Agency had relied upon dictionary definitions of the word "use" and that other dictionary definitions supported the commenter's preferred interpretation of that word to be limited to acts or practices that "employ, use, or put a regulated substance into service," and noted that at least one dictionary definition indicated that "use" means "long-continued possession and employment of a thing for the purpose for which it is adapted." The commenter therefore asserted that the Agency's regulatory definition should not include sale or distribution, since in the commenter's view, neither action is the act or practice of employing, using, or putting a regulated substance into service, nor is sale or distribution "the long-continued possession" and "employment for the purpose for which it is adapted," which, the commenter stated in the case of RACHP, is the transfer of heat.

Specifically, the commenter urged EPA to adopt the following definition of "use" under subsection (i): "Use means the act or practice of employing a product containing or designed to contain a regulated substance. Use does not include the destruction of a regulated substance." The commenter argued that its proffered definition would still allow EPA to phase out the manufacture of products made of or containing regulated substances without going beyond, in its view, the authority of the AIM Act. Further, the commenter claimed that a sell-through limitation, rather than a regulation based only on a product's date of manufacture, would be "unique" in comparison to numerous other regulations on durable goods, including those promulgated by the U.S. Department of Energy (DOE).

Response: We disagree with commenters who allege that EPA does not have authority under subsection (i) of the AIM Act to issue restrictions on the sale or

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distribution of products that use regulated substances. We do not agree with the commenter's reading of the statute, and specifically, its views that subsection (i) the AIM Act only provides EPA with authority to prohibit the "manufacture" of higher-GWP equipment and that, in contrast to subsection (h), which uses the language of "any practice, process, or activity," EPA's authority under subsection (i) is comparatively limited. In fact, subsection (i) does not mention either manufacture or equipment, much less contain any limitation that EPA may only address manufacture of equipment under subsection (i). Subsection (i)(1) says, with respect to EPA's authority, that "[s]ubject to the provisions of this subsection, the Administrator may by rule restrict, fully, partially, or on a graduated schedule, the use of a regulated substance in the sector or subsector in which the regulated substance is used." There is nothing in this provision that suggests that EPA's statutory authority under (i) is limited to issuing restrictions on manufacturing, nor does the provision suggest that only higher-GWP equipment may be the target of EPA's restrictions. To the contrary, this language broadly authorizes EPA to restrict any use of a regulated substance in the sector or subsector in which the regulated substance is used; there is no limitation, express or implied, to certain types of use or users.[42] These are assumptions that the commenter appears to have made without any grounding in the text of the statute.

We also do not agree with the commenter's view that Congress' decision to use different language than it did for subsection (h) (*i.e.*, its omission of the terms "any practice, process, or activity," which appear in subsection (h)) somehow narrows the

[42] Congress included express limitations on the applicability of the rules under AIM subsection (i) in a later part of the subsection (see subsection (i)(7)), and neither of the limitations in that provision mention a limitation to the manufacture of higher GWP equipment. Had Congress intended the kind of restriction the commenters suggest, it is reasonable to think they would have included those restrictions in subsection (i)(7).

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scope of subsection (i). The commenter appears to ignore the full context of each provision. Subsection (h) and subsection (i) use different language and are framed differently, but that does not mean that one is narrower or the other broader. Rather, EPA interprets those differences as conveying authority that is tailored to the respective area of focus of these subsections so that EPA can establish regulatory regimes that effectively achieve their respective purposes and complement one another. Because EPA is establishing these provisions under subsection (i), the critical question is whether they are within the authority conveyed under subsection (i) as Congress drafted it, not whether they would be authorized under some other language. When the statutory text of subsection (i) is read in full context, it comfortably encompasses restrictions on a range of entities that use regulated substances, not just manufacturers of equipment. One authority EPA has under (i) can be stated as follows: "[t]he Administrator may . . . restrict fully . . . the use of a regulated substance in the sector or subsector in which the regulated substance is used."

Subsection (i)'s grant of authority to issue a full restriction across use in a sector or subsector was a key rationale underlying EPA's interpretation. As EPA pointed out at proposal, EPA interprets the statute in a way that could give meaning to subsection (i)'s grant of authority to effectuate a full restriction, and thus transition, of all uses of a regulated substance in any given sector or subsector. As we explained in the proposed rule, a narrower interpretation of EPA's authority to exclude sale or distribution could circumvent the intended full transition of a sector or subsector away from use of HFCs. Consistent with these concerns articulated in the proposed rule, EPA received a comment from a State that has restricted the manufacture of products containing HFCs *without* a sell-through limitation, and that State observed that such an "approach can create

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challenges as it relies on regulated entities to provide documentation as to manufacture date," and that "[n]ot all entities in the market chain can provide such information for all products," noting that "[t]hese factors are further complicated when applied to international manufacturers and retailers." These concerns lend further support to EPA's view that covering all points in the market chain of "use in the sector or subsector" ensures that the use restrictions we establish achieve their intended purpose, where the intention is to fully restrict the use of a regulated substance in a sector or subsector, or, as in this case, to partially restrict the use of regulated substances before those substances reach consumers. As discussed in the proposed rule, even though EPA's definition of "use" is broad in order to enable the Agency to fully exercise the subsection (i) authority under that provision and to facilitate a full transition to HFC substitutes where appropriate, that does not mean that in every instance the restrictions promulgated under subsection (i) will exercise that full authority. In many cases, as in this action, EPA may issue partial restrictions that target only certain uses.

The same commenter who asserted EPA has no authority to restrict sale or distribution provided no rebuttal or engagement with the reasoning EPA provided at proposal for its interpretation: namely, that the express provision of subsection (i) is related to a sector or subsector's use of a regulated substance, that the subsection (i)(4) factors require EPA to analyze information related to a restriction's feasibility and impact from a sector-level viewpoint, and that, as stated previously, the authority to "restrict fully" means that EPA has authority to restrict many activities in a sector- or subsector-level chain where regulated substances are present, and therefore "used" in that sector or subsector. Instead, the commenter claimed that EPA "justified" its interpretation by relying on dictionary definitions of the word "use." This is not accurate. We began the

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proposed rule's preamble discussion with citations to the dictionary definition of that word, but the reasoning for our proposed interpretation and definition of the term did not rest solely on the dictionary definitions.

Nor do we agree with the commenter that their proffered definition, which relies on the commenter's "dictionary definition" understanding of the term "use," is workable. The commenter suggests that EPA should define "use" as "the act or practice of employing a product containing or designed to contain a regulated substance. Use does not include the destruction of a regulated substance." We do not agree with commenter's assertion that this definition "would still allow EPA to phase out the production of products made of or containing regulated substances." Putting aside the commenters' confusing use of the term "phase out" in the context of subsection (i), which addresses use restrictions, under the commenter's definition, EPA would only be allowed to restrict the act or practice of employing a *product* containing or designed to contain a regulated substance. We fail to see how this definition of use would allow EPA to restrict the manufacture of products containing HFCs, because the creation of a product is not the act or practice of employing that product, nor would EPA be permitted to restrict the import of such products, because import also does not "employ" the product. In fact, under the commenter's suggested definition, it would appear that the only potential regulated parties under AIM Act subsection (i) would be the consumers of products, as these are likely the only parties that would be "employing" the products, as the commenters seem to be using that term, and for the sector the commenter represents (RACHP), the consumers are almost certainly the only parties that are "employing" the products for "the purpose for which it is adapted, *i.e.*, the transfer of heat" (to quote the commenter's understanding of and application of the dictionary definition of "use"). We disagree that

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this is a reasonable reading of the AIM Act, given the textual considerations that subsection (i)(4) sets the Agency to consider when determining whether or not to restrict the "use of a regulated substance *in the sector or subsector in which the substance is used*." (emphasis added).

We also note that despite the commenter's observation that many regulations on goods, including those promulgated by the U.S. DOE, establish compliance based only on manufacture, that has little relevance for EPA's interpretation of the term "use" in subsection (i). EPA's action is governed by the authority grounded in the text of the AIM Act, not the text of the statute providing DOE authority to promulgate its regulations. In any case, designing a restriction that regulates actions other than manufacture is not "unique." In the context of SNAP under CAA section 612, which evaluates alternatives to ozone-depleting substances like chlorofluorocarbons (CFCs) (class I substances) and HCFCs (class II substances), EPA has long defined "use" as "any use of a substitute for a class I or class II ozone-depleting compound, including but not limited to use in a manufacturing process or product, in consumption by the end-user, or in intermediate uses, such as formulation or packaging for other subsequent uses." 40 CFR 82.172. The Agency's interpretation of the scope of its authority and its definition of the term "use" in the subsection (i) context similarly conceives of this authority as including the introduction of products containing regulated substances into what we consider to be sector or subsector activity, and the full market chain of activities, or "intermediate uses," that follow, through to the consumer or end-user.

2. What uses is EPA restricting in this rule?

a. Manufacture and Import of Factory-completed Products

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This rule includes restrictions that apply to the manufacture of certain factory-completed products by the dates specified in section VI.F. As discussed in section VI.A on definitions, commenters were generally supportive of EPA's proposal to establish use restrictions on the manufacture of factory-completed products using regulated substances. Many of the comments received on EPA's proposal to restrict manufacturing related to EPA's proposed definition of "manufacture" to include the installation of field-assembled systems.

EPA proposed to apply its restrictions equally as to domestically manufactured products using HFCs and products using HFCs that are imported. The AIM Act defines "import" as "to land on, bring into, or introduce into, or attempt to land on, bring into, or introduce into, any place subject to the jurisdiction of the United States, regardless of whether that landing, bringing, or introduction constitutes an importation within the meaning of the customs laws of the United States," and this rule follows that definition. Commenters were supportive of EPA's equal application of the proposed restriction to the manufacture of products using HFCs and to the import of products using HFCs, noting that restricting both manufacture and import would garner environmental benefits, meet industry expectations, and treat all equipment equally regardless of location of manufacture and availability of HFCs under the global phasedown. EPA is finalizing the restriction on the import of products as proposed.

While EPA is generally not regulating used equipment (*see* section VI.C.b), the Agency proposed to restrict the import of all products that do not meet the GWP limits, regardless of when the product was manufactured and regardless of whether the product is used. The goal of restricting the use of regulated substances (in this case, higher-GWP HFCs) in the named sectors and subsectors would be undermined if those sectors and

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subsectors could simply shift use to imported products containing higher-GWP HFCs that were not subject to the Agency's restrictions.

AIM Act subsection (i)(7)(B)(ii) states that subsection (i) rules shall not apply "except for a retrofit application, [to] equipment in existence in a sector or subsector before December 27, 2020." EPA interprets this limitation with respect to "equipment in existence in a sector or subsector" not to apply to equipment manufactured abroad prior to the Act's date of enactment, because EPA interprets "sector or subsector" in that provision to mean a sector or subsector in the United States. In general, where those terms appear in subsection (i) of the AIM Act, EPA understands them to mean the domestic sector or subsector, not the sector or subsector as it exists, operates, and functions in another country. For example, in assessing the availability of substitutes for use in a sector or subsector under subsection (i)(4)(B), EPA is generally analyzing the various subfactors—consumer costs, building codes, appliance efficiency standards, contractor training costs—vis-à-vis the domestic impacted sector or subsector.[43] Therefore, equipment that was manufactured in another country and existed prior to December 27, 2020, but was not imported to the United States until after that date is not subject to subsection (i)(7)(B)'s limitation, because until it is imported into the United States, it is not "in existence in the sector or subsector."

EPA received a number of comments related to its application of restrictions on imports, and we summarize and respond to these comments below.

Comment: One commenter supported and one commenter opposed the proposal to restrict the import of products not meeting the GWP limits, regardless of when the

[43] EPA is examining international information for some of the analyses, such as research from international organizations about technological achievability, because such information has relevance for the sector or subsector in the United States.

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product was manufactured and regardless of whether the products are used. The commenter opposed to EPA's proposal requested that EPA clarify that "equipment in existence as of December 27, 2020" applies to all equipment in existence up to the date of this rule's proposal, wherever that equipment is located (*i.e.*, whether in the United States or elsewhere), at least for semiconductor manufacturing equipment. The commenter asserted that semiconductor manufacturers have been producing semiconductor manufacturing equipment in the last two years that was designed well before the AIM Act was enacted, and that such equipment was intended to operate for the next 10 to 25 years. The commenter argues that until EPA published its proposed rule, semiconductor manufacturers did not have "actionable notice" that their products might be subject to the Agency's restrictions. The commenter also states that complex semiconductor manufacturing equipment may have been manufactured outside of the United States but was intended for use in the U.S. semiconductor sector. The commenter noted that the semiconductor industry has a global supply chain with long production timelines and asserted that EPA's proposed distinctions based on where equipment is located could impose significant complications on the sector's supply chain management.

Response: The Act's exception from applicability in AIM Act subsection (i)(7)(B)(ii) plainly does not apply to any equipment manufactured after December 27, 2020. We therefore do not agree with the commenter that the exception in that provision could be interpreted to apply to equipment manufactured between the date of the AIM Act's enactment and the publication of EPA's proposed rule. The statute is clear on its face, whether or not regulated entities were aware of being potentially subject to regulation under these provisions of the AIM Act until EPA issued its proposed rule.

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We also clarify that not all equipment that uses regulated substances in the semiconductor manufacturing industry is subject to these rules. The use of regulated substances in many semiconductor manufacturing processes, such as etching and the use of HFCs as solvents, is not restricted by this final action. EPA's restrictions cover only the use of HFCs as they relate to semiconductor manufacturing where those HFCs are used as a refrigerant in chillers for IPR. As discussed in section VI.F.1.j, EPA is differentiating its restrictions and the timing of those restrictions for this subsector based on the temperature of the exiting fluid. To the extent that the equipment cited by commenter has exiting fluid temperatures below -50 °C (-58 °F), the import of such new equipment is not restricted by this rule. For equipment with exiting fluid temperatures above that temperature, EPA has delayed the compliance date for installations of new systems to either 2026 or 2028 (again differentiating based on the temperature of the exiting fluid). Importing components of such systems may continue after those compliance dates to allow servicing of existing equipment in the U.S.

Comment: One commenter opposed to EPA's proposal to apply its restrictions to all imported products using HFCs above the GWP limits requested that used semiconductor manufacturing and related equipment (SMRE) that was designed to contain HFCs receive an exemption. The commenter stated that there is a robust and active market for used SMRE, and preventing the import of this used equipment could have inadvertent supply chain disruption effects.

Response: EPA understands the semiconductor manufacturing equipment to fit within the IPR subsector, typically utilizing chillers, often built into other non-refrigerant containing equipment, to cool processes necessary to produce semiconductor chips and other electronics. As such, we do not view such equipment differently from other IPR

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systems, which likewise could conceivably integrate a chiller into other equipment (*e.g.*, a chiller integrated with a conveyor belt intended to move food needing freezing along its production process). As discussed in section VI.F.1.j, EPA is finalizing a compliance date later than proposed based on our consideration of the subsection (i)(4) factors. Specifically, EPA is establishing a compliance date of January 1, 2028, for IPR chillers where the fluid exiting the chiller is below -22 °F (-30 °C), and a January 1, 2026, date for other such equipment. And, consistent with the proposed rule, this final rule does not restrict HFC use in such equipment where the fluid exiting the chiller is below -50 °C (-58 °F). This additional time compared to the proposal should assist in the commenter's ability to respond to the restrictions in this rule; for example, by importing appropriate equipment prior to the relevant compliance date and/or altering manufacturing outside the United States to use refrigerants that meet the restrictions for the United States (*i.e.*, less than 700 GWP).

Comment: Other commenters asked that EPA clarify how the import restriction applies to existing intermodal containers that are engaged in trade, refrigeration equipment in operation on ocean-going vessels, and non-road motor vehicles temporarily deployed overseas. Commenters stated that applying the GWP limit to all refrigerated containers is infeasible and would be highly disruptive to trade. Commenters also stated that such equipment should be allowed to be serviced in the United States and not be subject to the recordkeeping and reporting requirements.

Response: EPA agrees that applying the restrictions to products that are actively in use when travelling into U.S. jurisdiction could be problematic. For example, a strict reading of the proposed restrictions on import could have prevented a traveler from reentering the United States from Canada or Mexico with their car if the MVAC uses

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HFC-134a. As noted in the proposed rule, the Agency's intention is to cover the activities of entities bringing large shipments of products into the country, as well as activities of entities bringing smaller volumes of products into the country (*e.g.*, driving a truckload of air conditioning units across the Canadian or Mexican border for sale in the United States.). EPA therefore is distinguishing in this final rule those products or systems that are actively in use when travelling into U.S. jurisdiction from shipments of used products destined for resale or further distribution. EPA is not intending that this aspect of this rule restrict RACHP equipment in operation aboard marine vessels, planes, motor vehicles, refrigerated transport trailers, or intermodal containers. Likewise, foam or aerosol products that are in use (*e.g.*, trailers) or in possession of a consumer when crossing the border are likewise exempt from the import prohibition. However, EPA's intent is to apply the use restrictions consistently for domestic manufacturers and importers of products. As such, no person may sell new refrigerated transport trailers or refrigerated intermodal containers in the United States, whether manufactured domestically or abroad after the manufacture/import compliance date, unless it complies with the HFC use restrictions.

Comment: One commenter expressed concern that prohibiting the import of used, non-compliant products would also prevent the import of products intended for recycling. The commenter contended that such a regulated product is not 'in the sector or subsector in which the regulated substance is used' either outside or inside the United States, and thus prohibiting the import is contrary to subsection (i)(1) of the AIM Act.

Response: EPA considers the disposal chain, which includes the recycling of equipment, and not the use or reuse of the equipment in the relevant sector or subsector in the United States, to be outside the scope of the restrictions on distribution. This includes

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equipment bound for disposal that was never used by a consumer, such as defective components or products that were manufactured or imported illegally. Allowing for disposal furthers the intent of removing equipment from the market before it is used by the consumer.

b. Installation of Systems

EPA is defining the term install/installation as "to complete a field-assembled system's circuit, including charging with a full charge, such that the system can function and is ready for use for its intended purpose." As discussed in section VI.A (Definitions), many commenters expressed concerns about EPA's proposed definition of "manufacture," which would have included the installation and first charge of field-assembled equipment. These included concerns that defining "manufacture" to include "install" of field-assembled systems effectively accelerates the timeline of the prohibition and renders the one-year sell-through moot. Commenters suggested different ways to regulate the use of HFCs in field-assembled equipment, including restricting the manufacture of components that would later be field-assembled. In this final rule, EPA is restricting the installation of field-assembled systems with additional clarifications. The definition of install is virtually identical to the proposed definition of manufacture for field-assembled systems. As with the term manufacture, the definition of "install" serves as a distinct point in time by which listed activities must be completed for purposes of meeting the compliance date. By proposing in its prohibitions that "no person" may manufacture a product, EPA's intent was to capture any person who is responsible for the manufacture (which, at proposal, included installation of field-assembled equipment). EPA therefore does not think that limiting the responsibility to only the technician who first charges the system (and thus makes it ready for use for its intended purpose) is an

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appropriate application of the restriction on installation. Doing so would be equivalent to making the final individual on a factory assembly line the "manufacturer" of a refrigerator and not the OEM. Responsibility for installing a system that improperly uses a higher-GWP HFC refrigerant after the compliance date lies with multiple entities, including the designer, builder, and owner/operator of that system, in addition to the entities that assembled the components and got them into operating order on site.

Therefore, any person who assembles, contracts for, takes ownership of, or operates a system that is installed after the applicable compliance date using regulated substances prohibited for that subsector is in violation of this rule.

Comment: Some commenters requested that EPA allow for installation of a system if building permits have already been received to avoid the re-design and permitting of buildings. Another commenter sought flexibility in case there is a delay in receiving all the necessary components or a delay in assembling and charging the system. The commenter requested EPA allow appliances purchased under contract before the compliance date to receive their field charge after that date.

Response: EPA recognizes that some facilities may have been designed and permitted to specifically use systems with HFCs that will be restricted by this final rule. We anticipate that such instances are rare, especially because the final rule delays the compliance dates for the installation of most field-assembled systems by at least one year and sometimes longer depending on the subsector. However, systems using HFCs within facilities needing such long lead-times that they have approved building permits in place by the date of signature for this final rule are likely to be highly complex and costly to redesign. EPA previously granted additional time to install systems that have been permitted under the HCFC use restrictions under section 605(a) of the CAA. In those

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instances, EPA agreed to provide time if, among other conditions, those appliances were specified in a building permit dated before the compliance date (*see* 74 FR 66441, December 15, 2009) and in a more recent action the date of signature of the relevant proposed rule (*see* 85 FR 15267, March 17, 2020).

Based on the comments received, similar flexibility may be needed in this rule. Therefore, EPA is allowing one additional year for the installation of systems in four subsectors if an approved building permit issued before the date of signature of this final rule specified the use of a system containing refrigerants with GWPs above the relevant GWP threshold for the specified subsector. These subsectors are: IPR systems with a January 1, 2026, compliance date; retail food refrigeration – supermarkets; cold storage warehouses; and ice rinks. This flexibility will prevent the need to redesign these systems, and potentially the facility that houses these systems. EPA is not including other subsectors in this provision as those systems are not typically designed specifically for an individual facility and/or those systems have a later compliance date and thus can make any necessary changes with the GWP restrictions in mind.

EPA disagrees with the suggestion to allow systems purchased under contract prior to the compliance date to be field charged after that date. Doing so would undermine the intent of the regulation and the statute by incentivizing the finalization of numerous contracts in the days preceding the compliance date, which could then potentially allow for years of further installations using higher-GWP HFCs in sectors and subsectors that EPA has already determined under subsection (i)(4) are ready to transition to lower-GWP substitutes.

Comment: Some commenters disagreed with the installation being the point of compliance. One commenter stated that this broadens responsibility for compliance from

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a relatively small number of knowledgeable OEMs to a much broader group of distribution and installation stakeholders who do not have the same level of awareness of the regulatory requirements. Another commenter recommended that EPA exclude "purchaser and/or user" and "third party companies" from the definition of a "manufacturer," (under the definition as proposed) whether or not they are involved or provide support for activities associated with field assembly or charging. The commenter argued that the purchaser and/or user rarely, if ever, takes "ownership" of IPR equipment until it is fully charged and has been demonstrated to run safely for the use for which it was designed and/or intended, which is the responsibility of the manufacturer who designed and fabricated the parts.

Response: EPA disagrees with the comments that the Agency should only restrict OEMs and not regulate installation of a field-assembled system. Many commenters representing OEMs of components stated that they do not control how their components are used after they are sold to a distributor, and EPA agrees that with respect to restricting the use of HFCs in installation of field-assembled systems, OEMs of components used in those systems are not the appropriate entity to regulate (unless the OEM is involved in the design or construction of the system). While applying the restrictions on installations to the parties other than OEMs results in more potentially regulated entities, it appropriately places the restriction on the entities that can control the use of HFCs in that system. While a broader group of installation stakeholders may not be as accustomed to compliance issues as the relatively smaller group of component OEMs that commenters requested be subject to the restrictions, applying the restrictions for installation of systems to the designer, builder, and owner/operator of that system will help to ensure that there is a knowledgeable party driving compliance.

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Comment: Many commenters requested that EPA provide a precise and clear definition for when a field-erected and field-charged system modified as part of a remodel or regular maintenance is covered by the new GWP limit. They requested that EPA allow for replacement of appliance components, including but not limited to cases, compressors, valves, condensers, evaporator units, piping and other components to keep that existing system running. They also requested that EPA allow for remodels or retrofits to update the look, improve the efficiency, or reduce leaks in a system. Other commenters requested that EPA use California's definitions of new refrigeration equipment, new air-conditioning equipment, and new facility to demarcate which modifications to a system trigger the requirements applicable to new systems. A State commenter noted that a single, unified definition of 'new' would be useful for States that wish to establish controls that are aligned with EPA and in cases where stakeholders require clarity on State versus national controls.

Several commenters summarized California's regulations as an example of how a previously installed refrigeration system could trigger the use restriction through either of two methods. The first method is when the compressor capacity of the refrigeration system is increased or the cost of replacing components over a three-year period exceeds 50 percent of the capital cost of replacing the entire system (excluding display cases).[44] The second method is when an existing facility changes to a different end-use or when 75 percent of the refrigeration system's evaporators (by number) and 100 percent of its

[44] This is similar to the definition of "new" in New York State. Specifically, new is defined as "Products or equipment that are manufactured after the effective date of this Part or installed with new or used components, expanded by the addition of components to increase system capacity after the effective date of this Part, or replaced or cumulatively replaced after the effective date of this Part such that the cumulative capital cost of replacement exceeds 50% of the capital cost of replacing the whole system." 6 NYCRR 494.3(s).

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compressor racks, condensers, and connected evaporator loads have been replaced. A previously installed air-conditioning system triggers the use restriction depending on the size of the system. For systems with a single condenser and single evaporator, the use restrictions are triggered when replacing the exterior condenser, condensing unit, or remote condensing unit. For systems having more than one condenser and/or more than one evaporator, the use restrictions are triggered when 75 percent of the indoor evaporator units (by number) and 100 percent of the air source or water source condensing units are replaced over a three-year period.

A commenter recommended EPA use the first method to avoid the continuous replacement of parts indefinitely without ever triggering any restriction on the use of controlled substances. An industry commenter recommended the second method. A few commenters also requested that EPA define the term "new facility" which is substantively the same as the second method in the definition for new refrigeration equipment. One such commenter that favored this approach said it is clearer that components may be replaced and that restricting "new refrigeration equipment" would require establishing exceptions for remodels and replacement for maintenance.

Response: EPA's intention is to allow the ordinary servicing and repair of equipment and not to apply restrictions in a way that would prevent such maintenance. However, we are cognizant of the concern that systems could be significantly modified or upgraded to the point that such modification or upgrade should be considered a new installation subject to the subsector GWP limits.

The Agency has encountered the question of what modifications constitute the installation of a new system during the phaseout of HCFCs. Under section 605(a) of the CAA, EPA prohibited the use of virgin HCFC-22 and HCFC-142b to charge new

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appliances assembled onsite on or after January 1, 2010. (December 15, 2009; 74 FR 66437). In that context, the Agency's interpretation was that there were two different situations that could be equivalent to the manufacture (*i.e.*, installation) of a new system. These are modifications to a system that increase the total cooling capacity in BTU of the system or the complete replacement of all components within a system at once or over time. Based on commenters' requests for clarification on the issue, EPA is adopting these two situations in the regulatory text. In addition, after consideration of the public comments and its past experience implementing similar restrictions, the Agency is providing more specificity about which components must be replaced in order for a replacement to qualify as "new installation."

EPA noted in the proposed rule, in the context of what qualifies as "equipment in existence," that "in limited cases where every part of a piece of equipment had been altered or replaced," such equipment would fall outside the statutory and regulatory exemption in subsection (i)(7)(B), and the alteration or replacement would be considered a new installation subject to the restrictions under this section. In so doing, we did not intend that "every" piece would include refrigerant tubing, which is often very difficult to replace because the tubing may be inaccessible. Even in major overhauls of systems, this tubing is rarely replaced, and we therefore think replacements where this tubing remains installed should still be considered new installations for purposes of triggering these restrictions. Therefore, we are clarifying in this final rulemaking and in the regulatory text which components must be replaced, and at what percentages, to provide a precise, clear standard that will ensure that major replacements and alterations are properly subject to the restrictions and transition to lower-GWP refrigerants. Specifically, when 75 percent of the refrigeration system's evaporators (by number) and 100 percent of its

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compressor racks, condensers, and connected evaporator loads have been replaced, such replacement constitutes a new installation and is subject to the restrictions on installation. EPA's approach in this final rulemaking is also used by States that have adopted a definition of "new refrigeration equipment."

EPA disagrees with commenters' suggestion that the Agency adopt other methods used in California for determining when an existing refrigeration system is considered "new." Those other methods, such as including specific timeframes or assessing capital costs, deviate from EPA's historical interpretations under title VI of the CAA and raise additional questions about implementation. Nor is EPA adopting the method for determining when an existing air-conditioning system with a single condenser and single evaporator is considered "new." In implementing the use restriction on HCFC-22 under title VI of the CAA, EPA has considered the replacement of the condensing unit to be a repair and not the installation of a new system. EPA finds that it is also reasonable to continue that interpretation under the use restrictions in subsection (i) as it is the same type of equipment and because the AIM Act is implementing a phasedown rather than a phaseout, meaning there is no end date for the production and import of bulk HFCs.

c. Sale or Distribution of Factory-completed Products

As discussed above, EPA interprets "use" to include activities in the market chain that occur after the manufacture or import of a product. As such, EPA is applying use restrictions to any person who sells, distributes, offers for sale or distribution, makes available for sale or distribution, purchases or receives for sale or distribution, or attempts to purchase or receive for sale or distribution, or exports any product using a regulated substance in the sectors or subsectors controlled under subsection (i). Applying the restrictions in this way ensures that the goal of restricting the use of regulated substances

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in the sectors or subsectors in which the regulated substances are used can be achieved, because the sector and subsector's use of the regulated substance is present in all these aspects of the market chain, and it is EPA's intention to restrict use across that chain. Therefore, if a manufacturer or importer improperly introduces into the U.S. market a non-compliant product, distributors and retailers (including online retailers) offering that product for sale are also restricted from covered activities related to that product. Providing the means by which individuals are able to list and sell prohibited products, or exerting control over these sales, including operating platforms for eCommerce transactions, will be considered use under this rule. EPA is also applying the use restrictions to those entities who purchase or receive for the purpose of further sale or distribution with the intent to cover both sides of the transaction between distributors but not the purchase by a consumer. The intent of this restriction is to ensure that products that do not meet the limits do not enter the market and are not circulated in the market, prior to sale to the consumer.

EPA proposed to prohibit sale, distribution, offer for sale and distribution, and export of products using regulated substances not meeting the GWP limits one year after the proposed prohibition date for manufacture and import of products using regulated substances over the GWP limits in each subsector. EPA explained at proposal that limiting the period of time when products that do not meet the GWP limits can continue to be sold has advantages over indefinitely exempting the sale of inventory that does not meet the established use restrictions. In particular, we noted the advantage of having a date certain by which all parties—*e.g.*, the public, enforcement officials, and regulated entities—know that there can legally be no new products on the market that do not meet the GWP limits. This additional prohibition on the activities subsequent to manufacture

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and import but prior to sale to the consumer reinforces the sector or subsector's transition away from use of HFCs in new products and, to the extent that it is a possibility, prevents the stockpiling and continued sale of products that do not meet the sector or subsector use restrictions from continuing indefinitely into the future.

EPA received many comments on this proposed prohibition on the sale or distribution of products. Comments received on this aspect of this rule and EPA's responses to those comments are summarized and discussed in further detail below and in the response to comments document, available in the docket.

This final action retains a limited sell-through period on products using a regulated substance that do not meet the sector and subsector restrictions with key changes in response to concerns raised by the commenters. First, EPA is limiting the prohibition on sale, distribution, offer for sale and distribution, and export to factory-completed products that use prohibited higher-GWP regulated substances. As discussed in greater detail later in this section, EPA is excluding components and allowing for their continued manufacture, import, sale, distribution, offer for sale and distribution, and export, subject to certain restrictions, including that these uses are for the purpose of servicing existing equipment. Second, EPA is extending the compliance date for the sales prohibition on factory-completed products from the proposed one year to three years after the manufacture and import compliance date. EPA provided the two additional years to address commenters' concerns that a one year sell-through was potentially insufficient to clear inventory, and in particular, seasonal products such as window-unit air conditioners, which can experience variable demand from year-to-year. This final approach ensures that sectors and subsectors that use regulated substances will transition from the use of

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those substances where such transition is appropriate and alleviates the concerns raised by commenters.

Comment: Several commenters voiced concern that the one-year compliance deadline would create the risk of stranded inventory that would not be able to be sold, which would cause economic harm to manufacturers, distributors, retailers, and ultimately consumers. Commenters representing distributors highlighted the many considerations they must account for in determining the amount of inventory to stock, citing the desire to carry amounts of inventory large enough to maintain competitive pricing, against costs incurred via storage space leasing, warehouse mortgages, building utilities, and insurance on products stored in the warehouse. Other commenters, particularly those in the heating and cooling sector, noted that many factors, including the economy, weather, and demand for construction impact sales and that in this sector particularly, it is already difficult to forecast what amount of inventory will need to be carried over year to year. Many commenters noted that the sell-through limitation would exacerbate existing supply chain challenges, particularly for small businesses. Commenters stated that the one-year sell-through period would require distributors to either stock less inventory, and therefore potentially fail to meet customer demand, or to throw away inventory that would be prohibited by the sell-through limitation, and that either of these outcomes would cause economic harm. Commenters noted that the economic harm caused by the proposed one-year sell-through period might cause them to reduce their labor forces, and would require increased monitoring for compliance throughout the supply chain.

Many of these commenters also cited concerns about potential adverse environmental impacts of stranding inventory. Others noted that the environmental

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benefit of the AIM Act is from the phasedown of the supply of HFCs, and that the HFC price increases and lack of availability of regulated substances that will flow from the phase-down will provide a market force to transition to lower-GWP substitutes, making the sell-through limitation unnecessary as a backstop. Many commenters requested that EPA eliminate the sell-through limitation altogether, and instead permit unlimited sell-through of any product labeled with a "date of manufacture" meeting the compliance date for manufacture. Others requested that the Agency at least extend the permissible limitation to multiple years, with some commenters suggesting that two or three years would minimize the risk of stranded inventory.

EPA also received comments in support of its proposed prohibition on sale, distribution, offer for sale and distribution, and export. Some commenters stated that the compliance dates in the proposed rule already provide sufficient time for manufacturers and distributors to plan for the transition to lower-GWP substitutes and to sell existing inventories, and that the compliance date for the sell-through limitation should be one year at most. These commenters asserted that allowing an indefinite period for sell-through of equipment manufactured by the manufacture compliance date would complicate enforcement and could provide an incentive for companies to increase near term production of systems using HFCs before restrictions come into effect. The Agency also received supportive comments on the proposed sell-through limitation from States, including one that has promulgated under State law a prohibition on manufacture but allows unlimited sell-through of products manufactured prior to that prohibition date. That State commenter noted that the unlimited sell-through approach can create challenges because it relies on regulated entities to provide documentation as to the

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manufacture date, and that not all entities in the market chain can provide that information.

Response: EPA acknowledges the input provided by commenters both in support of and raising concerns with the limitation on sale, distribution, and export of products regulated under these restrictions. We recognize that the production and purchase of products or components that are unable to be sold to consumers is an economic and environmental outcome no parties desire, and the proposed rule's forward-looking compliance dates were intended to allow all parties in the market supply chain sufficient time to avoid that outcome. To that end, after considering the concerns raised by various commenters, EPA is extending the proposed one-year compliance date for the sell-through limitation on products to three years after the manufacture and import compliance date. The longer timeframe for a sell-through allows regulated entities more time to manage inventory to avoid purchasing products they will not be able to sell, reduce waste, and lessen the impacts to the downstream channels and customers. While EPA recognizes there will still be costs to establishing a sell-through limitation, we expect that extending this timeframe to three years will mitigate the costs of stranded inventory, storage, and product disposal that commenters identified. As such EPA has not quantified these costs in the RIA Addendum but describes them in qualitative terms. In addition, EPA notes that such comments were based on the assumption that components and repair parts would be subject to the sell-through, which they are not.

EPA anticipates that this extension will mitigate many of the concerns raised by commenters regarding the difficulty of balancing competing priorities and forecasting how much inventory to stock, particularly for those sectors marketing seasonal products. Allowing two additional years for the sale, distribution, offer for sale and distribution,

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and export of products manufactured or imported before the use restrictions will provide needed time for all parties to plan for a smooth transition to meet the new limits. As pointed out by the commenters, parties in these sectors and subsectors must already balance many competing factors—costs of storage, projected demand, weather, supply chain, demand for construction, and the economy—some of which are known and some of which are beyond the parties' control. Our intention in extending the compliance deadline for the sell-through limitation is to provide regulatory certainty with respect to this restriction to allow time for distributors and retailers to transition their inventory from products using regulated substances that do not meet the restrictions.

EPA does not agree that dispensing altogether with a sell-through limitation is appropriate in this case. This limitation reinforces the Agency's restrictions on manufacturing and import by establishing a bright line compliance date after which no products that do not meet the new restrictions may be sold or distributed. Based on past experience with the phaseout of ODS, EPA anticipates that the availability and price difference between HFCs in the United States and in countries with a later HFC phasedown schedule will create an incentive to import non-compliant products into the United States. A sales restriction eliminates that market. This is the intention of the Agency's restrictions—that by a date certain, the sector or subsector subject to the restriction will no longer be selling to consumers products that use regulated substances where a substitute can be used (per the Agency's determination under the (i)(4) factor analysis). Enforcement of the manufacture and import restrictions are supported because it is easier to identify non-compliant products within the distribution chain or at the point of sale than it is to identify them at a single moment in time when they cross the border. Ultimately the sales restriction protects U.S. manufacturers that have transitioned from

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being undercut by any foreign, non-compliant products that may have been improperly imported after the import prohibition compliance date. A "date of manufacture" label alone would not provide that same protection.

While some commenters stated that, in their view, a "date of manufacture" label would be easier to implement and require less compliance monitoring, we do not agree. Under that scenario, a product containing HFCs or blends that had GWPs exceeding the limits could permissibly be sold, distributed, or exported if the date of manufacture met the proper compliance date, but would be impermissible if manufactured after the compliance date. Also permissible for sale or distribution would be products containing HFCs or blends that had GWPs that met the new restrictions. The commenter's approach would require regulated entities to segregate those products that were manufactured or imported by the compliance date from those manufactured or imported after the compliance date. Per EPA's final rule, regulated parties would need only to discern whether the products met the limits by the compliance date in order to ensure they were complying. The commenters' preferred approach of focusing on the "date of manufacture" label also puts the success of the transition squarely on proper labeling and incentivizes inaccurate or fraudulent labeling. EPA is cognizant of the comments from our State partners who have implemented their programs in this way and faced these types of challenges.

With respect to comments asserting that the sell-through limitation is unnecessary because the environmental benefit of the AIM Act will derive from the Act's phasedown of regulated substances, we do not agree. Congress provided authority under subsection (i) separate from the phasedown authority under subsection (e) to restrict use of HFCs in particular sectors and subsectors, and it is the Agency's view that these sector- and

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subsector-specific restrictions are an important component to supporting the domestic phasedown of HFCs. As noted, the sell-through provisions provide a backstop to the manufacture and import restrictions by aligning incentives of all impacted users in the sector or subsector (manufacturers, importers, distributors, retailers, etc.), because all users will know that there will be no market for noncompliant equipment after the extended sell-through compliance date. We also note that even if commenters are correct that the phasedown's impact on the prices of bulk HFCs will disincentivize domestic manufacturers from generating large stockpiles of products in sectors and subsectors that are ready to transition to lower-GWP substitutes, this rule also restricts the import of products containing HFCs, the benefits of which are not reflected in the assessments of benefits in the phasedown.

Comment: One commenter alleged that EPA's proposed limitation on the sell-through of products not meeting the Agency's use restrictions would constitute a regulatory taking without just compensation under the U.S. Constitution. The commenter asserted that EPA's regulation of their property would justify compensation under the legal tests established by the Supreme Court in *Penn Central Transportation Co. v. New York City*, 438 U.S. 104 (1978) and *Lucas v. South Carolina Coastal Council*, 505 U.S. 1003 (1992). Specifically, the commenter stated that under *Penn Central*, a court must determine "the regulation's economic effect on the owner, the extent to which the regulation interferes with reasonable investment-backed expectations, and the character of the government action." The commenter asserted that the test was met with respect to EPA's proposed sell-through limitation because it "has an economic impact because of dead inventory; wholesale distributors used capital to purchase inventory to sell, which interferes with reasonable investment-backed expectations; and the government action is

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intentional in its taking of property by rendering the property valueless." Next, with respect to the *Lucas* test, which the commenter articulated as an "expanded definition of a per se taking and established that a regulatory taking could exist when a regulation results in the property becoming valueless," the commenter claimed that the test was met because affected property cannot be sold or exported, nor can it be donated to training facilities (as it will be obsolete), removing the regulated substance before selling the property for scrap will incur costs, and it has no value in retention (as was true of the eagle feathers at issue in *Andrus v. Allard*, 441 U.S. 51 (1979)). The commenter further argued that even though *Penn Central* and *Lucas* involved questions about government regulation of real property, the cases were made equally applicable to personal property by virtue of the Supreme Court's decision in *Horne v. Department of Agriculture*, 569 U.S. 513 (2013).

Finally, the commenter claimed that in their view "public benefit [did not] outweigh the condemnation" based on its reading of a Prohibition-era case, *Everard's Breweries v. Day*, 265 U.S. 545 (1924), which upheld the 18th Amendment's ban on the manufacture, sale, or transportation of intoxicating liquors for beverage purposes, in spite of Congress' exception for medically prescribed liquors. The commenter then stated that the compensation plan for its asserted takings would be the fair market value of equipment in the HVACR market.

Response: We do not agree with the commenter that this final action has resulted in any takings of private property under the Constitution. Courts have summarily dismissed claims that a takings has occurred prior to the application of a regulation to particular property. See, e.g., *Rybachek v. U.S. EPA*, 904 F.2d 1276, 1300 01 (9th Cir. 1990) ("[N]o takings claim here is ripe for judicial resolution. A taking occurs in this

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context only when the EPA's regulations are applied to particular property."); *Hodel v. Virginia Surface Mining & Reclamation Ass'n*, 452 U.S. 264, 293-97 (1981) (takings claim regarding surface-mining statutes and regulations premature until those rules are actually applied to particular property of which a taking is claimed). As such, the comments articulating particular legal tests regarding whether a taking has occurred and if so what compensation is required, and the application of those tests, are beyond the scope of this action.

We also point out that even though no property, real or otherwise, has been impacted by this action, which establishes compliance dates in the future, the Supreme Court's takings jurisprudence makes clear that "government may execute laws or programs that adversely affect recognized economic values," and accordingly has issued "decisions in which [the Supreme Court] has dismissed 'taking' challenges on the ground that, while the government action caused economic harm, it did not interfere with interests that were sufficiently bound up with the reasonable expectations of the claimant to constitute 'property' for Fifth Amendment purposes." *Penn Central*, 438 U.S. at 124–25. In this case, it is within commenter's control to manage its future investments with the expectation of the regulation and its extended compliance date. Relatedly, in the *Horne* decision cited by the commenter, the majority and the dissent were in agreement that the means of the government's action created a critical distinction for purposes of evaluating whether a Fifth Amendment takings had occurred. 576 U.S. at 361-62. Namely, in that case all the litigants and both the majority and dissent agreed that "the government may prohibit the sale of raisins without effecting a per se taking" even when the Hornes believed that the government's appropriation of raisins amounted to a takings. *See id.* The majority for the court, finding in favor of the Hornes, wrote, "that distinction

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flows naturally from the settled difference in our takings jurisprudence between appropriation and regulation. A physical taking of raisins and a regulatory limit on production may have the same economic impact on a grower. The Constitution, however, is concerned with means as well as ends." *Id.*

We therefore disagree with the commenter that any taking of property has occurred, nor do we think that prospective government regulation of the sale of products, such as the sell-through limitation finalized in this rule, fits the established Fifth Amendment jurisprudence of the type of regulation that would require just compensation under the Constitution.

Comment: Many commenters objected to the application of the prohibition on sale or distribution to components using regulated substances or intended to use regulated substances. These commenters expressed the need to retain a large and varied inventory of components to continue to service and repair existing equipment, and asserted that as distributors and retailers, there is no way of knowing whether the component is intended to be used in a newly installed system or in an existing system. Other commenters emphasized the importance of stocking parts for refrigeration systems and equipment. While commenters acknowledged that the market for refrigeration is less seasonal than for air-conditioning, they noted that it is critical that distributors keep multiple years' worth of parts and equipment to ensure that consumers can keep refrigeration systems running, because failure of these systems can cause extreme economic harm—*e.g.*, when hospitals are forced to dispose of vaccines and medications, or when grocery stores must throw away groceries.

Response: EPA is finalizing its proposed restriction on the sale, distribution, offer for sale and distribution, and export with respect only to factory-assembled products

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using a regulated substance that exceeds the GWP limit. As noted throughout this action, EPA's intention is to restrict the use of HFCs in new products being introduced and circulated in the sectors and subsectors subject to this rulemaking that use HFCs; our intention is not to prematurely shorten the useful life of existing products or systems that consumers have already purchased and are employing. We recognize that, consistent with commenters' concerns, use restrictions on the manufacture and import, as well as sale, distribution, offer for sale and distribution, and export, of components would restrict the ability of consumers to service and repair their existing equipment. Therefore, EPA is excluding components from the use restrictions and allowing for their continued manufacture and import subject to certain restrictions, including that they may only be used to service existing equipment and are subject to labeling and reporting requirements. Similarly, EPA is allowing for the continued sale, distribution, offer for sale and distribution, and export of components.

Comment: Several commenters noted that users of field-assembled products or systems do not get the advantage of a sell-through period because under the proposed rule the system is not considered to be manufactured until it is assembled in the field. One of these commenters asserted that the result of these definitions is that larger and more complex products (*i.e.,* field-assembled systems) cannot be sold and distributed by the proposed sell-through compliance deadline of January 1, 2026, and in effect, will have a much earlier manufacturing compliance deadline than the manufacturing compliance deadline for smaller, self-contained products covered by this rule (*e.g.,* aerosol cans). One environmental group commented that the one-year sell-through period is not needed for field-charged systems and recommended that EPA remove it.

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Response: As discussed in the section VI.A (Definitions), EPA is distinguishing factory-completed products from field-assembled systems in this final rule. EPA agrees with comments that it does not make sense to apply a sell-through limitation to such systems given that field-assembled systems typically cannot be imported, nor can they be sold or distributed absent the sale of the larger structure containing them (*i.e.*, building). Until the system is assembled and charged, it is a collection of components, and EPA has determined for the reasons discussed below not to restrict the use of HFCs in components at this time.

d. Export of Products Containing HFCs

EPA interprets a sector or subsector's "use" to cover not only manufacture and import of a product, but also the subsequent activities in the market chain related to products. Specifically, we interpret export to be included in the meaning of "use." Where EPA has determined, consistent with consideration of the factors listed in subsection (i)(4), that it is appropriate to restrict the use of HFCs, it is reasonable for restrictions on domestically manufactured products intended for the U.S. market to apply equally to domestically manufactured products intended for export. Applying the restrictions to all such equipment using a regulated substance treats materially similar uses of HFCs in the same manner. Including a sector or subsector's export of a product using HFCs as subject to the prohibitions will prevent the limited supply of HFCs in the United States from being exported in products that could otherwise have used substitutes. A company cannot request additional consumption allowances based on the export of products containing regulated substances; requests for additional consumption allowances are limited to the export of bulk HFCs. 40 CFR 84.17. As with products manufactured for domestic use, one intent of this restriction is to ensure that sectors and subsectors that are currently

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using HFCs and that are well-positioned to transition to substitutes, per EPA's determination under the (i)(4) factors, actually make that transition, leaving more of the limited supply of HFCs for use in sectors and subsectors that have fewer options. Including exports as a prohibited activity also supports global efforts to reduce HFC use in light of the Kigali Amendment to the Montreal Protocol.

Comment: Many commenters representing trade organizations, OEMs, and HFC distributors requested that EPA allow for the export of equipment designed to use current refrigerants. Commenters stated that prohibiting export would harm American manufacturing; cede foreign markets to competitors; and perhaps lead other countries to use equipment that is older, less energy efficient, and leakier.

Response: EPA acknowledges that limiting sales to foreign markets where higher-GWP HFCs are not yet prohibited could negatively impact U.S. manufacturers. However, because of the global phasedown in HFCs, this will be only in certain markets and only for a limited time. Many major markets currently prohibit equipment using higher-GWP HFCs and thus an export market for innovative American products currently exists. Countries that have not yet transitioned to lower-GWP HFCs in certain sectors and subsectors will do so as the global phasedown of HFCs under the Kigali Amendment proceeds.

The export prohibition in this rule is not unique. EPA has historically prohibited the export of products using ODS in the sectors and subsectors addressed in this rule when restricting their manufacture, import, sale, offer for sale and distribution, or distribution. Regulations implementing the nonessential products ban[45] and restrictions

[45] 40 CFR part 82, subpart C.

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on pre-charged RACHP equipment containing HCFC-22 and HCFC-142b[46] also prohibited export of domestically manufactured products. EPA has consistently included export as a prohibited element of distribution under regulations implementing title VI of the CAA.[47] Similarly, EPA's limitations on the use of an alternative to ODS under SNAP applies to products intended for export (59 FR at 13052; March 18, 1994; also *see* 40 CFR 82.174(e)). Therefore, EPA's application of its restrictions to the export of products using HFCs is reasonable and aligns with past practice and industry expectations. That being said, this rule does not prohibit the manufacture and export of components provided that labeling, reporting, and recordkeeping requirements are met. EPA anticipates that such reporting will allow the Agency to ascertain the impact of the global phasedown of HFCs on such equipment and in those subsectors.

Comment: Other commenters stated that countries should themselves determine when to transition to next-generation alternatives and that EPA should allow the export of equipment for as long as the importing country allows its use. One commenter stated that EPA is effectively legislating those jurisdictions worldwide that are refrigerant agnostic.

Response: EPA disagrees that this rule legislates the use of substitutes in other countries. EPA is prohibiting the use of higher-GWP HFCs in certain sectors and subsectors within the United States. Prohibited use includes the domestic manufacturing of those products, regardless of the market into which they are sold. Restrictions on sale or distribution, offer for sale and distribution, and export are intended to backstop the domestic manufacturing prohibition. Furthermore, components may continue to be

[46] 40 CFR part 82, subpart I.
[47] The definition of distributor under 40 CFR 82.62 and 82.302 includes a person who sells or distributes a product for export from the United States.

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manufactured and imported into the United States and may also be exported to jurisdictions that are refrigerant agnostic. Finally, this rule will not prevent products manufactured in one foreign country from being sold in another foreign country.

Comment: Many commenters noted that other jurisdictions may not have building codes that allow for next-generation refrigerants. Similarly, other commenters stated that other jurisdictions may not have trained technicians, recovery equipment, or other infrastructure necessary to support alternative refrigerants in MVACs. One such commenter stated that the primary substitute, HFO-1234yf, is not as effective in high temperature, high-humidity environments such as the Gulf Cooperation Council countries and that vehicles using HFO-1234yf will be at a competitive disadvantage in those markets.

Response: As discussed previously, EPA interprets "sector or subsector in which a regulated substance is used" to be a domestic sector or subsector which includes use by the manufacturer. The factors under subsection (i)(4) of the AIM Act do not direct the Agency to consider whether a substitute is available for use in a foreign market for servicing the product. Nor is it practicable for the Agency to identify whether substitutes are available in every country or consider every country's import controls, building codes, or otherwise.

On the technical point on use of HFO-1234yf in high ambient temperature counties such as the Gulf Cooperation Council countries, EPA notes that the TEAP has not indicated technical barriers that would preclude the use of alternative refrigerants that meet the GWP threshold for MVACs from being used in high ambient temperature countries. EPA is making some revisions in the final rule based on comments. For the reasons described in section VI.C.2.c, EPA is extending the compliance date for

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restrictions on exports from one year to three years. Thus, for example, light-duty (LD) passenger vehicles manufactured before Model Year (MY) 2025[48] containing an HFC with a GWP of 150 or greater may be exported until introduction of MY 2028 vehicles. This allows for flexibility past MY 2027, as suggested by commenters. Moreover, because the transition to refrigerants with GWPs below 150 in MVACs is well underway on a global basis, EPA does not agree that there will be infrastructure barriers for this subsector.

Comment: Other commenters stated these export restrictions are largely unnecessary, considering that the HFC allocation program provides the appropriate market constriction and will discourage unreasonable consumption of regulated substances for use in exported products.

Response: As discussed in response to similar comments regarding restrictions on sale or distribution, EPA is exercising the separate authority provided under subsection (i) of the AIM Act to restrict use of HFCs in particular sectors or subsectors- where the subsection (i)(4) factors are met. Establishing these sector and subsector specific restrictions helps to support the domestic phasedown and allocation program by ensuring that those sectors and subsectors that have available substitutes for use in place of higher-GWP HFCs use those substitutes.

3. What uses are not covered in the final rule?

a. Manufacture, Import, Sale, Distribution, and Export of Components

Based on the comments received, EPA is excluding components from the definition of product and is therefore not applying the final rule's restrictions on

[48] LD passenger vehicles that are manufactured in MY 2025 but are manufactured less than one year after publication of this final rule may also be exported until introduction of MY 2028 vehicles.

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manufacture, import, sale, distribution, offer for sale or distribution, or export (all of which apply to products) to components. EPA's exclusion of components from this rule's prohibitions is premised on the continued need for components to service existing systems.

EPA is applying requirements to label, report, and keep records related to the manufacture and import of certain specified components. For purposes of this rule, these specified components are condensing units, condensers, compressors, evaporator units, and evaporators. EPA is separating out this subset of components found in an RACHP system because these are refrigerant-specific (*e.g.*, unlike piping) and may contain significant amounts of regulated substances (*e.g.*, unlike a thermal expansion valve) when manufactured or imported. In some instances, such as a display case in a supermarket, these specified components may also be viewed as products or appliances themselves. However, even though these specified components constitute the major parts of a system, they still must be connected to a refrigerant circuit in order to function, and we therefore think treating these specified components as components is more appropriate at this time than treating them as products under this rule's prohibitions. EPA also considered that the same specified components (*e.g.*, compressors) can in some cases be used in systems in different subsectors, which may not be subject to the same GWP limit restrictions. Until the specified component is assembled in a system, it may not be clear what subsector GWP limit would apply to that specified component.

Labeling, reporting, and recordkeeping provisions are necessary to ensure that components that continue to be manufactured or imported containing higher-GWP HFC refrigerants are, in fact, used for the repair and servicing of existing equipment.

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Replacement of certain percentages of these specified components is also the type of modification that could constitute an installation of a new system that is prohibited under these restrictions (*see* section VI.C.2.b). We are requiring that manufacturers and importers of specified components label these components, report to EPA, and maintain the necessary records related to reporting, to help ensure compliance with this prohibition. (*see* sections VII and VIII).

Comment: Some commenters requested that EPA allow replacement components to be manufactured, imported, exported, or installed after the compliance date to maintain, service, or remodel an existing system. One commenter urged that this be allowed until the time those systems using high-GWP HFCs no longer exist in the field. One commenter suggested that such components be labeled, "For retrofit, replacement, remodel, or maintenance only." Other commenters recommended that the manufacture and import of components cease upon the compliance date for that sector or subsector just as is required of the installation of the system. These commenters stated that this would help to ensure that components are used for repairs and not to construct new systems.

Response: The repair and servicing of installed systems is crucial for all the reasons described previously. Avoiding early obsolescence due to the lack of a component is one reason EPA is not applying the prohibitions on sale or distribution, or offer for sale or distribution, to components.

With respect to the comment recommending that EPA prohibit manufacture and import of components upon the compliance date for the installation of systems using those components, we do not agree that this would accomplish the goal of ensuring supply of components to service and repair existing systems. In addition, components

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may be manufactured for use with multiple refrigerants, including potentially blends that comply with the GWP limit and ones that do not. Until the component is assembled into a system and charged, it would be unclear whether the component, on its own, met a restriction. As noted above, a component may also be used in multiple subsectors and thus could be compliant for use in one subsector but not another. Applying this rule's prohibitions on manufacture, import, sale, distribution, offer for sale or distribution, and export on components would be difficult to enforce.

EPA agrees with the commenter that there is a compliance risk that components manufactured or imported for repairs could be used to install a new prohibited system. EPA is mitigating that risk of noncompliance through labeling that a specified component is for repair and servicing only, as one commenter recommended, and reporting and recordkeeping requirements.

b. Used Equipment

EPA is not applying the GWP limit restrictions or other restrictions to the sale, distribution, offer for sale or distribution, or export of used equipment. By used, the Agency means products, components, or systems that have been in the ownership of someone other than a manufacturer, importer, or distributor, and have experienced ordinary operation or utilization by a consumer. Some equipment, such as air-conditioning and refrigerated appliances, are often conveyed with the sale of a building and could not reasonably be excluded from that conveyance. Other products subject to these restrictions may be incorporated into a larger good, such as an MVAC in a motor vehicle, which may be sold multiple times during the useful life of the good. Restricting the sale of used equipment that use HFCs would significantly decrease the value of those goods and impact the market for used products (*e.g.*, trading in a used motor vehicle

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during the purchase of a new one). Restricting the sale of used products could also have overall detrimental environmental effects by requiring consumers to discard products or equipment before the end of the product's useful life and could negatively impact affordability for consumers by eliminating options to purchase used products. Under title VI of the CAA, EPA typically has not restricted the sale of used appliances containing ODS and is maintaining a similar approach for this rule.

EPA intends that this exemption for used equipment cover both individuals selling products they themselves have used as well as entities that do volume business in used products (*e.g.*, stores selling second-hand goods or car-dealerships selling pre-owned vehicles). However, this used products exemption is not intended to cover entities that purchase new equipment, which is subject to the restrictions on manufacture and import, hold that equipment for a period of time, and then re-sell it. We have accordingly specified that equipment must have experienced ordinary operation or utilization by a consumer to qualify for the used equipment exemption.

EPA received one comment on its proposal not to restrict the sale, distribution, or export of used products. The commenter found the description of a used product to be problematic as it could restrict the recycling of an unsold defective unit, for instance. EPA does not seek to restrict the movement of equipment, used or new, for disposal, including recycling.

c. "Equipment in Existence"

Under subsection (i)(7)(B)(ii) of the Act, "a rule promulgated under this subsection shall not apply to, … except for a retrofit application, equipment in existence in a sector or subsector before December 27, 2020." As such, EPA's restrictions do not

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apply to the sale or distribution, offer for sale or distribution, or export of any equipment that was in existence in the sector or subsector prior to December 27, 2020.

Comment: Multiple commenters representing a range of stakeholders recommended that EPA consider all equipment that was manufactured prior to the compliance date for that subsector be considered "equipment in existence" for purposes of subsection (i)(7)(B). The commenters stated that doing so would provide necessary certainty that equipment manufactured between December 27, 2020, and the compliance date for that subsector (*e.g.*, January 1, 2026) could be serviced, repaired, and have components replaced as needed throughout its useful life. Another commenter similarly advocated that EPA should not mandate replacement of any equipment that has a date of manufacture of the compressor-bearing equipment prior to the effective compliance date.

Response: The Agency does not agree that equipment that was manufactured prior to a future compliance date for a subsector fits under subsection (i)(7)(B)'s "equipment in existence in a sector or subsector before [December 27, 2020]." Any equipment manufactured or installed after December 27, 2020, plainly does not meet the statutory exemption. Nonetheless, all equipment – regardless of the date of manufacture or installation – may be serviced, repaired, and have components replaced as needed throughout its useful life. Under this rule as finalized, servicing, repair, or maintenance of equipment that was in existence in the sector or subsector prior to December 27, 2020, would generally not render that equipment newly subject to EPA's restrictions on use of HFCs, except in those instances where such actions constitute a new installation(*see* section VI.C.2.b).

The Agency is also not mandating the replacement of any equipment that is currently in use, regardless of the date of manufacture or installation of that equipment.

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This rule's restrictions apply to the manufacture, import, sale, distribution, offer for sale or distribution, and export of new products and the installation of new systems. Only where an existing system is modified to the point that the cooling capacity is increased or a threshold percentage of specified components is replaced, is it considered an installation of a system subject to these restrictions.

d. Repair and Servicing

This rule does not impose restrictions on the repair and servicing of products or systems that are currently in use.

Comment: Many commenters expressed concern about the loss of significant capital investment and economic harm should EPA restrict the ability to repair existing systems. Distributors were also concerned about the cost of discarding components that could not be sold to service or repair a system. Some commenters noted the social and economic costs associated with the loss of food, vaccines, and other commodities that would spoil if a refrigeration system fails and cannot be quickly repaired. Some commenters noted the impact on low-income communities if supermarkets or other retail food facilities close. Some commenters were concerned for their customers if equipment warranties could not be honored or if they had to buy a new system for the failure of a single component.

Response: EPA acknowledges the concerns noted by commenters regarding the need to service and repair existing systems. Under this final rule, a product or system may be serviced and repaired throughout its useful life, including the replacement of components.

e. Retrofit Applications

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Under the AIM Act subsection (i)(7)(B)(ii), EPA has authority to apply restrictions to "retrofit applications," where existing equipment is upgraded by changing the regulated substance used(*see* AIM Act subsection (i)(7)(A)). The Act specifies that "retrofit" is where upgrades are made to existing equipment where the regulated substance is changed and which "(i) include the conversion of equipment to achieve system compatibility and (ii) may include changes in lubricants, gaskets, filters, driers, valves, o-rings, or equipment components for that purpose."

EPA did not propose to address retrofits in this rulemaking, although the Agency issued in conjunction with the proposed restrictions an advanced notice of proposed rulemaking seeking information regarding certain retrofitted equipment. As stated at proposal, EPA is not addressing retrofit applications in this final rulemaking.

Comment: One commenter urged EPA to adopt separate GWP limits for retrofits as was done in SNAP rules 20 and 21, and another recommended that EPA mandate the use of reclaimed refrigerant in existing retrofitted equipment, noting that EPA does not need to wait for a rulemaking under subsection (h) of the AIM Act to do so, and that some reclaimed feedstock is available now or could be made available by future compliance dates. Other commenters supported EPA's decision not to regulate retrofits of existing equipment as part of this rulemaking, citing concerns that replacement refrigerants for high-GWP substances for retrofit equipment are not yet available.

Response: As discussed in the proposed rule and in the Agency's request for information about refrigerants used in retrofitted equipment and the prevalence of that equipment in certain sectors and subsectors, the Agency is still gathering information about retrofit applications. While we recognize the Agency's authority to issue restrictions on retrofit applications in subsection (i)(7)(B)(ii), we do not view, and

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commenters did not suggest, that EPA has an obligation to issue such restrictions at this time. Those commenters who recommended that EPA regulate retrofit applications in this rulemaking did not provide information that altered EPA's assessment that for this set of restrictions issued under subsection (i), given the early stages of implementing the AIM Act overall and of the phasedown under subsection (e), it is efficient and effective to focus on transitioning sectors and subsectors at this first step through prohibitions on the introduction of higher-GWP HFCs in new products and systems.

D. How is EPA addressing restrictions on the use of HFCs requested in petitions granted?

EPA is addressing three sets of petitions in this action: the 11 petitions granted or partially granted on October 7, 2021; additional petitions submitted by the Air-Conditioning, Heating and Refrigeration Institute (AHRI) which updated previously submitted petitions; and two petitions granted by EPA on September 19, 2022. EPA is addressing these granted petitions in a single rulemaking rather than through separate rulemakings. In some instances, particularly where the petitioned sectors and subsectors overlap, responding through a single rulemaking allows for a complete analysis in a single location. Consistent with EPA's authority under subsection (i)(1) of the AIM Act, EPA is also establishing restrictions on the use of HFCs in certain sectors and subsectors that were not included in petitions received by the Agency to date.

Several commenters supported EPA's decision to address the granted and partially granted petitions together in one rulemaking. These commenters noted that addressing the petitions together allows for timely action and will provide consistency and transparency for regulated entities.

1. Petitions granted on October 7, 2021

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On October 7, 2021, EPA granted ten petitions and partially granted one petition under subsection (i) of the AIM Act (86 FR 57141, October 14, 2021). Copies of petitions granted (including the full list of petitioners and co-petitioners), a detailed summary of each petition, and EPA's rationale for granting these petitions are available under Docket ID EPA-OAR-2021-0643. Five of the granted petitions specifically requested that EPA replicate, in varying degrees, certain restrictions on use of HFCs based on the changes of status contained in SNAP Rules 20 and 21. These five petitions were received from the Natural Resources Defense Council et al. (hereby, "NRDC"); DuPont (two petitions); American Chemistry Council's Center for the Polyurethanes Industry (hereby, "CPI"); and the Household & Consumer Product Association and National Aerosol Association (hereby, "HCPA"). These petitions requested restrictions on the use of specific HFCs or blends containing HFCs in refrigeration, air-conditioning, and heat pump, foams, and aerosols sectors.[49] Another five petitions requested that EPA establish GWP limits for HFCs used in certain stationary AC and/or refrigeration subsectors. These petitions were received from the Environmental Investigation Agency et al. (hereby, "EIA"), AHRI (two petitions), Association of Home Appliance Manufacturers (hereby, "AHAM"), and International Institute of Ammonia Refrigeration et al. (hereby, "IIAR"). The one partially granted petition, submitted by California Air Resources Board et al. (hereby, "CARB"), requested two types of restrictions: (1) Certain restrictions on the use of HFCs contained in SNAP Rules 20 and 21 in the RACHP, foams, and aerosols sectors and (2) restrictions on the use of HFCs based on GWP limits

[49] EPA notes that while these petitioners requested that EPA establish restrictions on the use of HFCs by restricting specific HFCs or blends containing HFCs, it does not necessarily mean that these petitioners preferred this restriction format over establishing restrictions on the use of HFCs by establishing GWP limits. EPA believes that these petitioners requested restrictions on the use of specific HFCs and blends containing HFCs in this way to replicate the format presented in SNAP Rules 20 and 21.

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in certain stationary AC and refrigeration subsectors. CARB also requested EPA regulations should not limit States' ability to further limit or phase out the use of HFCs in their jurisdictions.

2. How is EPA addressing additional petitions that cover similar sectors and subsectors?

EPA received two additional petitions from AHRI on August 19, 2021, and October 12, 2021. The first petition requested that EPA establish transition dates for "New Refrigeration Equipment"[50] for certain commercial refrigeration subsectors listed, along with the associated maximum GWP. AHRI requested that the transition dates be at least two years after the adoption of safety standards and building codes.[51] AHRI's second petition in this category requested that EPA establish transition dates for "New Refrigeration Equipment" for specific chiller applications listed, along with the associated maximum GWP.

EPA is treating these two AHRI petitions as addenda to their October 7, 2021, granted petitions, and not as separate petitions, since the subsectors listed in these petitions are contained in the granted AHRI petitions and AHRI refers to these as further steps in the transition for these uses. The main difference between the requested action in these two petitions and the granted petitions is the lower-GWP limits with later compliance dates. Since EPA considers these two petitions as addenda to petitions granted on October 7, 2021, this rulemaking addresses these requests.

3. Petitions granted on September 19, 2022

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[50] AHRI suggests a definition for "New Refrigeration Equipment" as follows: equipment built with new components and equates to a nominal compressor capacity increase across the refrigeration appliance or an increase of the CO_2 equivalent of the refrigerant in the refrigeration appliance. Under this suggested definition, the replacement of components in Existing Refrigeration Systems would be permissible if the nominal compressor capacity is not increased across the refrigeration appliance or the CO_2 equivalent of the refrigerant in the refrigeration appliance is not increased.

[51] A discussion on the status of safety standards and building codes that may impact compliance dates is in section VI.E.2 of this preamble.

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On September 19, 2022, EPA granted two additional petitions that requested EPA establish restrictions on the use of HFCs in certain commercial refrigeration subsectors based on GWP limits. These petitions were received from AHRI and IIAR and covered similar commercial refrigeration subsectors contained in petitions granted on October 7, 2021. One difference to note is that both the AHRI and IIAR petitions requested restrictions on the use of HFCs for equipment types beyond what was covered in many of the petitions granted on October 7, 2021 (*i.e.*, all equipment with a refrigerant charge less than 200 lb) in listed subsectors. EPA granted these petitions based on its consideration of the (i)(4) factors in light of the information then available. Given the Agency was already developing the proposed rulemaking which addresses restrictions on the use of HFCs in the sector and subsectors contained in these newer petitions, recognizing the extensive overlap with the petitions granted on October 7, 2021, and in an effort to streamline rulemakings, EPA is addressing these newer petitions in this rulemaking. Copies of the AHRI and IIAR petitions can be found in the docket.

E. Subsection (i)(4) factors for determination

Subsection (i)(4) of the AIM Act directs EPA to factor in, to the extent practicable, various considerations when evaluating petitions and carrying out a rulemaking. EPA is not establishing regulatory text regarding these factors at this point; however, this section summarizes the Agency's interpretation and application of the (i)(4) factors. EPA's consideration of the (i)(4) factors served as the basis for the restrictions (for additional discussion see section VI.F of this preamble).

1. How is EPA considering best available data?

Subsection (i)(4)(A) of the AIM Act directs the Agency to use, to the extent practicable, the best available data in making a determination to grant or deny a petition

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or when carrying out a rulemaking under subsection (i). In this context, EPA interprets the reference to best available data as an instruction with respect to the other factors under (i)(4) rather than as an independent factor. Best available data may not always mean the latest data. For example, the latest data may not have yet had time to be peer reviewed and might benefit from peer review. This should not be interpreted as meaning EPA would only consider best available data to be peer-reviewed data, but that peer review is one consideration that could inform our understanding of what are the best available data in particular situations.

The best available data that the Agency has considered in determining the availability of substitutes under (i)(4)(B) includes, but are not limited to: SNAP listing decisions; Montreal Protocol reports by the TEAP and its Technical Options Committees and Temporary Subsidiary Bodies (*e.g.*, Task Forces);[52] TSDs from States with HFC restrictions;[53] information from other Federal agencies and departments (*e.g.*, DOE); proceedings from technical conferences; and journal articles. For some of the factors and subfactors, EPA developed TSDs that provide information from these sources and others that EPA believes to be the best available data. Furthermore, EPA considered information provided to the Agency from industry, trade associations, environmental non-governmental organizations, academia, standard-setting bodies, petitioners, in public comments and in stakeholder meetings that the Agency hosted, and other sources in response to EPA making the petitions publicly available through Docket ID No. EPA-HQ-OAR-2021-0289, to the extent that such information represented best available data.

[52] The Technical Economic Assessment Panel is an advisory body to the parties to the Montreal Protocol and is recognized as a premier global technical body; reports available at: *https://ozone.unep.org/science/assessment/teap.*

[53] An example is CARB's Initial Statement of Reasons and Standardized Regulatory Impact Assessment report. Available at: *https://ww2.arb.ca.gov/rulemaking/2020/hfc2020.*

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Comment: Two commenters stated that information contained in petitions is not "best available data," given the petitions are in the self-interest of the petitioners and that the petitioners are incentivized to downplay any adverse consumer impacts.

Response: EPA considered information from petitioners (among other sources) to the extent that such information represented best available data. EPA is cognizant of the potential biases in the petitions and stated in the proposed rule that the petitions formed merely the starting point of the Agency's analysis.

Comment: One commenter stated that WMO and the IPCC are cited throughout the proposed rule but were not included as sources of best available data despite being the most authoritative resource for information on the environmental impacts of HFCs. The commenter also stated that the 2007 IPCC's AR4 values for the GWPs of HFCs are not best available data, as the IPCC has updated these values in 2013 and 2021. The commenter stated that EPA is understating the effects of HFCs and any person who attempts to gather GWP information from the authoritative source (such as the IPCC) will not come to the same conclusions regarding compliant products.

Response: EPA agrees that the IPCC and WMO are sources of best available data, especially for the environmental impacts of HFCs and other greenhouse gases. EPA's non-exhaustive list of data sources referred to by the commenter were in the context of the subsection (i)(4)(B) factors for which other data sources are more relevant. EPA disagrees that the policy decision to use AR4 GWP values is a failure to use best available data. As the commenter noted, the exchange values for HFCs used in the AIM Act are the same as the AR4 GWP values. Use of AR4 values ensures consistency between the different regulations issued by EPA under the AIM Act, including the production and consumption caps and the issuance of allowances. Using different values

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would make the program harder to implement, confuse the body of stakeholders required to comply with the regulations, and prevent the Agency from evaluating the benefits of this rulemaking within the context of the different regulations issued by EPA under the AIM Act.

2. How is EPA considering the availability of substitutes?

Subsection (i)(4)(B) of the AIM Act directs EPA to factor in, to the extent practicable, the availability of substitutes for use of the regulated substance that is the subject of this rulemaking or petition, as applicable, in a sector or subsector. Several factors inform the availability of substitutes for use in a sector or subsector, based on the statutory language in subsection (i)(4)(B). As part of EPA's consideration of availability of substitutes, the AIM Act directs the Agency to take into account the following subfactors: technological achievability, commercial demands, affordability for residential and small business consumers, safety, consumer costs, building codes, appliance efficiency standards, contractor training costs, and other relevant factors, including the quantities of regulated substances available from reclaiming, prior production, or prior import.

EPA has considered the subsection (i)(4)(B) subfactors collectively, with no one subfactor solely governing the restrictions for any sector or subsector. EPA is not required to weigh all subfactors equally when considering the availability of substitutes. Subsection (i)(4) directs the Agency to consider the factors listed in (i)(4), including availability of substitutes, "to the extent practicable." EPA interprets this phrase to extend to its consideration of the subfactors in (i)(4)(B), given that these subfactors are to be taken into account in considering the availability of substitutes "to the extent practicable." EPA anticipates that in most situations, no single subfactor will be

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dispositive of its consideration of the availability of substitutes under subsection (i)(4)(B). In many instances, a particular characteristic of a substitute may be considered under multiple factors. For example, the use of a lower flammability refrigerant could have implications for commercial demands, safety, building codes, and contractor training costs. Likewise, the timing of a restriction's compliance deadline could be affected by multiple factors such as commercial demands, affordability for residential and small business consumers, safety, building codes, and appliance efficiency standards. Furthermore, not all the subfactors in (i)(4)(B) may be applicable to each sector or subsector. For example, appliance efficiency standards are not applicable to aerosols. Lastly, it may not be practicable to consider some subfactors in some situations such as when there are not sufficient available data regarding a specific subfactor. EPA did not receive comment on its methodology to weigh the factors collectively and to the extent practicable and therefore is finalizing restrictions in this rule using that approach.

Substitutes for higher-GWP HFCs have been the subject of evaluation for decades. EPA, State and foreign governments, industry standards organizations, and international advisory panels have long been identifying and assessing substances that can be used in lieu of higher-GWP HFCs and their predecessors, often for uses within the sectors and subsectors subject to this rule. EPA has drawn upon information generated by these efforts in considering the subsection (i)(4) factors in the context of this rulemaking, and in particular, in considering the availability of substitutes under subsection (i)(4)(B).

While these entities have evaluated substitutes for HFCs in other contexts, the information generated by these efforts provides a useful starting point. For example, in the SNAP program under section 612 of the Clean Air Act, EPA identifies and evaluates substitutes for ODS in certain industrial sectors, including RACHP, aerosols, and foams.

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To a very large extent, HFCs are used in the same sectors and subsectors where ODS historically have been used. Under SNAP, EPA evaluates acceptability of alternatives for ODS based on the potential human health and environmental risks, relative to other substances used for the same purpose. In so doing, EPA assesses atmospheric effects such as ozone depletion potential and global warming potential, toxicity and exposure data, flammability, and other environmental impacts. These assessments under SNAP are relevant to some of the subsection (i)(4) factors, particularly with respect to safety (and the resultant impact on availability of a substitute under (i)(4)(B)) and environmental impacts. We have therefore considered SNAP assessments and listings of acceptable substances in our consideration of the (i)(4) factors and establishment of use restrictions under subsection (i). Further, the fact that manufacturers and formulators have submitted substitutes to EPA for evaluation under SNAP can indicate to the Agency that the substitute is technologically achievable for a given sector and that there is (or will be) commercial demand for it. A substitute listed by EPA as acceptable for a given end-use under SNAP would most likely have been submitted by industry where the submitter thought that the substitute was technologically achievable and that there could be a market for such substitute.

EPA has also considered in this rulemaking the work undertaken by the TEAP. The TEAP analyzes and presents technical information and recommendations when specifically requested by parties to the Montreal Protocol. It does not evaluate policy issues and does not recommend policy. Such information is related to, among other things, substitutes that may replace the substances controlled under the Protocol and alternative technologies that may be used without adverse impact on the ozone layer and climate. The TEAP assesses the technical and economic feasibility of substitutes for

sectors and subsectors that use HFCs and publishes various technical reports through different technical committees, such as the Refrigeration, Air Conditioning, and Heat Pumps Technical Options Committee.[54] In the TEAP's evaluation of HFC substitutes, subfactors such as technological achievability and affordability have been considered to some extent. For this rulemaking, EPA considered technical and economic information from the TEAP's 2018 Quadrennial Assessment Report and the recent 2022 Progress Report, including the response to "*Decision XXXIII/5- Continued provision of information on energy-efficient and low-global-warming-potential technologies*" found in Volume 3 of the Progress Report.[55,56,57]

EPA also considered materials developed by, or submitted to, State and foreign governments that have requirements restricting the use of HFCs. Many of these jurisdictions highlight available substitutes that can be used in place of regulated substances in the sectors and subsectors that are the subject of this rulemaking.

This is not an exhaustive list of sources that EPA could use in the future to consider the availability of substitutes; section VI.E.1 of this preamble describes additional sources of information that the Agency considers to be best available data. For future Agency actions under the Technology Transitions program, EPA would likely

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[54] The TEAP 2018 Quadrennial Assessment Report includes sections for each of the Technical Options Committees (TOC): Flexible and Rigid Foams TOC, Halons TOC, Methyl Bromide TOC, Medical and Chemicals TOC, and Refrigeration, Air Conditioning and Heat Pumps TOC. Available at: *https://ozone.unep.org/science/assessment/teap.*

[55] In accordance with Article 6 of the Montreal Protocol, every four years the parties request assessments from various advisory bodies, including the TEAP's quadrennial assessment of the sectors and subsectors covered by the petitions. Under Decision XXVIII/2 the TEAP is also instructed to review HFC substitutes every five years. The parties also routinely request reports considering transitions and/or related topics (*e.g.*, commercial fisheries, energy efficiency for the refrigeration and air conditioning sector).

[56] TEAP 2022 Progress Report (May 2022) and 2018 Quadrennial Assessment Report. Available at: *https://ozone.unep.org/science/assessment/teap.*

[57] Volume 3: Decision XXXIII/5 – Continued provision of information on energy-efficient and low-global-warming-potential technologies, Technological and Economic Assessment Panel, United Nations Environment Programme (UNEP), May 2022. Available at: *https://ozone.unep.org/system/files/documents/TEAP-EETF-report-may-2022.pdf.*

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again consider information from these sources to assess availability of substitutes but the Agency may augment or omit sources where appropriate to be consistent with the Agency's interpretation of subsection (i)(4)(A).

EPA has identified substitutes[58] for use in lieu of regulated substances in specific sectors or subsectors by reviewing information from several of these sources, which the Agency considers to be best available data. EPA compiled a non-exhaustive list of available substitutes that informed the GWP limit or restriction. *See American Innovation and Manufacturing Act of 2020 – Subsection (i)(4) Factors for Determination: List of Substitutes*, referred to in this preamble as the "List of Substitutes TSD." That TSD and list were developed after considering, to the extent practicable, the subsection (i)(4)(B) subfactors, as discussed below and in the other TSDs available in the docket. Substitutes for regulated substances have been identified in this list as available for the sectors and subsectors for which EPA is establishing restrictions.

We note, however, that EPA's identification of a substitute as "available" for use in a particular sector or subsector is not intended as a determination that such substitute is already widely used in that sector or subsector, or that the subfactors in subsection (i)(4)(B) are fully realized as to that substitute (even if those conditions are true in some cases). For example, as stated in the proposed rule, some of the substitutes EPA lists as "available" for a sector or subsector may not yet be available uniformly throughout the United States or may not be already permissible under building codes in every jurisdiction in the United States (*see* section VI.E.2.d of this preamble). Instead, the Agency interprets "available" in subsection (i)(4)(B) as permitting it to consider the

[58] Inclusion of a substitute, either in the preamble or the docket, is for informative purposes only and is not intended as an EPA endorsement or recommendation.

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progress and status of a substitute's incorporation into a sector or subsector, particularly in relation to establishing the compliance deadlines for each restriction. The statute would serve little purpose if EPA were only permitted to restrict regulated substances where the (i)(4)(B) subfactors (*e.g.*, building codes, contractor training costs, commercial demand) were already "satisfied" because substitutes were already completely adopted by the sector or subsector. Instead, it is reasonable for the Agency to consider a substitute to be available based on the expectation that, by the compliance date established in a restriction, many of the (i)(4)(B) subfactors could feasibly be met. We recognize that forecasting availability based on the (i)(4)(B) subfactors by an established compliance dates in the future is an exercise that inherently requires some estimation and uncertainty; for example, it is impossible to perfectly predict the outcome of SNAP evaluations that have not yet occurred or the success or failure of equipment redesigns and safety tests. In setting compliance dates for the restrictions under subsection (i), EPA is exercising its judgment and applying best available data regarding how far along a sector or subsector is in the transition to lower-GWP substitutes to determine when those substitutes will be sufficiently available to accommodate a variety of uses within the sector or subsector.

Comment: One commenter stated that, in general, EPA has not adequately assessed available substitutes and the ability of these substitutes to be utilized in certain end uses by the dates that have been proposed. The commenter stated that it is not apparent from the proposed rule or the information that is available in the docket that EPA has adequately assessed each of the end uses in sufficient detail, or whether information the Agency has relied on correctly indicates that substitutes (as defined through GWP limitations) are technically achievable and therefore available.

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Response: EPA disagrees that the Agency has not adequately assessed available substitutes. The commenter did not explain, as a general matter, what information relied upon by the Agency it believed to be unreliable or insufficiently detailed. EPA has considered information provided by the TEAP, which taps into global expertise from industry, academia, and the public sector. EPA also looked to its own SNAP program, which has evaluated more than 500 ODS alternatives, many of which are also substitutes for HFCs. Moreover, these were not the only sources of information that the Agency relied upon, and additional supporting information is cited for each of the finalized restrictions.

a. Commercial Demands and Technological Achievability

Two of the subfactors that subsection (i)(4)(B) directs EPA, to the extent practicable, to take into account in its consideration of availability of substitutes are commercial demands and technological achievability. This section provides information on how the Agency views each term on its own, their potential impact on availability of substitutes, and their interconnectedness.

EPA views commercial demands as interest from OEMs and system owners to use substitutes in products for ultimate sale or installation. An OEM's interest in using a substitute is tied to their ability to meet consumer needs. As discussed previously, EPA considers a submission under the SNAP program to be an indicator that a chemical producer or formulator anticipates commercial demand for the submitted alternative. Another method to determine commercial demands is to assess what types of equipment in a sector or subsector are for sale and what regulated substances or substitutes are being used. Another means for assessing commercial demands is to review the information companies provide including, but not limited to, planned releases of products or

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equipment using substitutes. Likewise, use of products or equipment using substitutes by system owners can demonstrate commercial demands for that equipment.

EPA views technological achievability as the ability for a substitute to perform its intended function in a sector or subsector. For example, technological achievability can be demonstrated through a substitute's compliance with or listing by standard setting bodies such as ASHRAE or Underwriters Laboratories (UL) or through testing and demonstration labs and projects.

EPA provides additional information in the TSD *American Innovation and Manufacturing Act of 2020 – Subsection (i)(4) Factors for Determination: Technological Achievability and Commercial Demands*, referred to in this preamble as the "Commercial Demands and Technological Achievability TSD"; this TSD supports the Agency's consideration of the commercial demands and technological achievability subfactors and is available in the docket. The Commercial Demands and Technological Achievability TSD identifies products and systems using substitutes that are commercially available (*i.e.*, products for sale), or where manufacturers indicate they soon will be available, by sector and subsector. EPA views commercial availability of products and systems using substitutes as an indication of both commercial demand and technological achievability. In other words, a product or system using an available substitute in a market means that the particular substitute is technologically achievable and that there is a commercial demand for that substitute.

The Agency relied on a range of sources and considered where products and systems are already available as well as where they are expected to be available given their use in other countries and/or manufacturer announcements. These sources include, but are not limited to, publicly available data such as information on ENERGY STAR

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products, company websites, SNAP listings, news articles, market reports, and communication with industry experts. EPA also considers information that was provided to relevant States as informative when evaluating whether a technology is achievable or in commercial demand for the purposes of evaluating available substitutes in their respective rulemakings. Another source for considering technological achievability and commercial demand is the information provided by petitioners. While EPA made every effort to gather information related to these subfactors, we recognize that given the scope of this rulemaking and the number of sectors and subsectors covered, we may not have considered all versions and models of all products or equipment in every sector or subsector.

EPA is not limiting its consideration of commercial demands and technological achievability to a specific geographic region since products or systems may be introduced in a few markets first. The information provided in this rule and the Commercial Demands and Technological Achievability TSD available in the docket are based on the best available data and were considered to the extent practicable in this rulemaking.

b. Consumer Costs and Affordability for Residential and Small Business Consumers

Subsection (i)(4)(B) directs EPA, to the extent practicable, to take into account consumer costs and affordability for residential and small business consumers, among other subfactors, in its consideration of availability of substitutes. EPA views these two subfactors as related, in many instances, because residential and small business consumers are a subset of consumers at large. The Act does not specify in what way EPA should consider costs and affordability to these consumers in determining whether a substitute is available. The Agency's view is that the appropriate way to analyze

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consumer costs and affordability is to look not at the total cost of a product/system using a substitute, but rather at the difference in cost of a product/system resulting from the transition. For this rule, the Agency has considered the impact of its restrictions on the use of substitutes in certain subsectors to the costs of products or systems for consumers of all types. In some cases, EPA has extended proposed compliance dates to mitigate potential cost impacts to consumers, because in doing so, the Agency is anticipating that by the later compliance date established in the final rule, the HFC phasedown required under subsection (e) will be further along, there will be increased production of HFC substitutes, and the cost of the substitute will be less of a barrier to the availability of that substitute.

Although some substitutes are more costly than HFCs today, the experience with the ODS phaseout has been that prices of substitutes generally decline as production increases, as more producers negotiate licensing agreements for certain chemicals, and as patents expire. EPA has compiled a memo in the docket which provides a non-exhaustive list of several announcements that have been made regarding the initiation or updating of production plants for various substitutes.[59] Simultaneously, experience with the ODS phaseout and reductions in supply of HFCs in other parts of the world, suggest that the price of HFCs will increase as a result of the phasedown. While these are the anticipated trends, EPA finds that the cost of using a regulated substance or substitute generally represents only a small fraction of the total cost of the product.[60] For the RACHP sector,

[59] See memo titled, Technical Support Company Announcements of Increased Production of Low-GWP Substitutes in the docket that presents company announcements of increased production of lower-GWP substitutes. This memo is for informational purposes and does not represent endorsement by the Agency. EPA further notes that this memo is a non-exhaustive sampling of announcements; there may be other companies announcing increased production of lower-GWP substitutes.

[60] U.S. Department of Energy, Technical Support Document: Energy Efficiency Program for Consumer Products: Residential Central Air Conditioners and Heat Pumps, December 2016. Available at: *https://www.regulations.gov/document?D=EERE-2014-BT-STD-0048-0098.*

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the cost of refrigerant is less than one percent of the entire cost of the system, and the highest costs come from raw materials such as copper, steel, and aluminum that are used to make the equipment.[61] Therefore, even a large change in the cost of the refrigerant is unlikely to have a significant impact on the overall cost of the product.

Additionally, substitutes are more efficient refrigerants than the HFCs currently used, with some exceptions. This means that less refrigerant is necessary in the finished product. More importantly, this can reduce costs of the equipment because it requires less raw material such as copper, steel, and aluminum to create heat transfer elements. EPA applied the savings from using fewer raw materials and improved energy efficiency only when EPA found sufficient literature supporting such claims; however, other such cost saving factors may be relevant to other subsectors.

In considering affordability for residential and small business consumers and consumer costs, the Agency has also looked at overall compliance costs associated with this rule to OEMs, importers, retailers, distributors, and other regulated entities. This is because compliance costs to these entities tend to be passed on to consumers. EPA has previously analyzed "consumer costs" in relation to "compliance costs" and found very little difference in these.[62] EPA included the cost to consumers in an analysis of the HFC phasedown as stipulated in the AIM Act that Congress was considering in 2019. In that analysis, the costs to consumers were approximately $0 to $200 million less than the compliance costs, depending on the compliance step-down year (EPA analyzed 2020, 2024, 2029, and 2034). Compared to the total cumulative costs or savings estimated,

[61] *Consumer Cost Impacts of the U.S. Ratification of the Kigali Amendment*, JMS Consulting in partnership with INFORUM, November 2018. Available in the docket.
[62] See "American Innovation and Manufacturing Act of 2019: Compliance and Consumer Cost Estimates" document in the docket.

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these differences represented no more than a 20 percent difference, and in all cases were decreases in total costs or increases in total savings.

EPA's estimates of compliance costs include energy efficiency changes of equipment when switching from a regulated substance to a substitute, where data were available. To the extent available, EPA's analysis factored in energy efficiency changes inherent to the substitute, which is separate from the energy efficiency gains from using new equipment subject to more recent efficiency standards. These costs (or savings) will likely impact all consumers of the equipment using the substitutes, as the ones paying for the electricity. In this case, the consumer could be a residential consumer or a small business consumer, for instance a restaurant buying a new air conditioning unit or a small convenience store using new stand-alone retail food refrigeration equipment.

EPA's *Costs and Environmental Impacts* TSD summarizes many of the Agency's analytical results regarding the costs of using substitutes in the impacted subsectors (which in turn informed the Agency's assessment of whether that substitute is available) as well as the expected costs and negative costs (*i.e.*, savings) to industry associated with transitioning from a regulated substance to a substitute. This discussion (and the Costs and Environmental Impacts TSD) refers to the cost of manufacturing, purchasing, operating, and maintaining a product or system with a substitute that complies with the restrictions compared with that same product or system using a prohibited substance. For example, for the residential and light commercial air conditioning and heat pump subsector, the costs of manufacturing units that use lower-GWP substances or blends (*e.g.*, R-454B), and maintaining the operation of that equipment, compared to those costs for a baseline unit (*e.g.*, one that uses R-410A including the operation and maintenance of that unit), are used to generate an approximate accounting of the full cost (or potential

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savings) of the transition. Depending on the substitute and application, this can result in savings or costs borne by the consumer.

Data to develop the cost estimates summarized in the Costs and Environmental Impacts TSD were derived from a variety of information sources including technical literature and experts. EPA provides additional details regarding the data used in the RIA addendum and its accompanying appendices and references cited. The cost factors were applied to develop transition scenarios consistent with this rule using EPA's Vintaging Model. The resulting costs and abatement were used in a similar manner as the Marginal Abatement Cost analysis explained in the Allocation Framework RIA.

With respect to subsection (i)(4)(B)'s direction to consider affordability for small business consumers in particular, the Agency also analyzed whether its restrictions as a whole could have a significant economic impact on a substantial number of small business consumers. The analysis found that approximately 162 of the 51,047 potentially affected small businesses could incur costs in excess of 1 percent of annual sales and that approximately 110 small businesses could incur costs in excess of 3 percent of annual sales. Based on this analysis, we do not anticipate a broad, significant economic impact on small businesses as a result of the final restrictions. We expect that these results largely stem from the anticipated reduced costs of substitute chemicals as compared with HFCs as well as potential energy savings and reduced material costs for equipment as discussed above. This rule also does not require any consumers to stop using and maintaining their existing equipment.

Equipment manufacturers, which are often small businesses, have also already begun to transition to different refrigerants required by this rule in response to regulations being implemented in several States. Although State actions do not affect the entire U.S.

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market, many manufacturers have begun the transition to HFC substitutes to have products that can be sold nationally and comply with regulations in export markets. Additional information on potential impacts of this rule on small businesses can be found in the Small Business Regulatory Enforcement Fairness Act (SBREFA)[63] screening analysis located in the docket for this rulemaking.

One factor that affects affordability for residential and small business consumers is up-front capital costs for new equipment. Compared to large businesses, both groups may be less likely to be able to afford high up-front capital costs. However, this rule does not require that existing equipment be retired by a specific date, nor are estimates of emission reductions associated with these restrictions predicated on the assumption that equipment would be retired prematurely. Indeed, this final rule makes substantial changes from the proposed rule to reduce costs borne by distributors and equipment owners associated with the sell-through of products, the repair of existing systems, and the continued supply of components.

More salient to EPA's analysis is consideration of the costs of a substitute and its impacts on availability, particularly with regard to investments that must be made in redesigning equipment to incorporate use of the substitute. This redesign may have downstream costs on consumers, both small business and residential. One way EPA has factored in these costs and attempted to mitigate downstream impacts on consumers is by establishing compliance dates that are further in the future than the one-year required under the AIM Act. By signaling earlier to regulated industry that transitions will be required and providing more than one year for compliance, EPA provides some economic

[63] Economic Impact Screening Analysis for Restrictions on the Use of Hydrofluorocarbons under Subsection (i) of the American Innovation and Manufacturing Act, available in the docket.

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and regulatory certainty to designers and manufacturers, and eases supply constraints on components that these manufacturers may need for the redesign. Additionally, staggering the compliance dates across multiple years, rather than having a single January 1, 2025, compliance date, lessens potential bottlenecks in the transition to manufacture new equipment, such as testing and certification of equipment by a nationally recognized testing laboratory (NRTL). The resultant savings may then be passed on to consumers.

Comment: One commenter stated that EPA failed to consider higher repair and servicing costs over the life of these systems caused by the proposed rule. The commenter asserted that by moving to flammable refrigerants, service technicians must undertake additional precautions that would add to the time and cost to repairs; that moving from one refrigerant (R-410A) to multiple refrigerants will require costly redundancy of refrigerant-specific servicing equipment; and that newly designed equipment is generally less reliable and requires more repairs than established products.

Response: EPA disagrees with this commenter. In the context of availability, EPA did consider repair and servicing. As explained elsewhere in this final rule, this is not the first transition for most of the sectors and subsectors covered by this rule. Many manufacturers already use flammable HFCs or HFC alternatives including in foams, aerosols, and RACHP. EPA understands that there may be additional technician training needed; however, training is often needed when alternatives are introduced including with regard to inherent characteristics of the alternative that could include flammability, glide, changes in compatibility with components or oils, and other factors. Therefore, the need for training or changes in how repairs are undertaken, for example, is not limited to the introduction of flammable alternatives. We expect that under the HFC phasedown, access to HFCs, both newly manufactured and reclaimed, will continue far into the

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future, particularly given that the AIM Act directs EPA to phase down and not to phase out HFC production and consumption and subsection (h) provides direction concerning maximizing reclamation of HFCs. A network of reclaimers offer reclaimed HFCs that can be used to service existing equipment for its full useful life. Reclaimed CFCs and HCFCs remain available in the United States for servicing equipment that was designed, sold, installed, and continues to be operated by residential and small business consumers. Furthermore, the Regulatory Impact Analysis for this rule finds that for many subsectors, required transitions will provide net savings to the economy over time, which may in turn be passed on to small business and residential consumers.

c. Safety

Subsection (i)(4)(B) directs EPA, to the extent practicable, to take into account safety in its consideration of the availability of substitutes. As part of EPA's consideration of safety, EPA is providing additional information in the Safety TSD This TSD supports the Agency's consideration of the safety subfactor and is available in the docket. EPA has reviewed information on flammability and toxicity as well as the ability of substitutes to meet relevant industry safety standards. In our interpretation of best available data, we evaluated information from recognized industrial sources, including standard-setting bodies, the SNAP program, international technical committees, and information from petitions. Safety information may impact the availability of substitutes in a particular sector or subsector, for example, if there are restrictions on the use of a substance in local building codes and/or regulatory requirements. Industry acceptance of substitutes that are compliant with safety standards is also an indication of safety and, therefore, impacts the use of a particular substitute.

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Taking safety into account in considering the availability of substitutes is not intended to limit substitutes to only those that are risk free. This interpretation under subfactor (i)(4)(B) is informed by the approach EPA has taken under the SNAP program, where the Agency has likewise stated that it does not require alternatives to be risk free (59 FR 13044, March 18, 1994). Many industry standards are designed to mitigate risk and allow for the safe use of flammable, toxic, or high-pressure substitutes. EPA therefore understands the direction to take safety into account, to the extent practicable, as encompassing consideration of information on the risks associated with the substitute as well as information on risk mitigation.

EPA has considered the listings under SNAP in its assessment of the availability of substitutes in this rule. The SNAP program, in making listing decisions for a substitute (*e.g.*, to list as acceptable or unacceptable), considers whether a substitute presents human health and environmental risks that are lower than or comparable to such risks from other substitutes that are currently or potentially available for the same uses. Under this comparative risk evaluation, the human health risks analyzed include safety, and in particular, flammability, toxicity, exposure (of workers, consumers, and the general population) to chemicals with direct toxicity; and exposure of the general population to increased ground-level ozone. Under the SNAP program, EPA makes decisions that are informed by its overall understanding of the environmental and human health impacts.

Under SNAP, EPA can list substitutes as "acceptable subject to use conditions," indicating that a substitute is acceptable only if used in a certain way. Use conditions can include, but are not limited to, warning labels, charge size limits, compliance with relevant safety standards, unique fittings for servicing of equipment, and restrictions on where a substitute is used (*e.g.*, normally unoccupied spaces).

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EPA can also list substitutes as "acceptable subject to narrowed use limits" under SNAP, indicating that a substitute may be used only within certain specialized applications within an end-use and may not be used for other applications within that end-use. EPA lists an alternative as acceptable subject to narrowed use limits because of a lack of available alternatives within the specialized application. Users of an alternative in this category must make a reasonable effort to ascertain that other alternatives are not technically feasible for reasons of performance or safety. Users are expected to undertake a thorough technical investigation of alternatives to the otherwise restricted compound. Although users are not required to report the results of their investigations to EPA, users must document these results and retain them in their files for the purpose of demonstrating compliance.

EPA lists substitutes as "unacceptable" under SNAP if the Agency determines that they may increase overall risk to human health and the environment, compared to other alternatives that are available or potentially available for the same use. EPA has listed substitutes as unacceptable considering the human health criteria described above, as well as the environmental factors considered under SNAP. For example, SNAP has listed certain substitutes as unacceptable due to unusually high ozone depletion potential, global warming potential, toxicity and exposure, flammability (where it is not clear how to mitigate risks sufficiently), and potential impacts on local air quality. Substitutes listed as unacceptable in an end-use are prohibited for that use for those subject to SNAP.

EPA evaluates substitutes under the SNAP program on an ongoing basis and over time has listed numerous substances as "acceptable," "acceptable, subject to use conditions," or "acceptable, subject to narrowed use limits." Often, EPA applies compliance with relevant safety standards, such as those discussed in the remainder of

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this section, as a use condition to mitigate some of the risk associated with using certain substitutes, particularly those that are classified as flammable. Therefore, updates to standards can greatly affect how SNAP considers the safe use of certain substitutes, and expanded risk mitigation strategies required by standards could reduce the comparative risk evaluation of a substitute under SNAP. The SNAP program also often applies use conditions in addition to those required by safety standards, which can further reduce the risk associated with use of a substitute.

In its evaluation of the safety subfactor under subsection (i)(4)(B) for refrigerants, EPA is also considering the safety group classification designated by ASHRAE Standard 34, and requirements for the safe design, construction, installation, and operation of systems under ASHRAE Standard 15, *Safety Standard for Refrigeration Systems*, and 15.2, *Safety Standard for Refrigeration Systems in Residential Applications*. ASHRAE Standard 34 assigns a designation consisting of two to three alphanumeric characters (*e.g.*, A2L or B1). The initial capital letter indicates the toxicity, and the numeral and trailing letter, if any, denotes the flammability. Under this standard, Class A refrigerants are those for which toxicity has not been identified at concentrations less than or equal to 400 parts per million (ppm) by volume, based on data used to determine threshold limit value-time-weighted average (TLV-TWA) or consistent indices. Class B signifies refrigerants for which there is evidence of toxicity at concentrations below 400 ppm by volume, based on data used to determine TLV-TWA or consistent indices. Refrigerants that are listed under the B (higher toxicity) classification of ASHRAE Standard 34 have been used safely and effectively for many years. For example, after the CFC phaseout, several companies offered comfort cooling chillers using HCFC-123, and at least one has since transitioned to the low-GWP B1 refrigerant R-514A in part of its product line.

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These systems generally have low leak rates, are located away from building occupants in limited-access areas (*e.g.*, mechanical rooms) with secured entrances, and utilize refrigerant sensors and alarms to alert operators of leaks. Building codes further reduce risks by requiring, for example, mechanical ventilation to the outdoor space where such systems are placed.

The standard also assigns refrigerants a flammability classification of 1, 2, 2L, or 3 based upon the results of standardized testing for flame propagation, heat of combustion, lower-flammability limit (LFL), and burning velocity. Tests for flammability are conducted in accordance with American Society for Testing and Materials E681 using a spark ignition source at 140 °F (60 °C) and 14.7 psia (101.3 kPa).[64] The flammability classification "1" is given to refrigerants that show no flame propagation. The flammability classification "2" is given to refrigerants that exhibit flame propagation, have a heat of combustion less than 19,000 kJ/kg (8,169 BTU/lb), and have a LFL greater than 0.10 kg/m^3. The flammability classification "2L" is given to refrigerants that exhibit flame propagation, have a heat of combustion less than 19,000 kJ/kg (8,169 BTU/lb), have an LFL greater than 0.10 kg/m^3, and have a maximum burning velocity of 10 cm/s or lower when tested in dry air at 73.4 °F (23.0 °C) and 14.7 psi (101.3 kPa). The flammability classification "3" is given to refrigerants that exhibit flame propagation and that either have a heat of combustion of 19,000 kJ/kg (8,169 BTU/lb) or greater or have an LFL of 0.10 kg/m^3 or lower.

For flammability classifications, refrigerant blends are designated based on the worst case of formulation for flammability and the worst case of fractionation for

[64] ASHRAE, 2022. *ANSI/ASHRAE Standard 34-2022: Designation and Safety Classification of Refrigerants.*

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flammability determined for the blend. Information on the ASHRAE classification of each substitute identified by EPA for this rule is available in the docket for this rulemaking.

ASHRAE Standard 15 specifies requirements for air-conditioning and refrigeration systems based on the safety group classification of the refrigerant used, the type of occupancy in the location for which the system is used, and whether refrigerant-containing parts of the system enter the space or ductwork and so that leakage in the space is deemed "probable." "High-probability" installations are those such that leaks or failures will result in refrigerant entering the occupied space. Occupancies are divided into six classifications: institutional, public assembly, residential, commercial, large mercantile, and industrial. Examples of these include jails, theaters, apartment buildings, office buildings, shopping malls, and chemical plants, respectively. Sections 7.2 and 7.3 of ASHRAE Standard 15 determine the maximum amount of refrigerant allowed in the system, while section 7.4 provides an option to locate equipment outdoors or in a machinery room constructed and maintained under conditions specified in the standard. Section 7.6 of ASHRAE Standard 15 addresses the refrigerants in this final rule when used for human comfort in "high-probability" systems, including requirements for nameplates, labels, refrigerant detectors (under certain conditions), airflow initiation and other actions (if a rise in refrigerant concentration is detected), and other restrictions.

ASHRAE Standard 15 is generally followed for several of the RACHP subsectors addressed in this rule, and in many cases is required as a use condition under SNAP for comfort cooling chillers (*see* 88 FR 26382, April 28, 2023) or adoption either by reference or through similar language in local building codes. Therefore, part of our consideration of safety in our evaluation of the availability of substitutes is based on our

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knowledge of this and other ASHRAE Standards, and the evaluation of safety in these standards regarding substances, equipment, and use conditions. For example, the scope of ASHRAE standard 15 specifically excludes refrigeration systems operating with R-717 (ammonia) refrigerant and references IIAR Standard 2, *American National Standard for Safe Design of Closed-Circuit Ammonia Refrigeration Systems*. For subsectors where R-717 is currently widely employed (*e.g.*, industrial process refrigeration, cold storage warehouses, ice rinks) or where it may be used as a substitute, our consideration of safety in evaluating the availability of substitutes also incorporates this standard. Where the standards distinguish what types of refrigerants may be used based on a feature of the equipment (*e.g.*, charge size), EPA has in some instances considered those distinctions in setting the levels of restrictions or the timing of compliance dates.

EPA also considered UL standards in factoring in safety when evaluating the availability of substitutes under subsection (i)(4)(B). In general, UL standards provide engineering, labeling, and design requirements that address potential safety concerns for various types of refrigeration, air-conditioning, and heat pump equipment. Updates to UL standards are then incorporated into other regulatory and industry assessments, such as updates to SNAP listings, equipment design and testing, and changes to building codes. In some cases, EPA took notice of the timing of a publication of an update to a UL standard in establishing the compliance date for a subsector restriction, such as the safety standard UL 60335-2-89. This standard covers chillers used for IPR and other IPR systems, cold storage warehouses, retail food refrigeration equipment, and commercial ice machines. In October 2021, the 2nd edition of the standard was published, updating safety requirements so that flammable and lower flammability refrigerants could be deployed more widely in commercial refrigeration equipment. These updates included

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safety requirements, such as sensors in the room to trigger refrigerant shut-off valves when a refrigerant leak is detected and updated warning labels that better alert technicians, equipment users, and firefighters that a flammable refrigerant is contained in the equipment, among others. The updates included in UL 60335-2-89, 2nd edition, enable lower-GWP flammable refrigerants to be used safely in equipment in greater amounts than before through expanded mitigation strategies.

Based on the above, we find that products and systems can be used safely even if there are challenges with the HFC or HFC blend substitute being used. For example, most products within the RACHP sector will be tested at NRTL for conformance to the applicable UL standard and other requirements (*e.g.*, DOE energy conservation standards, National Sanitation Foundation (NSF) requirements). This testing provides a check on the products design to ensure, for instance, that charge sizes of flammable refrigerants do not exceed the standard's limit and that proper design and mitigation features are included as required. Likewise, when building projects are permitted, the authority having jurisdiction will typically review the design including specification on the refrigeration systems and conduct another review before giving permission for the building to commence operation. This too provides a check on the safety of such systems, for instance by ensuring compliance with ASHRAE Standard 15 or similar requirements provided by the local building codes.

Additional information on EPA's consideration of safety is available in the Safety TSD in the docket.

d. Building Codes

Subsection (i)(4)(B) directs EPA, to the extent practicable, to take building codes into account in its consideration of availability of substitutes. For certain types of

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equipment, especially in the RACHP sector, building codes may inform which substances can be used or may prescribe additional requirements before a specific substance can be used, thereby impacting availability of substitutes in some jurisdictions. This section summarizes EPA's understanding of building code development across the nation generally and how model building codes are developed and adopted into local building codes. EPA has considered this information, to the extent practicable, to evaluate how building codes may affect the availability of substitutes to regulated substances. Additional information is found in the TSD *American Innovation and Manufacturing Act of 2020 – Subsection (i)(4) Factors for Determination: Building Codes*, referred to in this preamble as the "Building Codes TSD." This TSD supports the Agency's consideration of the building codes subfactor and is available in the docket.

Building codes are established at the subnational level and can differ greatly across jurisdictions. Some States develop their own building codes and determine the frequency with which they are updated. Other states adopt (and sometimes amend) "model" building codes that are written by code-setting organizations. Code-setting organizations include the International Association of Plumbing and Mechanical Officials (IAPMO), the International Code Council (ICC), and the National Fire Protection Association (NFPA). Many States allow local governments to set their own building codes, provided they comply with the minimum standards established under State building codes. Both State and local building codes are periodically reevaluated and updated. The Agency did not review every jurisdiction's building codes as EPA does not view that as practicable.

Model building codes serve as the basis for many State and local building codes and incorporate a range of industry standards that establish specific requirements for

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building performance or design. Several of these standards are directly relevant to the availability of substitutes in the RACHP sector. EPA considered, to the extent practicable, updates to industry standards and if those updates may be incorporated into model building codes that will allow the future use of products that use substitutes. EPA also considered whether current building codes permit the installation and use of products and systems using substitutes, particularly with respect to setting compliance dates for restrictions. As noted earlier, EPA does not interpret subsection (i)(4)(B)'s direction to factor in building codes, to the extent practicable, as a requirement that EPA must find that current building codes already permit the use of a substitute before it may be deemed available.

EPA understands that, in some cases, jurisdictions need to update their building codes for some substitutes to be available for certain uses. EPA finds it reasonable to consider that updates to building codes may already be underway to reflect updated regulatory requirements or safety standards, and for EPA to establish compliance dates with the expectation that jurisdictions will prioritize completing those updates with those deadlines in mind. EPA is aware of ongoing efforts by industry groups and other stakeholders to work with State and local officials to update building codes to allow for alternative refrigerants. EPA has had and will continue to have discussions concerning agency rulemaking and meet with relevant stakeholders, including State officials. In some cases, it will be EPA's establishment of a future restriction that will serve as the catalyst, or at least a contributing factor, to the updating of building codes to accommodate those restrictions. Users may also be able to take other actions, usually site-specific, to show comparable safety to existing refrigerants and systems to receive approval from the authority having jurisdiction, even where building code updates are not

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yet complete. The Agency has therefore, for many of the subsectors addressed in this final action, provided additional time enabling those jurisdictions to update their building codes or legislation accordingly.

Model codes are typically updated on a three-year cycle, and most model building codes were last updated in 2021; the next scheduled updates are for 2024. Several proposed changes in the current code development cycle for the 2024 codes could enhance the availability of HFC substitutes under model building codes. For example, ICC, an international developer of model codes, standards, and building safety solutions, approved changes to many model codes that affect the availability of A2L refrigerants for the RACHP sector. These model code changes, which will go into effect in 2024, are consistent with updated industry standards that allow the use of substitutes identified in this rulemaking. However, State and local building code agencies do not automatically adopt updates to the model codes and thus, they may not be implemented until after 2024.

Information from stakeholders, including petitioners, indicates that several States are updating building codes both as part of the cyclical review and off cycle that would allow for the use of additional HFC substitutes. For example, Oregon, California, and Colorado have recently made, or are considering making, changes to their codes that would effectively incorporate updated industry standards as reflected in the model code changes that occurred in 2021. Updated codes may require automatic refrigerant leak detection systems, circulating fans, and labeling and handling instructions for flammable refrigerants in certain applications and installations.

Additional information on EPA's consideration of building codes can be found in the Building Codes TSD in the docket.

e. Appliance Efficiency Standards

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As part of the Agency's consideration of the availability of substitutes as directed by subsection (i)(4)(B), EPA is taking into account, to the extent practicable, appliance efficiency standards. EPA consulted with the U.S. Department of Energy regarding relevant minimum energy efficiency standards and the timing for any planned changes to the current standards. DOE, through its Building Technologies Office and Appliance and Equipment Standards Program, sets minimum energy efficiency standards for more than 60 different types of equipment, including appliances and equipment used in homes, businesses, and elsewhere.[65] Several of these equipment types are within the RACHP sector and are covered in this action. Among the equipment relevant to this action are consumer products (*e.g.*, refrigerators, freezers, and room air conditioners) and commercial and industrial systems (*e.g.*, automatic commercial ice machines, vending machines, walk-in coolers, and walk-in freezers).[66] EPA provides additional information in the memo *American Innovation and Manufacturing Act of 2020 – Subsection (i)(4) Factors for Determination: Appliance Efficiency Standards*, referred to in this preamble as the "Appliance Efficiency Standards memo." This memo supports the Agency's consideration of the appliance efficiency standards subfactor and is available in the docket.

The DOE Appliance and Equipment Standards Program regularly develops and updates appliance efficiency standards and test procedures. Future revisions to existing appliance efficiency standards could impact what substitutes are chosen to be used in equipment in specific sectors and subsectors. EPA is in regular communication with DOE

[65] See the U.S. Department of Energy's Appliance and Equipment Standards Program available at: *www.energy.gov/eere/buildings/appliance-and-equipment-standards-program*.
[66] For additional information and a complete list of products, please refer to the U.S. Department of Energy's website available at: *www.energy.gov/eere/buildings/standards-and-test-procedures.*

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so both agencies are aware of the schedules for these separate but related actions. The Appliance Efficiency Standards memo lists applicable standards in relevant sectors and subsectors and identifies standards currently undergoing revision. We understand that for redesign and testing of equipment, industry prefers that DOE and EPA regulations are synchronized where possible. Given that DOE and EPA operate under separate Congressional mandates, that synchronization may not always be possible, but sharing information early can reduce inconsistencies such that, to the extent possible, the refrigerants used to set performance standards will be available under the technology transitions program. For example, EPA discussed with DOE test procedures that they developed for Automatic Commercial Ice Machines (ACIMs). Based in part on that discussion, and as suggested in comments, EPA is not finalizing the restrictions for this subsector as proposed, but rather is finalizing restrictions in part by referencing DOE regulations (*see* section VI.F.1.g). EPA also recognizes the potential to greatly increase climate protection by both reducing the GWP of substances used in the relevant subsectors (*e.g.*, construction foams, appliances foams, and refrigerants) covered by this action and supporting energy efficiency in such applications.

Comment: Commenters stated that product design changes for refrigerant and efficiency both require a significant amount of time, resources, and capital and that there is benefit to every stakeholder in the channel if these regulatory actions are coordinated. One commenter stated that new DOE efficiency standards for ACIMs will be effective between 2027 and 2029 and the proposed compliance dates would require redundant work to develop products that first comply with both requirements. Two commenters that manufacture ice machines stated that many of their products will become less efficient by up to 10 percent due to the operating differences of the refrigerants.

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Response: EPA recognizes that other requirements such as DOE energy conservation standards apply to ACIMs just as they apply to many RACHP subsectors. While EPA and DOE operate under different authorities and must follow timelines as set forth by these authorities, we find that the compliance dates finalized here broadly meet the commenters' request. For remote ACIMs, a compliance date of 2027, and for self-contained ACIMs, compliance dates of 2026 or 2027 with a three-year sell-through period, comport well with the commenter's prediction of DOE efficiency standards becoming effective in 2027 to 2029. DOE has already begun the process for such standards, and OEMs can choose to develop new products meeting the restrictions set in this rule while at the same time considering potential DOE energy conservation standards.

EPA disagrees that ACIMs using alternative refrigerants will necessarily experience a drop in efficiency. One ACIM manufacturer recently reported on results of an ACIM after the R-404A compressor was replaced with an R-290 one, finding a 34 percent energy savings and an increase of 35 percent in ice production.[67] DOE found a similar improvement when using R-290 in a different type of ACIM.[68] In its TSD for ACIMs, DOE in its preliminary analysis estimates the baseline energy can drop from 10% below baseline (*i.e.*, after other improvements were made) to 18% below baseline when switching to R-290. The refrigerant change increased the energy efficiency ratio (EER) from 6.4 to 7.4. When evaluating compressors for ACIMs, DOE found that R-290 compressors were consistently more efficient than R-404A ones over the full capacity

[67] See *https://www.embraco.com/en/embraco-brings-to-ahr-expo-a-case-study-with-34-energy-savings-in-ice-machines*.

[68] Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Automatic Commercial Ice Makers; EERE-2017-BT-STD-0022-0009_content (1); available at *www.regulations.gov*.

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range studied (from approximately 1,000 BTU/h to 5,000 BTU/h). In six other types of ACIMs, DOE consistently found that the energy use dropped by switching to R-290,[69] and likewise found improvements by switching to R-600a in three types of ACIMs.[70]

f. Contractor Training Costs

As part of the Agency's consideration of the availability of substitutes as directed by subsection (i)(4)(B), EPA is taking into account, to the extent practicable, available information on contractor training costs, including training related to substitutes for relevant sectors and subsectors (*e.g.*, certain RACHP and foam subsectors). EPA obtained contractor training and exam cost data through a review of publicly available literature, from industry trade and training associations, and information submitted to EPA during the comment period or in petitions under subsection (i). It is not feasible to obtain information and data on all available training programs and exams and our review represents an assessment to the extent practicable of information in relevant sectors and subsectors for contractor training costs. Some substitutes may require specialized or additional training, knowledge, or expertise to ensure their safe handling and use. This includes, but is not limited to, flammable (A3 or B3), lower flammability (A2L or B2L), and higher toxicity (B1, B2L, B2, or B3) refrigerants and other substitutes with unique or different characteristics such as those operating at higher pressures than HFCs. To the extent practicable, the Agency has considered the cost of trainings to contractors for handling products and equipment containing substitutes for HFCs or blends containing HFCs substitutes. In certain situations, the Agency has endeavored to mitigate costs

[69] Based on ACIM type, energy use compared to baseline declined 18% to 25%, 8% to 18%, 7% to 20%, 8% to 19%, 42% to 48%, and 11% to 32%.
[70] Based on ACIM type, energy use compared to baseline declined 0% to 8%, 20% to 22%, and 3% to 10%.

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associated with high demand for trainings associated with new substitutes by providing additional time for compliance (and, in turn, for those trainings to occur).

Manufacturers and trade organizations often provide training and certification beyond what is required under the regulations implementing sections 608 and 609 of the CAA. This is not a new practice, especially with the release of new equipment. As the transition to lower-GWP refrigerants continues, more technicians are expected to work with flammable refrigerants, and a variety of training and education resources are anticipated to include the incorporation of flammable refrigerants into existing curriculum. There are already courses, trainings, and conferences across the country that focus on lower-GWP refrigerants among the affected subsectors. Costs of trainings are dependent on several factors, such as the organization providing the training, how it is administered, and the location. In some States, continued RACHP education is required as part of a State licensing requirement; training on using flammable refrigerants may be incorporated to fulfill this requirement.

Certain applications in the foams and aerosols sectors may also require safety training. In particular, the Occupational Safety and Health Administration (OSHA) requires that contractors providing *in situ* installation of spray foams, foam insulation, and aerosols receive health and safety training regarding the hazards of working in confined spaces and procedures to avoid injury from fall hazards. OSHA issued a standard reflected in 29 CFR part 1926 subpart AA – Confined Spaces in Construction, which requires that employers provide employees free training to ensure that the employee understands the hazards of working in a confined space. Additional trainings and exams are available beyond the basic required safety training and may vary in costs depending on the level and amount of training a contractor obtains.

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g. Quantities of Regulated Substances Available from Reclaiming, Prior Production, or Prior Import

As part of the Agency's consideration of the availability of substitutes as directed by subsection (i)(4)(B), EPA is taking into account, to the extent practicable, information on quantities of HFCs from reclamation and stockpiles of previously produced or imported HFCs. EPA is providing additional information in the TSD *American Innovation and Manufacturing Act of 2020 – Subsection (i)(4) Factors for Determination: Quantities Available from Reclaiming, Prior Production, or Prior Import*.

HFCs available from prior production or import that have been stockpiled and HFCs that have been recovered and reclaimed can both smooth transitions to alternative technologies and ensure that existing equipment can continue to be used. The Agency knows from its experience under the ODS phaseout the important role reclamation plays by providing an ongoing supply of material. This is true not only for the RACHP sector but a similar approach of recycling of fire suppressants is also used for the fire suppression sector, where regulated substances are recovered and tested and/or reprocessed to certain industry purity standards. Some companies may also choose to stockpile substances to ensure a continued supply that can meet their needs. EPA cannot estimate how much material will be stockpiled for a particular sector or subsector or by a particular company; however, the Agency can consider this approach as a general matter.

Information that EPA considered includes HFC reclamation data submitted annually in accordance with the Clean Air Act section 608 reclamation program, codified at 40 CFR part 82, subpart F; reclamation, production, and import data reported under 40

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CFR part 84, subpart A;[71] data gathered to support development of the AIM Act subsection (e) regulations contained in the docket for the 40 CFR part 84, subpart A rules;[72] and data reported to the Greenhouse Gas Reporting Program (GHGRP) under subparts OO and QQ.

In addition, EPA is developing proposed regulations under the authority of subsection (h) of the AIM Act. Subsection (h)(1) of the Act provides that "[f]or purposes of maximizing reclaiming and minimizing the release of a regulated substance from equipment and ensuring the safety of technicians and consumers, the Administrator shall promulgate regulations to control, where appropriate, any practice, process, or activity regarding the servicing, repair, disposal, or installation of equipment … that involves: (A) a regulated substance; (B) a substitute for a regulated substance; (C) the reclaiming of a regulated substance used as a refrigerant; or (D) the reclaiming of a substitute for a regulated substance used as a refrigerant." Such regulations, if finalized, could increase the level of reclamation in the future, such that the data provided in the TSD may be a conservative estimate of what may be available in the future.

3. How is EPA considering overall economic costs and environmental impacts, as compared to historical trends?

Subsection (i)(4)(C) directs the Agency to factor in, to the extent practicable, overall economic costs and environmental impacts, as compared to historical trends. The Act does not prescribe how EPA should carry out its consideration of this factor, nor does the statute clearly delineate what is meant by the phrase "as compared to historical

[71] In addition to quarterly data, under 40 CFR 84.31, HFC producers, importers, exporters, application-specific allowance holders, reclaimers, and fire suppressant recyclers must annually report the quantity of each regulated substance held in inventory as of December 31 of each year.
[72] Available at *www.regulations.gov*, in Docket ID No. EPA-HQ-OAR-2021-0044.

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trends." In light of the ambiguity, we interpret the language of (i)(4)(C) as purposefully accommodating of many different types and degrees of analysis of economic costs and environmental impacts (including costs and impacts that may be difficult to quantify) in part because the nature of EPA's action when applying this provision can differ greatly depending on the circumstances.

Subsection (i)(4)(C) applies both to EPA's action on subsection (i) petitions and to EPA's rulemakings under subsection (i). Subsection (i) requires EPA to grant or deny petitions within 180 days of receipt, a time period that inherently limits the scope and depth of any potential analysis under subsection (i)(4)(C). EPA's timeframe for promulgating a rule subject to a granted petition is two years from the date of a petition grant, and in undertaking a rulemaking, whether by negotiated rulemaking or not, EPA will undoubtedly perform more in-depth analysis of economic costs and environmental impacts than we would in the more abbreviated statutory period allotted for petition decisions. As worded, particularly read in light of subsection (i)(4)'s acknowledgement that consideration of some factors will be limited by practicability (*i.e.*, "to the extent practicable"), the provision has flexibility to permit EPA to tailor its consideration of this factor accordingly.

We note also that subsection (i)(4)(C) applies to cases where EPA is considering a broad swath of restrictions—such as this action, which covers more than 40 subsectors—as well as cases where EPA is contemplating a much more limited set of restrictions, potentially for only one sector or subsector. As discussed in this section, EPA reviewed multiple sources of information when factoring subsection (i)(4)(C) into the use restrictions for this action. This information included, but was not limited to, the Costs and Environmental Impacts TSD, information previously developed by EPA concerning

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HFCs and transitions, our experience with the ODS program, information developed by the TEAP, the Montreal Protocol's Science Assessment Reports, industry reports and commissioned studies (*e.g.*, JMS Consulting in partnership with INFORUM), journal articles, and other research. In other actions under subsection (i), it may be appropriate in some instances for EPA to prepare detailed analyses such those in the Costs and Environmental Impacts TSD, but also times when new analyses of similar detail would be unnecessary or not practicable.

It is also not clear from the plain language of the statute what information EPA should consider when thinking about "historical trends," and how EPA should "compare" "overall" economic cost and environmental impact information about newly contemplated restrictions to those trends. Here too the ambiguity of these phrases accommodates consideration of a variety of information and comparisons depending on the circumstances and the available information.

In undertaking this action, EPA does not yet have historical overall economic cost and environmental impact trends for previous use restrictions, or transitions from HFCs to substitutes, under subsection (i) to compare with the overall economic costs and environmental impacts of the contemplated restrictions. However, it is practicable and reasonable to in part interpret our obligation to factor in the considerations under subsection (i)(4)(C) by looking at the overall economic costs and the anticipated environmental impacts of the restrictions as compared to a scenario where historical trends continue into the future (*i.e.*, "business-as-usual"). For purposes of this action, a reasonable reading of the business-as-usual scenario is the conditions that would occur if only the Allocation Framework Rule and the 2024 Allocation Rule were in effect. Therefore, the analysis in the Costs and Environmental Impacts TSD uses as a baseline

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what would occur absent the restrictions finalized in this rulemaking. As noted, subsection (i)(4)(C) does not require a specific type of analysis, such as the one EPA conducted for purposes of the Costs and Environmental Impacts TSD, and we anticipate that the Agency could consider this (i)(4) factor using a different type of analysis in the future.

As this is the first set of restrictions under subsection (i) requiring transitions from certain regulated substances in certain sectors and subsectors, it is appropriate to consider information from historical comparable technology transitions in similar contexts. As noted elsewhere, HFCs are used mainly in the same sectors and subsectors where ODS were used. EPA has considered the overall economic costs and environmental impacts of actions taken under the CAA title VI regulations on ODS in a memo[73] available in the docket. EPA acknowledges that the ODS phaseout and transitions from HFCs as a result of this rule have their own unique regulatory features and technological transitions at play, leading to different overall economic impacts and environmental impacts. The memo discussing the costs and environmental impacts of the ODS phaseout is included as supplemental information and as a relevant benchmark, as the transition to HFC substitutes will impact many of the same industries and entail, in some cases, similar technological shifts.

One key historical trend observed during the ODS phaseout that may be relevant to the HFC phasedown is that technology transitions did not necessarily drive up the cost of products to the consumer or hurt the performance of products. A clear example of this

[73] See "Overview of CFC and HCFC Phaseout" document in the docket.

was discussed in a 2018 report of the TEAP.[74] From 1972 through 2015, household refrigerators sold in the United States underwent several design changes in response to regulations requiring transition from ODS refrigerant, ODS-containing insulation foam, and increased energy efficiency. Over that time, the average capacity of refrigerators sold in the United States also grew to accommodate consumer preferences. Even as refrigerators became larger, more energy efficient, and transitioned from use of ODS, the average price fell in real dollars. Consumers not only benefitted from the lower initial purchase price, but the greater energy efficiency also reduced consumers' electricity costs. This example, and a similar trend seen in household unitary AC units, are discussed in more detail in the report *American Innovation and Manufacturing Act of 2019: Compliance and Consumer Cost Estimates*, which can be found in the docket.[75]

As described in the memo that summarizes the costs of the ODS phaseout, the most comprehensive analysis was in a 1999 peer-reviewed report from EPA to Congress.[76] In that report, EPA summarized the costs of the allowance allocation and reductions for CFCs, HCFCs, halons, and methyl chloroform to be $18 billion (7 percent discount rate) to $56 billion (2 percent discount rate) in 1990 dollars.[77] It was also noted that the transition to more energy efficient air conditioning using alternatives to HCFC-22 could lower this cost by $16.8 billion in 1990 dollars.[78] As opposed to this net cost, the Costs and Environmental Impacts TSD indicates that the transitions envisioned would

[74] Decision XXIX/10 Task Force Report on Issues Related to Energy Efficiency while Phasing Down Hydrofluorocarbons, Technical and Economic Assessment Panel, UNEP, May 2018. Available at: *https://ozone.unep.org/sites/default/files/2019-04/TEAP_DecisionXXIX-10_Task_Force_EE_May2018.pdf*
[75] *Consumer Cost Impacts of the U.S. Ratification of the Kigali Amendment*, JMS Consulting in partnership with INFORUM, November 2018. Available in the docket.
[76] Final Report to Congress on Benefits and Costs of the Clean Air Act, 1990 to 2010; EPA 410-R-99-001 Nov 15, 1999.
[77] Approximately $36 billion and $111 billion, respectively, in 2020 dollars.
[78] Approximately $33.3 billion in 2020 dollars.

yield a net savings through 2050 of $4.2 billion (7 percent discount rate) to $8 billion (3 percent discount rate) in compliance costs.

The primary goal of the ODS phaseout was to protect the ozone layer in accordance with title VI of the CAA and the Montreal Protocol, whereas the primary purpose of this action is to restrict the use of higher-GWP HFCs, making the benefits difficult to compare. However, the phaseout of ODS also provided climate change benefits, as most ODS are also high-GWP greenhouse gases, as indicated by the exchange values for the ODS that are listed in subsection (e)(1)(D) of the AIM Act.[79] Although such benefits have not been calculated specifically for the United States, we note that the U.S. was one of the largest producers and consumers of ODS, and that the benefits from phasing out ODS can be significant given the high GWPs of the most common ODS.

4. How is EPA considering the remaining phasedown period for regulated substances?

Subsection (i)(4)(D) directs the Agency to factor in, to the extent practicable, the remaining phasedown period for regulated substances under the final rule issued under subsection (e)(3) of the AIM Act, if applicable. In the Allocation Framework Rule (86 FR 55116, October 5, 2021), EPA established the allocation program under subsection (e) of the AIM Act, which is codified at 40 CFR part 84, subpart A. A key provision under subsection (e) requires EPA to phase down the consumption and production of the statutorily listed HFCs on an exchange value-weighted basis according to the schedule in the table in subsection (e)(2)(C) of the AIM Act. The quantity of allowances available for

[79] Velders, Guus JM, et al. "The importance of the Montreal Protocol in protecting climate." *Proceedings of the National Academy of Sciences* 104.12 (2007): 4814-4819.

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allocation for each calendar year decreases over time according to the statutory phasedown schedule.

Currently, the United States is at the first step of the HFC phasedown. In 2023, HFC production and consumption is limited to 90 percent of the historical baseline. Additional reduction steps occur on January 1 of 2024, 2029, 2034, and 2036, at which point HFC production and consumption will continue at 15 percent of the baseline. Starting with the allowances for calendar year 2024 the total quantity of production and consumption allowances that may be allocated will drop by one third – to 60 percent of baseline – and starting with calendar year 2029 they will decline to 30 percent of baseline. Thus, most of the phasedown will occur within the next six years. This reduction in the supply of HFCs is an important factor in finalizing restrictions under subsection (i) with compliance dates and GWP limits that are as stringent as feasible under the analysis of all the (i)(4) factors.

EPA also views this final rule as supporting the phasedown schedule. While promulgated under a separate statutory provision under the AIM Act, the restrictions on the use of HFCs will have a complementary effect in meeting the HFC phasedown schedule by facilitating necessary transitions to lower-GWP substitutes. This rule supports innovation and advances the adoption of substitutes where available, thereby reducing demand for HFCs. EPA anticipates new substitutes and technologies will continue to emerge as the reductions in the caps on production and consumption allowances continue. Restricting the use of HFCs in sectors and subsectors that are better positioned to transition to new substitutes and technologies is consistent with subsection (i) and supports the overall production and consumption phasedown.

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Title VI of the CAA similarly provided for prohibitions on the sale or distribution in interstate commerce of certain products under section 610 and for additional restrictions on use of certain ODS under section 605(a). These restrictions supported the ODS phaseout. For example, most of the nonessential products bans under section 610 were established at the very beginning of the ODS phaseout program – ahead of the overall CFC phaseout by a few years and ahead of the HCFC final phaseout by a few decades. By banning the use of certain ODS where substitutes were available, early transitions accrued additional environmental benefits and supported the overall economy-wide transition by removing uses of controlled substances that were no longer necessary. At the time, in discussing some of the statutory criteria to be considered in determining whether a product was nonessential, EPA noted that "where substitutes are readily available, the use of controlled substances could be considered nonessential even in a product that is extremely important." (58 FR 4768, January 15, 1993).

5. How did EPA determine the degree of the restrictions for each sector and subsector?

AIM Act subsection (i)(1) grants EPA authority to restrict by rule the use of a regulated substance in the sector or subsector in which the regulated substance is used, and these restrictions may be exercised "fully, partially, or on a graduated schedule." In determining the degree of the restrictions—*e.g.*, GWP level, how partially or fully to restrict the use, and on what schedule—EPA looked to the factors in subsection (i)(4). Specifically, we interpret subsection (i)(4) as directing EPA to balance multiple factors in establishing the level of the contemplated use restriction, and we describe in this section the guiding principles and methodology EPA employed in our consideration of those factors in developing the restrictions established in this action. In short, EPA selected the degree of restriction for each sector or subsector by weighing the following

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considerations: maximizing environmental benefit while ensuring adequate availability of substitutes (as informed by the subsection (i)(4)(B) subfactors) and with consideration of how this action comports with the overall economic costs and environmental benefits compared to historical trends. With respect to all of our information and analysis we strive to use best available data. We are also mindful of the HFC phasedown schedule in ensuring that the use restrictions support that schedule by reducing total U.S. demand for HFCs by transitioning uses in sectors and subsectors where the Agency has determined that substitutes are available.

EPA is establishing restrictions on the use of HFCs by, for the most part, setting GWP limits by sector or subsector. In section VI.B, EPA highlights the benefits of using GWP limits, including achieving environmental benefits, smoothing the transition from higher-GWP substances, supporting innovation, providing regulatory certainty, and harmonizing with approaches taken by other governments in establishing similar requirements.

Because the use restrictions were requested by numerous stakeholders, representing a broad range of interests (regulated industry, environmental and public health organizations, and State and local governments), EPA considered the petitions—either in the form of GWP limits or specific substances to be restricted—as the starting point for the level of the restrictions. In some cases, petitioners provided information about substitutes that are already in use or would soon be ready to be in use in the affected sectors and subsectors and attested to the achievability (technologically, regulatory, economic, and otherwise) of certain substitutes. The substitutes discussed in the petitions and supporting information had lower GWPs, and thus reduced adverse impacts on climate, compared to the regulated substances for which a use restriction was

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requested. Many of the petitioners are the entities (or trade associations representing those entities) developing substitutes or manufacturing products using substitutes.

The impetus for this rulemaking, in part, was to address the granted petitions. Therefore, the restrictions requested in those petitions, including specific substances or GWP limits, and the timing of those restrictions, were a natural starting point for the Agency's inquiry. However, as a starting point, EPA was clear in the proposed rule that the Agency was not obligated to propose a rule restricted to the petitions. Subsection (i)(4) requires that EPA take into account, to the extent practicable, the factors described in section VI.E of this preamble. In following this statutory directive, EPA considered the (i)(4) factors collectively, with no single (i)(4) factor (or subfactor) driving the restrictions for any sector or subsector. Collective consideration of the (i)(4) factors is consistent with the statutory text, which directs EPA to account for all the factors, to the extent practicable, in carrying out a rulemaking under subsection (i), and which does not state that one factor should carry more weight than the others. Further, accounting for the (i)(4) factors together enables EPA to take a holistic approach in facilitating transition to substitute technology, one that considers the availability of substitutes, overall economic costs and environmental impacts, as compared to historical trends, and the HFC phasedown schedule codified by the Allocation Framework Rule.

The direction in subsection (i)(4)(C) to factor in overall economic costs and environmental impacts as compared to historical trends does not have a clear meaning in the context of selecting the degree of a restriction for a given sector or subsector. The provision's focus on an "overall" comparison makes direct application of this factor in setting a level of restriction for a specific sector or subsector less practicable. However, the focus in subsection (i)(4)(C) on "economic costs" and "environmental impacts" still

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provides direction to the Agency that cost and environmental considerations are relevant factors for EPA to consider in setting the level of a use restriction under subsection (i), and we address how EPA did so in the following paragraphs.

For these restrictions, in factoring in environmental impacts, our aim was generally to establish GWP limits for each sector or subsector at the lowest supportable level while considering the other factors under subsection (i), specifically, availability of substitutes and cost, as well as considerations of implementation and enforcement. It is reasonable to prioritize maximizing the climate change benefits of restricting the regulated substances that are the focus of this rule, given that these environmental impacts are and have been one of the central concerns with the use of HFCs. Much of the information relied upon in our analysis of available substitutes comes from SNAP, which evaluates and identifies as "acceptable" those substances that reduce overall risk to human health and the environment, as well as the TEAP reports which speak to human health and environmental considerations, the granted petitions, and information from State and foreign government regulations.

Therefore, in selecting the levels of restrictions for each sector and subsector, we set the GWP limit at the lowest level that will provide a sufficient range of substitutes for applications within a subsector. EPA projects the cumulative environmental impact of these restrictions to be significant; with an average annual additional[80] emission reduction of 4 to 34 $MMTCO_2e$, and an average annual additional consumption reduction of 28 to 43 $MMTCO_2e$, from 2025 through 2050(*see* Costs and Environmental Impacts TSD).

[80] These reductions would be in addition to the consumption reductions from the Allocation Rules.

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EPA did not set the level of restrictions for this rule at precisely the GWPs of identified available substitutes in each sector or subsector. Instead, EPA is establishing GWP limits at regular intervals—*i.e.*, 150 GWP, 300 GWP, and 700 GWP. This approach has advantages over a methodology that tightly tailors the GWP limit for each subsector to the specific GWPs of the currently identified available substitutes for that particular sector or subsector (*e.g.*, establishing GWP limits of 237, 258, and 290 based on the particular substitutes currently available in three different subsectors). Establishing limits at regular intervals avoids changing the status of an alternative caused by minor discrepancies in the methodology used to calculate GWPs;[81] promotes development of new variations on substitutes that are still within the permissible range; allows for use of a wider range of substitutes (recognizing that not every substitute is necessarily available for each use within a subsector); and eases implementation of the restrictions for regulated parties, consumers, and enforcement.

To ensure adequate availability of substitutes, EPA looked at a range of information relevant to the subfactors provided in subsection (i)(4)(B) from a variety of sources. In general, EPA aimed to establish GWP limits at a level that would include multiple available substitutes that could be used in that sector or subsector (taking into consideration the various (i)(4)(B) subfactors to the extent practicable). In the following sections, we provide detailed information regarding the availability of substitutes for each sector and subsector.

Our methodology for setting the levels of the use restrictions also factored in considerations of cost, both in identifying availability of substitutes and in assessing

[81] For example, using the methodology finalized in this rule, EPA calculates that R-452B has a GWP of 698 and thus meets the 700 GWP limits.

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overall costs of the levels of the restrictions. Some of the subfactors in subsection (i)(4)(B) for the Agency to take into account when determining "availability" are explicitly or implicitly related to cost. Subfactors that explicitly relate to cost include commercial demands (there would be no demand for a substitute that caused a product to be so costly as to be unmarketable), consumer costs, affordability for residential and small business consumers, and contractor training costs. Other subfactors that are not explicitly related to cost contain implicit considerations of cost. For example, a company generally would not invest in demonstrating that use of a substitute is technologically achievable in a sector or subsector if the use of that substitute was so cost prohibitive that it would never actually be adopted. The Agency factored in these cost subfactors to the extent practicable when considering availability of substitutes.

Subsection (i)(4)(C) also specifically directs EPA to factor in, to the extent practicable, overall economic costs as compared to historical trends, and as discussed above, the Agency has considered numerous sources of information as we developed this rule, including the cost findings summarized in the Costs and Environmental Impacts TSD. As discussed in that TSD, we anticipate that the incremental economic cost of the restrictions will result in a savings to the regulated industry, *i.e.*, that complying with the use restrictions and transitioning from higher-GWP regulated substances to lower GWP substitutes will, on the whole, reduce costs for industry.

In summary, in carrying out a rulemaking under subsection (i), EPA views subsection (i)(4)(A) through (D) as providing overarching direction for setting restrictions under this section. Subsection (i)(4)(B) also requires the Agency to examine the particular subfactors listed therein for the sector or subsector in order to determine whether a substitute is available for use in that sector or subsector. Therefore, in the

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following section addressing the final restrictions and compliance dates for each sector and subsector, EPA has focused the bulk of its discussion on the identification of available substitutes and the Agency's consideration of the relevant sub-factors informing availability.

F. For which sectors and subsectors is EPA establishing restrictions on the use of HFCs?

This section provides a description of each sector or subsector subject to the restrictions in this rule, the final use restrictions, and compliance dates, and EPA's assessment of the availability of substitutes for each sector or subsector (see section VI.E.5). In addition, this section includes summaries of comments on specific sectors and subsectors and EPA's responses.

1. Refrigeration, Air Conditioning, and Heat Pumps

Subsectors in the RACHP sector typically use a refrigerant in a vapor compression cycle to cool and/or dehumidify a substance or space, such as a refrigerator cabinet, room, office building, or warehouse. The equipment in this subsector, for the purposes of this rule, includes self-contained, factory-completed products and larger, field-assembled systems. EPA recognizes that these terms may be used under SNAP and the refrigerant management regulations in 40 CFR part 82, subpart F.

a. Industrial Process Refrigeration (IPR)

IPR systems are used to cool process streams at a specific location in manufacturing and other industrial processes (*e.g.*, chemical, pharmaceutical, petrochemical, and manufacturing industries). IPR systems are directly linked to the industrial process, meaning the refrigerant leaving the condenser and metering device is delivered directly to the heat source before returning to the compressor. This also includes appliances used directly in the generation of electricity. Specialized refrigerated

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laboratory equipment, such as that used in the pharmaceutical industry, may fall under this subsector if it operates at temperatures above -62 °C (-80 °F), and is not considered to be very low temperature refrigeration equipment.

Where one system is used for both IPR and other applications (such as cooling a room or building in which the industrial process is located), EPA considers it to be an IPR system if 50 percent or more of its operating capacity is used for IPR. Cooling or IPR that involves using a chiller, *e.g.*, to circulate a secondary fluid to the point at which heat is removed from the process, or to cool a room or building as explained in this section, is regulated as a chiller and is discussed in section VI.F.1.j. IPR equipment not using a chiller is regulated as part of the IPR subsector and discussed in this section.

In the proposed rule, EPA included data centers and data servers in the description of applications that the Agency considers to be IPR. In this final rule, EPA is creating a separate subsector for data centers, information technology equipment facilities (ITEF), and computer room cooling equipment which includes appliances used for large scale cooling of server farms, ITEF, computer rooms, data centers, data servers, communication rooms, and other spaces dedicated to maintaining the operating temperature of electronic technologies. This subsector is discussed in section VI.F.1.b.

Many types of foods require refrigeration during the production process. EPA considers refrigerating equipment used during the production of food and beverages in an industrial setting to fall under IPR. If the food production process requires cooling done directly by a refrigerant, either at the point where cooling is required or to cool a room or building in which the cooling is required, the equipment falls within the IPR subsector. If instead a chiller is used to cool a secondary fluid (*e.g.*, water) that then provides the required cooling, EPA considers the use to be in the chillers for IPR subsector. The IPR

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subsector includes all equipment and operations that use a refrigerant to make and prepare food that is not immediately available for sale (or supply, if the food is not "sold") to the consumer and would require shipping or delivering it, possibly through intermediate points, to the point where such sale would occur. This could include facilities where food is processed and packaged by the food producer, such as a meat processor that prepares and packages individual cuts of meat within a single facility or building while maintaining the required temperatures. Although such facilities may be designed in a fashion similar to a cold storage warehouse, the fact that items are being processed by the food producer indicates that the application falls in the IPR subsector. However, if a food producer operates a refrigerated storage area solely for the holding of already packaged food, and possibly for packing such food in larger containers or bundles for shipment, that application would fall within the cold storage warehouse subsector.

Another example of an IPR system is a "blast cooler" or "blast freezer." In this context, "blast cooler" or "blast freezer" refers to a type of equipment in which cold air is supplied and circulated rapidly to a food product, generally to quickly cool or freeze the food before damage or spoilage can occur. This is the same description as the Agency has previously used for this equipment (*see* 80 FR 42901, July 20, 2015). Such equipment might be used as part of a food production line in an industrial setting. They also can be placed separately at public facilities including hospitals, schools, restaurants, and supermarkets. These public facilities might use the blast cooler or freezer on food that they will store for later use after they receive it from a vendor or that they cook or prepare as part of their operations. Such units might also be placed near entranceways to cold storage warehouses, for instance to receive food refrigerated and shipped at one temperature and then to bring it down to a lower temperature for storage.

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IPR systems typically have large refrigerant charges to satisfy the significant cooling demands throughout the facility. Historically, facilities have commonly used R-717, hydrocarbons, CFCs, HCFCs, and HFCs including but not limited to R-12, R-22, R-404A, R-507A, and R-134a.

What restrictions on the use of HFCs is EPA establishing for IPR systems?

EPA is prohibiting the use of HFCs and blends containing HFCs in IPR systems at different GWP thresholds (150, 300, and 700) depending on a combination of factors including the size, refrigerant temperature entering the evaporator, and design of the system. These GWP limits apply to new IPR systems other than chillers used for IPR, which are discussed in section VI.F.1.j. EPA is establishing a 150 GWP limit for new IPR systems with refrigerant charge capacities of 200 lb or greater with refrigerant temperature entering the evaporator at -30 °C (-22 °F) or above beginning January 1, 2026.[82] EPA is establishing a 300 GWP limit for new IPR systems with refrigerant charge capacities less than 200 lb and for the high temperature side of cascade systems with refrigerant temperature entering the evaporator at -30 °C (-22 °F) or above, also beginning January 1, 2026. If the low temperature side of a cascade system has a charge capacity less than 200 lb with refrigerant temperature entering the evaporator at -30 °C (-22 °F) or above, then the GWP limit is 300, beginning January 1, 2026. If the low temperature side of a cascade system has a charge capacity of 200 lb or greater with refrigerant temperature entering the evaporator at -30 °C (-22 °F) or above, EPA is prohibiting the use of HFCs and HFC blends with a GWP of 150 or greater in the low temperature side of the cascade beginning January 1, 2026. In new IPR systems where

[82] The refrigerant HFC-134a has a boiling point slightly above -30 °C (-22 °F) and R-717 has a boiling point slightly lower at -33.3 °C. R-717, HFC-134a, and similar refrigerants like R-450A and R-513A work above this temperature.

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the refrigerant temperature entering the evaporator is equal to or above -50 °C (-58 °F) but less than -30 °C (-22 °F), the GWP limit is 700 beginning January 1, 2028. EPA is currently not establishing restrictions for new IPR systems with refrigerant temperature entering the evaporator below -50 °C (-58 °F).[83]

In considering the availability of substitutes under subsection (i)(4)(B), EPA identified several substitutes[84] as available for use in IPR systems in place of the higher-GWP substances that EPA is prohibiting. These available substitutes for all non-chiller IPR systems include HCFO-1224yd(Z) (GWP less than 1), R-717 (GWP 1), R-1270 (GWP 1.8), R-290 (GWP 3.3), and R-600 (GWP 4).[85] EPA is aware of a statement by one stakeholder that R-717 and hydrocarbons (R-600, R-1270, R-290) were used in 90 to 95 percent of the market share for IPR systems in 2019, indicating the technological achievability and commercial demand for systems using available substitutes.[86]

In addition to the substitutes that are already available for use in this subsector, EPA has recently proposed to list HFO-1234yf, HFO-1234ze(E), R-454A, R-454C, R-455A, R-457A, and R-516A (with GWPs of 1, 1, 237, 146, 146, 137, and 140 respectively) as acceptable, subject to use conditions, under SNAP for use in IPR (88 FR

[83] The refrigerants R-404A and R-410A have bubble (boiling) points slightly above -50 °C (-58 °F). R-404A and similar refrigerants like R-448A, R-449A, R-449B, R-452A, and R-410A and similar refrigerants like HFC-32 and the R-454 series, work above this temperature.
[84] EPA notes for all substitutes identified in section VI.F of this preamble, not every substitute listed is necessarily available across all U.S. markets. For example, in some cases, substitutes may be technologically and economically viable and may be in use in international markets but may be unavailable in specific U.S. market for other reasons such as building code restrictions. The lists of "available" substitutes therefore includes some substances which may only be "potentially available" in some areas. EPA also notes that not all of the identified substitutes are listed as acceptable under the SNAP program. See section VI.E.2 of this preamble for a discussion on availability of substitutes.
[85] EPA notes that the GWP limits apply only to regulated substances and blends containing a regulated substance (*e.g.*, R-471A, R-454A, and R-454C). The GWPs of the other substitutes, which do not contain a regulated substance, are provided here and in subsequent sections for context only.
[86] AHRI Letter Responding to CARB's Request for Input and Clarifications Following the August 6, 2019, Public Meeting for Industrial Process Refrigeration and Transport Refrigeration Equipment. Available in the docket.

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33722, May 24, 2023). These proposed listings meet the GWP limit of 300 for this subsector, and all except R-454A meet the GWP limit of 150. Although the already available substitutes have been evaluated by EPA to be sufficient to meet these restrictions, the potential for a greater array of options in the future may further smooth the transition from higher-GWP HFCs. EPA continues to encourage innovation of refrigerants that meet these restrictions and anticipates the number of substitutes available for use in IPR will continue to grow.

Comment: One commenter expressed support for the proposed January 1, 2025, transition date for commercial refrigeration, including IPR. Several commenters requested a January 1, 2026, transition date for commercial refrigeration equipment, including IPR, citing the need for building codes to be updated and stating that the IPR industry (including OEMs, refrigerant suppliers, technicians, and system designers) is not ready in all regions and applications. One commenter added that even meeting a January 1, 2026, transition date does not allow enough time for OEMs and distributors to adjust their supply chain processes.

Response: In this final rule, for IPR equipment with a refrigerant temperature entering the evaporator greater than or equal to -30 °C (-22 °F), EPA is extending the compliance date to January 1, 2026. For IPR equipment with a refrigerant temperature entering the evaporator from -30 °C (-22 °F) to -50 °C (-58 °F), EPA is extending the compliance date to January 1, 2028, for reasons discussed in this section.

The additional year for most IPR equipment provides time for the adoption of building codes that incorporate updated safety standards (*e.g.*, UL 60335-2-89, ASHRAE

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15-2022) allowing for the safe use of lower-GWP refrigerants.[87,88] The International Building Code is scheduled to be updated in 2024, which would then need to be adopted by State and local jurisdictions. Delaying the compliance date to January 1, 2026, provides time for jurisdictions to make these updates. However, EPA can consider a substitute to be available before every building code in every jurisdiction across the United States permits its use. See section VI.E.2.d of the preamble for further discussion on how building codes affect the availability of substitutes. Based on EPA's assessment of the availability of substitutes under subsection (i)(4)(B), additional time is warranted for a transition in IPR systems, with the compliance date depending on the temperature of the refrigerant entering the evaporator. The Agency is extending the compliance date to January 1, 2028, for IPR systems with refrigerant temperature entering the evaporator from -30 °C (-22 °F) to -50 °C (-58 °F) because, as discussed further below in this section, there are fewer technologically achievable refrigerants with a sufficiently low boiling point such that they may be used in equipment used at lower temperatures. Therefore, more time may be needed to identify, test, and implement appropriate substitutes in such equipment.

The additional year for most IPR systems will also help mitigate other issues identified by commenters regarding the industry's ability to transition, such as the refrigerant supply chain, the timeline for new equipment design and testing, and need for specialized technician trainings. One additional year is in agreement with several industry commenters and provides time for EPA to continue its review of lower-GWP substitutes,

[87] ASHRAE. (2022). ANSI/ASHRAE Standard 15-2022: Safety Standard for Refrigeration Systems.
[88] UL Standard. (2021). Household and Similar Electrical Appliances - Safety - Part 2-89: Particular Requirements for Commercial Refrigerating Appliances and Ice-Makers with an Incorporated or Remote Refrigerant Unit or Motor-Compressor (Standard 60335-2-89, Edition 2).

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such as the proposed SNAP Rule 26 discussed previously (88 FR 33722, May 24, 2023), which will likely provide even more refrigerant options. For these reasons, EPA is providing one additional year for most of the IPR subsector, and three additional years for IPR systems with refrigerant temperature entering the evaporator from -50 °C to -30 °C (-58 °F to -22 °F), to comply with the GWP restrictions established in this final rule.

How does charge size and system design affect the availability of substitute refrigerants?

EPA is establishing different GWP limits for new IPR, remote condensing unit, supermarket, and cold storage warehouse systems based on the refrigerant charge capacity of the system. Setting different GWP restrictions based on the charge of the system is consistent with information provided by petitioners, EPA's understanding of technical challenges inherent to smaller charge capacity systems, and industry safety standards. In general, systems with smaller refrigerant charge capacities (*i.e.*, smaller than 200 lb) are located inside and in potentially confined spaces where a leak of a flammable refrigerant could result in concentrations of concern. Conversely, larger refrigerant charge capacities (*i.e.*, greater than or equal to 200 lb) are typically located outside the refrigerated space, where safety standards and building codes allow for greater use of flammable and lower flammability refrigerants. Setting different GWP limits for this subsector based on the charge capacity of equipment will increase the number of available substitutes where lower-GWP substitutes are limited.

Each of the restrictions adopted in this action is tailored to the subsector-specific applications and availability of substitutes for those applications. Specifically, for smaller-footprint applications (*i.e.*, spaces with lower total air volume where smaller amounts of leaked refrigerant could disproportionately increase in concentration) in these subsectors, the use of A2Ls (lower flammability refrigerants) is limited by the product

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safety standard UL 60335-2-89. This standard, which can be referenced by building codes, sets charge limits for A2L refrigerants used indoors to 260 times the lower flammability limit (LFL, in kg/m^3). This allowance is near or under 200 lb for most A2L refrigerants. For example, this restriction would allow up to 176 lb of HFC-32 in a single refrigeration circuit (87 FR 45522, July 28, 2022; 88 FR 26400, April 28, 2023). However, in certain applications, safety standard ASHRAE 15 will apply to equipment with charge capacities above this threshold, enabling the use of larger refrigerant charges by requiring additional mitigation strategies, such as increased air exchange to minimize the concentration of leaked refrigerant in the air. Therefore, larger systems covered by ASHRAE 15 are less limited in their refrigerant options when complying with safety standards incorporated in building codes.

EPA proposed to differentiate the subsection (i) restrictions for these subsectors based on refrigerant charge capacity to conform with applicable safety standards, in consideration of the (i)(4)(B) factors, which direct the Agency to consider safety, to the extent practicable, in assessing availability of substitutes. Using a 200 lb charge capacity threshold, rather than a lower one such as 50 lb as suggested by some commenters, allows for greater availability of technologically achievable substitutes in IPR, retail food remote condensing units, retail food supermarket systems, and cold storage warehouse systems of all sizes. Systems with refrigerant charge capacities less than 200 lb are restricted from using certain lower-GWP refrigerant options by safety standards, and thus require a higher GWP limit to ensure the availability of substitutes for use in these subsectors.

EPA has also considered the availability of substitutes when cascade systems are used in new IPR, supermarket, remote condensing unit, and cold storage warehouse

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systems. A cascade system is a design option which consists of two independent refrigeration systems that share a common cascade heat exchanger. They are often employed in applications when the required temperature is very low. Each side of a cascade system uses a different refrigerant that is most suitable for the given temperature range. High temperature systems, or the "high temperature side," have typically used HFCs as a refrigerant; however, it is technologically achievable in some cases and has become more common to use R-717. For low temperature systems, or the "low temperature side," low boiling point refrigerants such as R-744 and R-508B have been used. Considerations for the choice of refrigerant on the high and low temperature sides of cascade systems are influenced by many factors including, but not limited to, a refrigerant's toxicity and flammability, its temperature glide, and its suitability for the temperature application specifications.

In its consideration of safety and building codes under subsection (i)(4)(B), to the extent practicable, EPA understands that the use of flammable or toxic refrigerants, such as R-717, on the high temperature side of a cascade system may be limited in certain circumstances (*e.g.*, in areas that are heavily populated or based on building codes and/or standards). Therefore, EPA is establishing a higher GWP limit for HFCs used in the high temperature side of cascade systems to allow sufficient refrigerant options to comply with local building codes and industry safety standards. Because the high temperature side of a cascade system typically enters the building (*i.e.*, in the machinery room), some refrigerants such as R-717 may not be allowed by building codes or may be limited in the charge size allowed. On the other hand, the current edition of safety standard UL 60335-2-89 includes provisions that support higher charge sizes for A2L refrigerants, including some that meet a GWP limit of 300 but not 150, such as R-454A and R-457B. A GWP

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limit of 300, as compared to a GWP limit of 150, also allows for a greater array of available substitutes, such as R-515B which was recently listed as acceptable under SNAP Notice 38 (88 FR 61977, September 8, 2023) and R-480A which is pending SNAP review, which will further ease the transition to lower-GWP refrigerants. EPA notes that the applicable GWP limit for the low temperature side of a cascade system is dictated by the charge size of the low temperature side by itself.

Comment: Some commenters from industry generally supported the proposed GWP limits based upon charge capacity thresholds for refrigeration (*i.e.*, GWP limit of 300 for refrigeration systems with a refrigerant charge capacity of less than 200 lb and GWP limit of 150 for refrigeration systems with a refrigerant charge capacity of 200 lb or more), including IPR systems, retail food refrigeration (remote condensing units and supermarket systems), and cold storage warehouses. Three other commenters recommended a single GWP limit for each of these subsectors, regardless of the equipment's charge size. A couple of commenters stated that could incentivize manufacturers to move to higher-GWP HFCs in systems with smaller charges. One commenter requested a 150 GWP limit, citing adequate availability of current refrigerant options below that level. They asserted that a 300 GWP limit for certain charge sizes and systems was unnecessarily high, overly complicated, and could stifle innovation of very low-GWP refrigerants. Another commenter requested a 10 GWP limit for all equipment in these four subsectors, claiming there are no currently available substitutes between 10 and 300 GWP.

Several commenters agreed with establishing two GWP limits for these subsectors by charge capacity, but urged EPA to adopt a 150 GWP limit for IPR, retail food refrigeration, and cold storage warehouses with a charge capacity threshold of 50 lb,

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instead of 200 lb as proposed. In support of shifting the threshold to 50 lb, these same commenters noted that California's regulations establishing GWP limits and EPA's section 608 Refrigerant Management Program both use 50 lb as a charge capacity threshold and that having the same charge capacity threshold as California's GWP restrictions would allow for nationwide consistency instead of a patchwork of requirements. They also noted that updated safety standards and building codes have made a range of substitutes available for use in this subsector for equipment with charge sizes between 50 and 200 lb. Another commenter described a 10 lb charge capacity cutoff as more appropriate for these subsectors than 200 lb for purposes of safety, but still requested a single GWP limit regardless of charge size.

These same commenters also disagreed with EPA's proposal to set a separate GWP limit for the high temperature side of cascade systems. Instead, they requested that EPA group cascade systems with other types of direct refrigeration systems in the subsector containing a single refrigerant loop. Such restrictions would be similar to California's regulations, which do not include a separate requirement for cascade systems. One commenter stated that there does not appear to be a clear rationale articulated in the proposed rule for separating cascade systems into a separate subsector category for GWP limit, nor any criteria or requirement limiting the HFC or HFC-blend charge size of the refrigerant used in the high temperature side of a cascade system.

Several commenters pointed to the availability of substitutes below 150 GWP, such as R-744 and R-717, making the proposed 300 GWP limit unnecessarily high for equipment of certain charge capacities (ranging from no lower limit to 50 lb) and for the high temperature side of cascade systems. One commenter acknowledged that EPA has assessed R-717 as being prohibitively toxic for use in certain locations based on building

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codes, but they asserted that R-717 may only be prohibited by a small number of localities and stated that it is otherwise a suitable refrigerant option to meet a 150 GWP limit in most cases. This commenter stated that cold storage warehouses and IPR systems have widely used R-717, historically, and they claimed R-744 is a suitable alternative in cases where R-717 cannot be used. Another commenter noted that continuing to use HFC blends up to a GWP of 300 in new systems, especially in sectors where refrigerant leaks are widespread, poses dramatically more harm to the climate than use of non-HFCs and expressed concern that new refrigeration systems will place significant demand on a dwindling supply of HFCs when it will be needed to service existing equipment in other subsectors such as residential AC.

Response: EPA did not propose and is not finalizing a GWP limit of 10 for IPR, remote condensing units, supermarket systems, and cold storage warehouses. EPA agrees with commenters that some of the refrigerants available for use in these subsectors, such as R-744 and R-717, have GWPs of less than 10. As noted in section VI.E.5, this action establishes GWP limits at regular, grouped intervals, to ease compliance and enforcement and also to ensure that there are adequate available substitutes for various applications within the subsector. Some of the lowest-GWP refrigerants, particularly those with non-fluorinated chemistry, may not be appropriate in all situations (*e.g.*, R-717). Moreover, the GWP limits EPA is finalizing allow for additional refrigerants to be used and for continued innovation. The Agency does not agree that this approach will unnecessarily incentivize the use of higher-GWP refrigerants than would otherwise have been used, and is finalizing restrictions consistent with our review of the (i)(4) factors for each of the sectors and subsectors.

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After review of the comments, EPA is finalizing the refrigerant charge capacity threshold at 200 lb for non-chiller IPR equipment, with refrigerant entering the evaporator (for IPR systems that are not chillers) with a temperature of -30 °C (-22 °F) or above, as proposed. For purposes of subsection (i) and its evaluation of the availability of substitutes for use in a sector or subsector, EPA is aligning the refrigerant charge capacity threshold with applicable safety standards (*e.g.*, UL 60335-2-24, UL 60335-2-40, and UL 60335-2-89) rather than aligning with thresholds established by States. EPA recognizes there may be benefits to greater consistency between regulatory requirements. However, EPA must consider the (i)(4) factors, to the extent practicable, and these lead EPA to base the GWP threshold on the industry safety standards, which limit the allowable charge of flammable refrigerants based on the flammability limit of each refrigerant to minimize risk from their use. In particular, the industry safety standard for commercial refrigeration equipment, UL 60335-2-89, restricts charge sizes of A2L refrigerants at approximately 200 lb in a single circuit in equipment where leaks would likely enter an occupied space, whereas ASHRAE 15 allows for larger charge sizes in machinery rooms and outdoors by requiring additional mitigation strategies, such as certain rates of air exchange. Equipment installed in machinery rooms or outside has greater flexibility to meet the requirements of safety standards and building codes, while smaller equipment is more constrained by available space and may need more refrigerant options that minimize the footprint of refrigerating systems. Therefore, by harmonizing charge capacity thresholds with UL 60335-2-89, EPA is ensuring adequate availability of substitutes for equipment with charge capacities below 200 lb.

Concerning the suggestion to use a 50 lb charge capacity cutoff, EPA's refrigerant management program under CAA section 608 applies leak repair requirements to certain

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appliances with a full charge of 50 or more pounds of any ODS refrigerant or blend containing an ODS refrigerant (*see* 40 CFR 82.157(a). The factors for determination of availability of substitutes listed in subsection (i)(4) of the AIM Act do not lead the Agency to conclude that aligning the charge capacity threshold for these subsectors' restrictions with the threshold used for ODS leak repair requirements is appropriate. The refrigerant charge capacity threshold of 10 lb was suggested by one commenter as being more technically appropriate as a way of addressing safety than 200 lb without explanation. EPA therefore does not agree that 10 lb is a more appropriate charge capacity threshold than 200 lb. Further discussion on EPA's decision to choose a 200 lb cutoff to determine GWP limits for IPR, remote condensing units, supermarket systems, and cold storage warehouses can be found earlier in this section.

EPA considers it unlikely that establishing size thresholds will create an incentive to build more smaller refrigeration systems rather than fewer large refrigeration systems. Drivers for selection of a commercial refrigeration system, such as cost, amount of product needing to be cooled, ability to control temperature, durability, support from the vendor, and ease of servicing, are not likely to push the system user uniformly toward purchasing a refrigerant with a GWP of 300 compared to a refrigerant with a GWP of less than 150. Rather, EPA expects that a company would use a smaller system with a refrigerant with a GWP between 150 and 300, such as the HFC/HFO blends R-454A or R-515B, instead of a lower-GWP refrigerant, such as R-744 (GWP 1), or the HFC/HFO blend R-454C (GWP 146) if they determined refrigeration systems with lower-GWP refrigerants would take up too much space.

EPA also disagrees with the suggestion to remove the 300 GWP limit for the high temperature side of cascade systems. Technical constraints related to temperature,

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pressure, efficiency, and glide limit the available refrigerants for the high temperature side of cascade systems. As discussed in the proposed rule (87 FR 76775; December 15, 2022), building codes and safety considerations may also limit the availability of flammable and/or toxic refrigerants in the high temperature side of cascade systems. By establishing a GWP limit of 300, rather than 150, additional substitutes are available that overcome the technical constraints and subsection (i)(4) factors that limit the number of refrigerant options in subsectors using cascade systems.

How does operating temperature affect the availability of substitute refrigerants?

Comment: Several commenters suggested that GWP limits for non-chiller IPR systems be based on operating temperature ranges, similar to the current European Union (EU) F-Gas regulations[89] and CARB regulations. A few of these commenters suggested EPA provide flexibility with higher GWP limits for systems with lower temperature ranges. One such commenter requested a GWP limit of 700 for IPR equipment with refrigerant evaporating temperatures greater than -25 °C (-13 °F) and a 2,200 GWP limit for IPR equipment with refrigerant evaporating temperatures from -25 °C (-13 °F) to -45 °C (-49 °F). That commenter stated that flammable and toxic alternatives that meet the original GWP limits of 150 or 300 would not be viable for new or retrofit IPR facilities due to safety risks, technical feasibility, and cost. Several commenters also requested exemptions from restrictions for IPR systems using flooded or liquid overfed evaporators.

Regarding IPR systems operating at colder temperatures, many commenters requested clarification for systems with very low temperatures that may or may not be

[89] European Union Law. 2014. Regulation (EU) No 517/2014 of the European Parliament and of the Council of 16 April 2014 on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006 Text with EEA relevance. Available at: *http://eurlex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2014.150.01.0195.01.ENG.*

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exempt from GWP limits under EPA's proposed rule, including those for laboratory equipment and IPR chillers. One commenter proposed an exemption for all IPR applications with a refrigerant evaporating temperature below -45 °C, and suggested that all IPR systems, including both direct process cooling and chiller systems, have the same GWP limits, as the same refrigerant selection challenges exist for both system designs. Another commenter suggested that EPA exempt specialty applications for systems designed for -50 °C (-58 °F) exiting fluid temperatures or create a formal variance process, similar to California and Washington State regulations. One commenter stated that to meet the technical demands of the laboratory products industry's specialized applications, new sustainable substitutes—or a sudden and transformative advance in refrigeration science—would be necessary to meet the schedule of the proposed rule. The commenter strongly encouraged EPA to consider providing clear, concise exceptions for equipment utilized in a laboratory setting or provide for a longer compliance window so that there is adequate time to make substantive changes to delicate and complex laboratory equipment.

Response: After review of the comments and further consideration of the availability of substitutes under subsection (i)(4) of the AIM Act, EPA is establishing separate GWP thresholds for IPR equipment based on the temperature of the refrigerant entering the evaporator. This provides more options for specialized equipment that must achieve temperatures significantly lower than 0 °F, considering technological achievability as a factor limiting the availability of substitutes in such equipment.

EPA largely agrees with the commenter that asserted IPR systems with evaporating temperatures below -25 °C (-13 °F) require the same refrigerant options as chillers for IPR in which EPA proposed a GWP limit of 700, as the same technical

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constraints related to refrigerating at colder temperatures apply (*e.g.*, fewer refrigerants have such a low boiling point). EPA is therefore finalizing a GWP limit of 700 for IPR equipment with refrigerant entering the evaporator with a temperature less than -30 °C (-22 °F) but greater than or equal to -50 °C (-58 °F), regardless of the refrigerant charge capacity or whether the equipment is part of a cascade system.

EPA disagrees with the comment that the threshold be at -25 °C (-13 °F) because the same constraints on the availability of substitutes under the (i)(4)(B) analysis that can be used at lower temperatures apply in other subsectors, such as for chillers for comfort cooling and chillers for IPR; hence, EPA is finalizing the same GWP threshold based on the same temperature threshold as for chillers for IPR at -30 °C (-22 °F). This also allows for greater simplicity and ease of determining which GWP threshold applies than if there were different thresholds for chillers for IPR and for other IPR systems. One of the commenters has stated that refrigerant with an evaporating temperature of less than -25 °C should be able to use refrigerants such as R-513A, which has a GWP of 630 (between 300 and 700). Such equipment would have the same refrigerant options as chillers for IPR.

EPA also disagrees that a GWP limit up to 2,200 would be appropriate, given the sufficiently available substitutes with GWP below 700 for use in this exiting fluid temperature range, such as R-513A (GWP 630). Furthermore, as indicated by considerations described in recently proposed SNAP listings for use in IPR (88 FR 33722, May 24, 2023), there may be additional available substitutes for this equipment in the future, such as HFO-1234yf (GWP 1), HFO-1234ze(E) (GWP 1), R-457A (GWP 137), R-516A (GWP 140), R-455A (GWP 146), R-454C (GWP 146), and R-454A (GWP 237).

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For IPR equipment with refrigerant entering the evaporator with a temperature of -30 °C (-22 °F) or higher, EPA disagrees with the commenter who requested the Agency finalize a GWP limit as high as 700. EPA has identified HCFO-1224yd(Z) (GWP less than 1), R-717 (GWP 1), R-1270 (GWP 1.8), R-290 (GWP 3.3), and R-600 (GWP 4) as suitable for use in equipment operating above -30 °C (-22 °F), and all have a GWP below 150. In comparison, equipment with temperatures between -30 °C (-22 °F) and -50 °C (-58 °F) could require higher volumetric capacity (*e.g.*, to replace R-404A) and would have fewer refrigerants able to attain lower boiling points, so a wider range of refrigerants with higher GWPs are needed compared to equipment with temperatures at -30 °C (-22 °F) and above. EPA is therefore finalizing the GWP limits of 150 and 300 for this type of equipment, depending on the refrigerant charge capacity and whether the refrigerant is used in the high temperature side of a cascade system, based on the technological achievability of using identified substitutes at these warmer evaporating temperatures.

EPA disagrees with comments that requested exemptions for all IPR systems using flooded or liquid overfed evaporators. Many of the technological challenges associated with using lower-GWP refrigerants in IPR equipment are related to the temperature of the refrigerant going into the evaporator. Therefore, EPA has not set restrictions for IPR equipment, including those using flooded or liquid overfed evaporators, operating below -50 °C (-58 °F) at this time.

In the case of IPR equipment with refrigerant temperature entering the evaporator lower than -50 °C (-58 °F), EPA recognizes that most of the refrigerants used for such equipment have relatively high GWPs. The Agency expects that after further research and development, there may be additional refrigerants available for these low temperatures, given the growing demonstrations of technological achievability; additional

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reviews of refrigerants for safety, health, and environmental impacts under the SNAP program; and changes to industry standards that allow for larger charge sizes of flammable refrigerants, such as ethane. However, upon evaluating the availability of substitutes for IPR equipment operating at very low temperatures, EPA is not restricting the use of HFCs and HFC blends in new IPR equipment with refrigerant entering the evaporator or chillers for IPR with exiting fluid temperatures lower than -50 °C (-58 °F) in this final rule. Given that this equipment is not covered in this final rule, EPA declines to implement an individual variance process as requested by the commenter. Note that EPA may choose to set restrictions in the future as the availability of lower-GWP substitutes continues to grow.

Concerning one commenter's request for either an exception or a longer period to comply for refrigerated laboratory equipment, to the extent that equipment used in the laboratory has exiting fluid temperatures of -50 °C (-58 °F) or lower, EPA notes that this equipment will also not be restricted from using HFCs or HFC blends under this final rule. Refrigerated laboratory equipment operating at temperatures at or above -50 °C (-58 °F) and less than -30 °C (-22 °F) is considered part of IPR, and will have three years longer than proposed, until 2028, for new equipment to transition to substitute refrigerants. Laboratory refrigerated equipment that operates at temperatures higher than -30 °C (-22 °F), also part of IPR, is similar to retail food refrigerators and freezers with alternatives that are already available (*e.g.*, R-290), and under this final rule, they will have one year longer than proposed, until 2026.

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b. Data Center, Information Technology Equipment Facility , and Computer Room Cooling Equipment

In the proposed rule, EPA indicated that appliances used to cool data centers and data servers were considered part of the IPR subsector. After review of the comments and relevant industry standards in consideration of the subsection (i)(4) factors of the AIM Act, EPA is creating a new subsector for data center, ITEF, and computer room cooling equipment, subject to a 700 GWP limit beginning January 1, 2027. Such cooling equipment is designed specifically for large-scale cooling or AC of information technology (IT). Examples include server farms, ITEFs, computer rooms, data centers, data servers, communication rooms, and other spaces dedicated to maintaining the operating temperature of electronic technologies. Equipment typically has large refrigerant charge capacities to satisfy the significant cooling demands of the heat-generating equipment. Historically, cooling equipment within this subsector has commonly used HCFC-22, moving to R-410A and to a lesser extent R-407C after the 2010 ban on production of HCFC-22 for new equipment. Historically, some facilities may have been cooled by chillers using CFC-12, particularly if the facilities date back to before the 1994 CFC production and consumption phaseout, or they may use HFC-134a; nonetheless, with the establishment of this subsector under subsection (i) of the AIM Act, EPA considers such equipment to be within its own subsector rather than the chillers subsector, both subject to a 700 GWP limit. As communications and information technology has developed over the past few decades, the heat produced and the cooling demand has increased significantly, complicating designs in consideration of the weight and location of the cooling equipment and how these issues might impact structural requirements of the facility.

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Comment: Several commenters requested that equipment used to cool data centers, computer rooms, server farms, and ITEFs, including chillers for this market, should not be included within the IPR subsector, and should instead either be classified as its own subsector or included under the residential and light commercial AC subsector. Several commenters described the system design and refrigerant selection of data center and IT equipment cooling as closer to those for building AC applications than those for IPR, including indirect cooling through AC by chillers or direct expansion (DX) systems. Commenters noted that such equipment indirectly cools through AC equipment rather than through refrigeration as in IPR, and that new technologies such as dielectric fluids for direct contact systems and full immersion chip heat exchangers are also being used. Additionally, some of these commenters noted that data center, ITEF, and computer room cooling equipment has higher heat loads than traditional AC equipment, and although it may be more similar to equipment in the residential and light commercial AC subsector than to that in the IPR subsector, considerably larger refrigerant charges (per square foot of the building being cooled) differentiate this equipment from that in those two subsectors.

Commenters also highlighted that data center, ITEF, and computer room cooling equipment falls within the scope of the UL Standard 20335-2-40, 4th edition, which covers electrical heat pumps, air conditioners, and dehumidifiers, and not UL 60335-2-89, which covers commercial refrigeration equipment used in IPR. Commenters therefore recommended that EPA consider data centers, ITEF, and computer room cooling equipment to be a separate subsector, similar to how DOE classifies this type of cooling equipment under their energy conservation standards. Further, commenters asserted that data center, ITEF, and computer room cooling equipment are subject to unique operating

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conditions and important safety considerations not shared by other subsectors, such as year-round cooling and non-stop, continuous cooling operation and technical designs that maintain temperatures in a wide range of weather conditions, in addition to reliability mandated by the critical nature of the equipment.

Commenters also noted that EPA's original SNAP rulemaking and Applicability Determination Index document for control number C960015 do not include IT cooling equipment within the definition of IPR (59 FR 13037, March 18, 1994). Other commenters noted that CARB defined this type of cooling equipment under "Air Conditioning Equipment."

Response: EPA agrees with commenters that the cooling needs for data centers, ITEFs, and computer rooms are sufficiently different from those of industrial processes to merit a separate subsector. As commenters noted, equipment for this purpose has been granted its own annex in the 4th edition of UL 60335-2-40, "Household and Similar Electrical Appliances - Safety - Part 2-40: Particular Requirements for Electrical Heat Pumps, Air Conditioners and Dehumidifiers," and is in the process of being added to ASHRAE 15-2022, "Safety Standard for Refrigeration Systems." EPA proposed to include data centers and server farm cooling equipment within the IPR subsector. Based on a review of the comments, including information on how the availability of substitutes for data centers, ITEF, and computer rooms can be affected by the safety standards covering the equipment, EPA has decided to consider data center, ITEF, and computer room cooling equipment as a separate subsector, independent of the IPR subsector, for the purposes of establishing GWP restrictions for this equipment.

Additionally, rather than including data center, ITEF, and computer room cooling equipment in the residential and light commercial AC subsector, also covered by the UL

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60335-2-40 safety standard, EPA agrees with most commenters that the significantly larger charge sizes and delays in being addressed by safety standards warrant independent evaluation of the availability of substitutes for this subsector.

EPA recognizes how defining categories of equipment consistently with other regulatory authorities can minimize confusion for stakeholders. However, while CARB considers IT cooling equipment to be part of residential and light commercial AC and SNAP considers this equipment to be part of IPR, in this rulemaking EPA is establishing a separate subsector to enable EPA to evaluate the availability of substitutes for use in data center, ITEF, and computer room cooling equipment together, independently of other similar equipment types. Therefore, EPA is finalizing a separate subsector to better consider the (i)(4) factors, and particularly the availability of substitutes under (i)(4)(B) when setting restrictions on the use of HFC and HFC blends in new data center, ITEF, and computer room cooling equipment.

What restrictions on the use of HFCs is EPA establishing for data center, ITEF, and computer room cooling equipment?

EPA is prohibiting the installation of new data center, ITEF, and computer room cooling equipment that uses HFCs and HFC blends with GWPs of 700 and above beginning January 1, 2027. EPA proposed to consider equipment in this subsector to fall within IPR, with a 150 GWP limit for equipment with charge capacities greater than or equal to 200 lb and a 300 GWP limit for equipment with charge capacities less than 200 lb and for the high temperature side of cascade systems, effective January 1, 2025. However, after review of the comments received and consideration of the subsection (i)(4) factors of the AIM Act, EPA is finalizing a separate subsector for data center, ITEF, and computer room cooling equipment to allow evaluation of the availability of

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substitutes in consideration of the significantly different technical specifications of equipment designed for this purpose.

In considering the availability of substitutes for data center, ITEF, and computer room cooling equipment under subsection (i)(4)(B), EPA identified several substitutes that could replace the higher-GWP substances, such as R-410A, that will be restricted under this rule. Finalizing a GWP limit of 700 allows the use of available substitutes that meet the technical requirements for this subsector, notably the high heat loads generated in the area in which the computer equipment is installed. These available substitutes include HFO-1234ze(E) and R-513A, for which equipment has recently been introduced, as well as refrigerants being developed and implemented in other AC subsectors, such as HFC-32 (GWP 675) and R-454B (GWP 465). As the technology develops, other available refrigerants with even lower GWPs may prove practicable for this subsector, including nonflammable refrigerants R-744 (GWP 1), R-471A (GWP 144), R-480A (GWP 291), and R-482A (GWP 144), or additional A2L refrigerants such as R-454A (GWP 237), R-454C (GWP 146), and R-457A (GWP 137).

Comment: EPA received many comments requesting a 700 GWP limit for data center, ITEF, and computer room cooling equipment. Given the technological similarities to residential AC equipment and chillers, commenters explained that this type of equipment therefore also requires additional substitutes above 150 to 300 GWP to meet its cooling needs. One such commenter pointed to refrigerants historically used in data center, ITEF, and computer room cooling equipment as also used in commercial AC, such as the high-pressure refrigerant R-410A and to a lesser extent, R-407C. Thus, this commenter requested the continued use of high-pressure substitutes identified for commercial AC equipment, R-454B and HFC-32, with GWPs up to 675. Another

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commenter noted how IT cooling equipment is subject to requirements under UL 60335-2-40, showing its congruence to other subsectors within this standard's scope, while another highlighted an insufficient number of suitable components, specifically compressors, currently available for use by the industry with refrigerants below the proposed 150 or 300 GWP limit. Additionally, a commenter asserted that the high-pressure operating conditions of IT cooling equipment relative to residential and commercial AC equipment further limit the number of suitable refrigerants for this subsector, and that the proposed 150 or 300 GWP limit would impose excessive economic costs without appreciable environmental gains.

Response: As noted in the discussion above, EPA agrees that data center, ITEF, and computer room cooling equipment is sufficiently different from other IPR applications to warrant creating a distinct subsector, separate from IPR. While EPA identified alternatives in the proposed rule below the proposed threshold, EPA understands from the commenters that the operating conditions for this subsector suggest a higher GWP limit is appropriate. Therefore, EPA is finalizing a 700 GWP limit for data center, ITEF, and computer room cooling equipment. In establishing a distinct subsector for this equipment, EPA evaluated the refrigerant options available for use, in consideration of the factors under subsection (i)(4) of the AIM Act, in IT cooling equipment independently of IPR. The Agency is establishing a 700 GWP limit rather than the proposed GWP restrictions on use of HFCs and HFC blends for IPR of 150 or 300 GWP based on a review of the comments and reconsideration of the (i)(4) factors, including a review of the relevant safety standards and technological challenges for this new subsector. EPA determined that there would be an insufficient number of available substitutes for these particular uses under the proposed restrictions.

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Moreover, the type of equipment used in this new subsector is generally similar to equipment for residential and light commercial AC and chillers for comfort cooling, which are all covered by the safety standard UL 60335-2-40. EPA proposed, and is now finalizing, GWP limits of 700 for residential and light commercial AC and chillers for both comfort cooling and IPR in this rule. Analogous technical challenges remain for equipment in the data center, ITEF, and computer room cooling equipment subsector transitioning to substitutes with GWPs lower than 700. EPA notes that challenges associated with compressors and other components, requiring continued use of higher-pressure refrigerant options, such as HFC-32 and R-454B, also apply to equipment in this subsector. For further discussion on EPA's decision to set a 700 GWP limit for chillers for comfort cooling and IPR and for residential and light commercial AC, see sections VI.F.1.j and VI.F.1.k.

As noted by commenters, data center, ITEF, and computer room cooling equipment faces even greater obstacles than those for smaller equipment within the scope of UL 60335-2-40. Refrigerant capacities necessary to cool high-heat load equipment and spaces are significantly greater than those typical of residential and light commercial AC equipment, highlighting the need for a 700 GWP limit for this type of equipment. The challenges of using flammable refrigerants to cool sensitive data and information systems 24/7 in facilities, requiring 100 percent reliability compared to other types of AC equipment, were also stressed by commenters in their request for EPA to consider IT cooling equipment separately from IPR. Commenters who requested a separate subsector unanimously agreed that setting GWP restrictions at the same level as residential and light commercial AC and chillers for IPR would offer a sufficient number of available substitutes, provided there is adequate time to transition. Therefore, EPA is establishing

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the same GWP restrictions for the manufacture and installation of new equipment in this subsector as in other analogous AC subsectors. The Agency has identified many refrigerant substitutes that are likely to meet the requirements of this subsector that are below this GWP limit, including HFC-32, R-454B, and R-513A, with the possibility to also use R-450A, R-452B, R-454A, R-454C, and R-457A, considering the additional time provided for the reasons discussed in the response to comments below. The list of available substitutes includes the nonflammable options R-450A and R-513A, which may be used where flammable refrigerants remain prohibited for safety reasons or are not technologically achievable.

Comment: EPA received many comments regarding the proposed January 1, 2025, compliance date for IPR as it would apply to data center, ITEF, and computer room cooling equipment. Many commenters requested additional time to comply with GWP restrictions, in addition to higher limits. Several commenters requested a January 1, 2029, compliance date, while one requested the compliance date be no earlier than January 1, 2027, or later than January 1, 2029, and another generally stated IT cooling equipment may need additional time beyond 2026. Two commenters expressed support for the proposed date, provided EPA finalized a GWP limit of 700.

Commenters requested compliance dates two years or more later than those proposed. These commenters noted a variety of reasons for this request, including time needed for IT equipment cooling design, prototyping, and testing; accommodation for 20-month lead-times for component manufacturing; and time to train designers and regulators on new provisions in codes and safety standards. Other commenters noted that the UL standard allowing for the use of lower-GWP A2L refrigerants in data centers, ITEF, and computer room cooling equipment was updated relatively recently in

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December 2022.[90] These commenters highlighted that SNAP has yet to adopt the most recent edition of UL 60335-2-40, and requested additional time for SNAP to incorporate the updates included in the 4th edition. A commenter also asked for additional time to allow further safety standard development, such as finalizing Addendum "t" to ASHRAE 15-2022, which would address IT cooling equipment, specifically.

Certain commenters stated that building codes currently prohibit use of flammable lower-GWP substitutes in this subsector. Commenters also noted that building codes are updated on a fixed development cycle and that adopting A2L refrigerants into these codes may take many years.

Response: EPA has identified available substitutes that meet the restrictions for this subsector, given the similarity of the equipment to equipment in the residential and light commercial AC subsector and chillers for comfort cooling and the identical GWP limits. However, EPA is finalizing a January 1, 2027, compliance date for data center, ITEF, and computer room cooling equipment, providing additional time consistent with a review of the subfactors in subsection (i)(4)(B). In particular, the updates to safety standard UL 60335-2-40, allowing sufficiently large charge sizes of A2L refrigerants to be used in this equipment, were only published in December 2022. Thus, the regulatory evaluations under SNAP, equipment redesign and testing, and updates to building codes that typically follow updates to UL safety standards are all in somewhat early stages. The additional time for compliance provided by this final rulemaking will enable updates to the UL standard, and future harmonizing updates to ASHRAE 15-2022, to be incorporated in these areas, increasing the number of available substitutes for use in this

[90] 4th edition of UL Standard 60335-2-40

subsector by January 1, 2027. See sections VI.E.2.c and VI.E.2.d for further discussion on how EPA considers these factors in its evaluation of substitutes.

EPA is finalizing a date that the Agency has determined to be reasonable after reviewing the comments and applying the subsection (i)(4) factors to this new subsector. While some commenters asked for compliance dates beyond the January 1, 2027, date being finalized, the Agency does not agree that more time is reasonable. Design and testing of substitute refrigerants in equipment for this subsector is already underway, and a number of non-flammable refrigerants that meet the GWP restrictions for some equipment are already available (*e.g.*, R-513A and R-744). Certain server farms are cooled exclusively with water through direct evaporative cooling.[91] Commenters also noted that new technologies such as dielectric fluids for direct contact systems and full immersion chip heat exchangers are other possible cooling methods.

Equipment used for the purposes of cooling IT equipment generally resembles traditional AC equipment, cooling either through indirect chillers or DX systems. The Agency understands that the high heat load of data centers, ITEF, and computer rooms can be very large compared to typical building cooling; however, by allowing continued use of certain high-pressure refrigerants, such as HFC-32 and R-454B, challenges associated with designing new equipment will be minimized. Further, building codes must also be updated for many other subsectors that are likely to transition at least partly to flammable refrigerants, such as retail food refrigeration, IPR, residential and light commercial AC, and chillers, among others, and such industries have indicated confidence that such updates can be completed by compliance dates finalized in this rule.

[91] *https://sustainability.fb.com/wp-content/uploads/2022/02/Public-Water-Reporting_Expanding-the-Operating-Envelope.pdf*

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The Agency has therefore determined that setting the compliance date for new manufactures and installations in this subsector beginning January 1, 2027, is reasonable for the reasons discussed above.

c. Retail Food Refrigeration

Retail food refrigeration is characterized by storing and displaying food and beverages, generally for sale, at different temperatures for different products (*e.g.*, chilled and frozen food). The designs and refrigerating capacities of such equipment vary widely. Retail food refrigeration is composed of four main categories of equipment, and EPA is treating these categories as separate subsectors under the Technology Transitions program: stand-alone equipment in retail food refrigeration (hereafter, "stand-alone units"); refrigerated food processing and dispensing equipment; remote condensing units in retail food refrigeration (hereafter, "remote condensing units"); and supermarket systems.[92]

What restrictions on the use of HFCs is EPA establishing for new retail food refrigeration?

EPA proposed a 150 GWP limit across retail food refrigeration, with exceptions for remote condensing units and supermarket systems with refrigerant charge capacities greater than or equal to 200 lb, and for the high temperature side of these subsectors' cascade systems, where a 300 GWP limit would apply. After review of the comments, EPA is finalizing the GWP limits as proposed for retail food refrigeration in stand-alone

[92] By "supermarket systems," EPA means systems that operate with racks of compressors installed in a machinery room where different compressors turn on to match the refrigeration load necessary to maintain temperatures using direct or indirect (*e.g.*, cascade) systems. These systems are described further in the section of the rule pertaining specifically to retail food refrigeration—supermarket systems, section VI.F.1.c.iv. Grocery stores, warehouse stores, convenience stores, supermarkets, and bodegas may not use a "supermarket system" as described in this rule and instead may be using stand-alone units and/or remote condensing units. The presence of a refrigeration system in a supermarket does not on its own mean that it falls within the retail food refrigeration – supermarket subsector.

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units, remote condensing units, and supermarket systems. For refrigerated food processing and dispensing equipment covered by edition 7 of UL Standard 621, Ice Cream Makers (UL 621) and for equipment with charge sizes greater than 500 g, EPA is not finalizing a GWP limit, but rather prohibiting the use of certain refrigerants. For refrigerated food processing and dispensing equipment not covered by UL 621 and with charge sizes less than or equal to 500 g, EPA is finalizing the 150 GWP limit as proposed.

EPA proposed a January 1, 2025, compliance date for all four categories of retail food refrigeration. After review of the comments, EPA is finalizing a January 1, 2025, compliance date for stand-alone units, as proposed. For remote condensing units, EPA is finalizing a compliance date of January 1, 2026. For supermarket systems, EPA is finalizing a compliance date of January 1, 2027. For refrigerated food processing and dispensing equipment, EPA is finalizing different compliance dates depending on the specific equipment: January 1, 2028, for equipment within the scope of UL 621; January 1, 2026, for other refrigerated food processing and dispensing equipment with charge sizes of 500 g or less; and January 1, 2027, for other refrigerated food processing and dispensing equipment with charge sizes greater than 500 g.[93] After review of the comments on the proposed rule and the availability of HFC and HFC-blend substitutes for these subsectors, and considering the subsection (i)(4) factors under the AIM Act, the Agency concludes that finalizing these restrictions on the use of regulated substances by the specified timeframes is appropriate.

[93] Commenters noted that some refrigerated food processing and dispensing equipment utilizes two refrigeration systems: one to process the food/drink and a separate one to cool a holding tank to maintain the food/drink at the required temperature. In those situations, each separate refrigeration system must comply with the applicable HFC restrictions.

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EPA received comments regarding the proposed restrictions and compliance dates applicable across the entire retail food refrigeration subsector, which are addressed in this section. EPA also received comments that addressed issues specific to certain subsectors within retail food refrigeration, and those are summarized and responded to separately, below.

Comment: Many commenters addressed the proposed GWP limits for the entire retail food refrigeration subsector. Most commenters from industry generally supported the proposed GWP limits. One industry commenter requested increases to the proposed GWP limits to that of existing, readily available refrigerants such as R-513A (GWP 630) and R-449A (GWP 1,396), citing lack of trained technicians to service and install new systems, unavailability of lower-GWP refrigerant options, safety concerns, and disproportionate economic burden on disadvantaged communities. The commenter noted that the refrigerants EPA identified with GWPs less than 150 for this subsector, such as R-454C, R-471A, and R-455A, have not been SNAP-approved for use in a retail environment. The commenter pointed out that the flammability of these substitutes poses significant health and safety concerns, and also stated that the toxicity concerns of substitutes like R-717 prevents their widespread adoption across the subsector. Further, the commenter asserted that R-744 is not a viable option for retail food refrigeration in many cases due to efficiency concerns, leak detection challenges, costs, and other technological constraints associated with a high-pressure refrigerant.

Several environmental groups urged EPA to lower the proposed GWP limits in the retail food refrigeration subsector. One organization recommended that EPA adopt a 150 GWP limit across retail food refrigeration, regardless of charge size, citing adequate availability of existing refrigerant options. As discussed in section VI.F.1.c.i, they

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asserted that the 300 GWP limit for certain charge sizes and systems was unnecessarily high and overly complicated, could provide potential for a regulatory loophole, and could stifle innovation of very low-GWP refrigerants.

Response: EPA has considered comments requesting uniform restrictions across retail food refrigeration—those seeking both increased and decreased stringency from EPA's proposed limits—and has determined that uniform restrictions and compliance timeframes are not appropriate, given the differences in availability of substitutes for use in these subsectors. EPA proposed GWP limits for retail food refrigeration based on the availability of substitutes specific to each subsector. For these four subsectors, EPA considered all subsection (i)(4)(B) factors to the extent practicable, including carefully evaluating the circumstances associated with technological achievability of substitutes given the varying equipment types, location of the equipment, servicing challenges, and technological specifications and constraints. Selecting a single GWP limit for all retail food refrigeration oversimplifies the technologies and substitutes available for use in this subsector. Therefore, the Agency discusses available HFC and HFC-blend substitutes in the following sections to describe the appropriateness of the finalized GWP limits in the context of each subsector.

EPA does not agree with commenters seeking a higher GWP limit for all retail food refrigeration subsectors. As discussed in the List of Substitutes TSD and in the sections that follow, EPA has considered, to the extent practicable, the subsection (i)(4)(B) factors and identified lower-GWP refrigerant substitutes that are available for use to meet the Agency's GWP limit. To the extent that the availability of some substitutes is currently constrained for certain uses within the retail food refrigeration subsectors, such as R-454C and R-455A, as noted by one commenter, EPA has

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considered those constraints and is providing additional time for compliance for some of the subsectors and uses. Since issuing the proposed rule, EPA has listed R-471A as acceptable for use in these subsectors.

EPA does not agree that the concerns raised by a commenter—potential lack of trained technicians, unavailability of lower-GWP refrigerant options, and safety concerns—warrant establishing a uniformly higher GWP limit for the four retail food refrigeration subsectors. The Agency has analyzed these concerns specific to the systems and equipment in each subsector within retail food refrigeration and adjusted the restrictions and compliance timeframes as appropriate. For example, the concerns raised by a commenter about R-744 and R-717 use in retail food refrigeration are relevant to certain subsectors where these options have been identified as substitutes, such as in supermarket systems, but not necessarily others. Such considerations are discussed in the context of the relevant subsectors rather than in this section, which applies generally to all of retail food refrigeration.

EPA also does not agree that it would be appropriate to establish uniform GWP limits across the retail food refrigeration subsector, regardless of the charge size of equipment. For further discussion on EPA's decision to finalize GWP restrictions based on a 200 lb refrigerant charge capacity threshold for certain subsectors, see section VI.F.1.a.

With respect to those commenters seeking GWP limits below 150, the Agency acknowledges that some refrigerants identified as available for use, such as R-744 and R-717, meet that threshold, but EPA does not agree that it is appropriate to adopt restrictions based only on the lowest GWP substitutes. Doing so would inappropriately limit the overall availability of substitutes for that subsector (*see* section VI.E.5). Setting

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restrictions at least at 150 GWP for the subsectors in retail food refrigeration ensures that multiple available substitutes may be used, which eases constraints on commercial demands, costs, and training needs specific to certain substitutes. Allowing a variety of substitutes acknowledges the fact that not every substitute can be used for every application within a subsector and ensures a smooth transition from higher-GWP HFCs.

Comment: EPA received many comments supportive of the proposed GWP limits that requested additional time to comply. Some commenters requested a January 1, 2026, compliance date, noting several concerns affecting the subsector's ability to meet the January 1, 2025, date. Other commenters requested a much longer timeframe for compliance for the retail food refrigeration subsector, including compliance dates that would not become effective until January 1, 2032.

A couple of commenters who requested additional time for compliance noted the delayed updates to UL Standard 60335-2-89 in the 2nd edition, published in October 2021, relative to publication dates of similar updates to other industry standards (*e.g.*, UL 60335-2-40 and ASHRAE 15). They highlighted how it takes time for updates in safety standards to be adopted and implemented. After a safety standard is updated, it must be reflected in equipment testing and certification, manufacturing facility updates, building codes, and be adopted where appropriate under SNAP. The commenter stated that the updated UL Standard 60335-2-89, which covers commercial refrigeration, has not yet been fully incorporated and addressed in these ways. Commenters stated that the retail food refrigeration subsector has fewer available substitutes than other subsectors (such as residential AC and heat pumps) where the updates to their applicable UL standards were published earlier. Therefore, these commenters asserted that additional time for compliance with the GWP limits for retail food refrigeration would allow for

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manufacturers to design and test equipment to comply with the updated UL standards and address other concerns, such as building code adoption, that could limit the ability to install and operate such equipment. The commenters assert that without this extra time, it would be unreasonable to consider certain refrigerant substitutes, particularly certain flammable substitutes, to be "available."

The need for more time to test new equipment and refrigerants was highlighted by a few commenters. Two commenters noted that providing further time for compliance would help NRTLs test and list equipment using new lower-GWP substitutes prior to the compliance date. Additional time was also requested to evaluate the safety and efficiency of systems using flammable refrigerants, which the commenter stated have yet to be evaluated by retailers for effectiveness. According to commenters, after such systems are evaluated, manufacturing facilities would need to be upgraded for the safe storage and handling of flammable refrigerants. One commenter highlighted how the retail food refrigeration subsector's role in providing groceries and supplies to the public mandates 24/7 reliability, and that some systems using low-GWP substitutes, such as R-744, are not yet reliable. This commenter stated that additional time would allow them to develop and test systems to ensure that they meet all of the sector's reliability, performance, and safety requirements.

Additionally, commenters noted that building codes in certain areas could impede the transition to substitute refrigerants because they currently do not allow for use of flammable refrigerants in new buildings. These commenters requested a delay in the compliance date to allow those jurisdictions to continue to update their codes to reflect the expanding list of safe, lower-GWP refrigerant options in response to updated safety standards.

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Finally, commenters highlighted that relevant SNAP listings for refrigerants in retail food refrigeration, in response to the updates to UL 60335-2-89, have yet to be finalized. Commenters cited additional SNAP listings for A2Ls and expanded charge sizes for R-290 in this subsector as necessary to comply with the proposed GWP limits, and that additional time would provide the opportunity for EPA to finalize pertinent SNAP listings before the compliance date.

Response: EPA has considered these comments and agrees that additional time for compliance is appropriate in some instances. EPA does not agree that such additional time is required for every subsector in retail food refrigeration, and therefore addresses these concerns and requests for extensions in the subsector-specific sections that follow. This section discusses in general terms the extent to which EPA considered how the timing of UL standards' publications impacts other factors that inform availability of substitutes for retail food refrigeration as part of the decision to provide a later compliance date.

Most retail food refrigeration equipment falls under the scope of safety standard UL 60335-2-89. In October 2021, the 2nd edition of this standard was published, updating safety requirements so that flammable and lower flammability refrigerants could be deployed more widely in commercial refrigeration equipment. EPA recognizes the time it can take for an updated UL standard to be widely incorporated and for the updates to be applied across industry. Many other relevant changes affecting the availability of substitutes and facilitating transition to the use of those substitutes generally occur after the UL standard is updated, including evaluation of substitutes under the SNAP program, adoption of new editions into building codes, equipment testing and certification, safety updates to manufacturing facilities, and training of technicians. All of these are

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considerations for EPA's assessment of availability of substitutes under subsection (i)(4)(B). Further discussion on how updates to UL 60335-2-89 affect the availability of substitutes for equipment within the safety standard's scope can be found in section VI.E.2.

Typically, following updates to safety standards for retail food refrigeration, EPA evaluates substitutes through the SNAP program's comparative risk framework, where the Agency considers safety by assessing exposure assessments, toxicity data, and flammability, among several regulatory criteria. EPA is currently evaluating many of the refrigerants impacted by the updates to UL 60335-2-89 and has proposed to list many refrigerants as acceptable, subject to use conditions, under SNAP for use across retail food refrigeration (88 FR 33722, May 24, 2023). Although those evaluations under SNAP are ongoing, the Agency anticipates that given the number of substitutes currently proposed as acceptable for use, users in the retail food refrigeration subsector will likely have an expanded set of available substitutes from which to choose in the coming years. EPA has considered its ongoing retail food refrigerant evaluations under SNAP on a subsector-specific basis, and the adjusted compliance timeframes reflect these evaluations and their potential impact on the availability of substitutes for use in each individual subsector. Further discussion on the intersection of SNAP listing decisions and AIM Act subsection (i)(4) can be found in section VI.E.2.

As noted by many commenters, building codes can limit refrigerants available for use based on their flammability, the charge size of the equipment, and other relevant safety factors, and take time to adopt changes to safety standards. These code updates are generally made in each specific jurisdiction, and the timeframe for adoption of new editions of safety standards can vary greatly. In certain jurisdictions, users may be unable

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to utilize certain flammable substitutes identified by EPA for use in retail food refrigeration, even if they are SNAP-approved, until building codes incorporate the updates in the 2nd edition of UL 60335-2-89. However, EPA may still consider a substitute to be available before every building code in every jurisdiction across the United States permits its use. See section VI.E.2.d for discussion on EPA's consideration of building codes and the availability of substitutes under subsection (i)(4).

Further, EPA agrees with commenters that updates to UL standards must also be incorporated into equipment design, testing, and certifications. Even after manufacturers develop equipment using substitutes, NRTLs must certify that the new equipment meets UL safety standards. NRTL equipment certification requires substantial testing, site visits, and labor input before new equipment can be used. For a subsector as large as retail food refrigeration, NRTLs could struggle to complete certification of new equipment by the proposed January 1, 2025, compliance date for the subsector.

EPA also anticipates that the use of lower-GWP refrigerant options like R-744, with very high pressure, or the use of flammable substitutes may require more specialized training. Such trainings are available and underway, but more trained technicians would benefit the commercial refrigeration industry in the transition to lower-GWP refrigerants.

EPA agrees with the commenter that manufacturing facilities not currently using flammable refrigerants will need to incorporate safety updates before using flammable refrigerants on site. EPA acknowledges that these changes to manufacturing facilities could require financial and time investments; however, the use of flammable refrigerants has steadily increased over the last ten years, meaning some manufacturers have already made such upgrades. In the cases where these updates have yet to be made, EPA

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understands that they could delay when those facilities are able to factory-charge new substitutes into their appliances or pre-charged components.

EPA has therefore determined, in consideration of the need for certain SNAP approvals, updates to building codes, equipment design, testing, and certifications, technician trainings, and manufacturing facility upgrades, that providing additional time to comply is reasonable for certain subsectors in retail food refrigeration. Considering these factors, noted by many commenters, the Agency is finalizing delayed compliance dates for certain refrigerated food processing and dispensing equipment, remote condensing units, and supermarket systems. This additional time will provide an opportunity for additional SNAP listings to be finalized; jurisdictions to consider the latest edition of UL 60335-2-89 and incorporate the updated safety requirements into their building codes to enable the use of certain substitutes; further development, testing, and certification of equipment using new substitutes; a greater number of specialized trained technicians; and completion of remaining safety updates to facilities.

EPA understands that the lagging effects of updating UL 60335-2-89 do not affect stand-alone units and certain refrigerated food processing and dispensing equipment in the same way. Therefore, EPA is finalizing the compliance date of January 1, 2025, for stand-alone units and certain refrigerated food processing and dispensing equipment as proposed. Further discussion on EPA's decision to finalize the compliance dates for these subsectors can be found in sections VI.F.1.c.i and VI.F.1.c.ii.

i. Retail food refrigeration–stand-alone units

Stand-alone units are equipment where all refrigeration components are integrated and, for the smallest types, the refrigeration circuit is entirely brazed or welded. Stand-alone units are charged with refrigerant at the factory and typically require only an

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electricity supply to begin operation. Examples include refrigerators, freezers, and reach-in coolers (either open or with doors). EPA considers these to be products according to the definition of stand-alone units finalized in this rulemaking.

Medium-temperature stand-alone units maintain a temperature above 32 °F (0 °C). Most are typically designed to maintain food and beverages at temperatures roughly between 32 °F (0 °C) and 41 °F (5 °C). Low-temperature stand-alone units are designed to maintain food and beverages at temperatures roughly between -40 °F (-40 °C) and 32 °F (0 °C) (*i.e.*, freezers). Today, HFC-134a is the most commonly used refrigerant in stand-alone units, with R-404A also commonly used in low temperature applications and some high-capacity applications.

What restrictions on the use of HFCs is EPA establishing for new stand-alone units and why?

EPA is prohibiting the manufacture and import of stand-alone units that use HFCs and HFC blends with a GWP of 150 or greater beginning January 1, 2025. This GWP limit applies to new stand-alone units, irrespective of compressor capacity or evaporator design. After review of the comments received, EPA is finalizing these restrictions as proposed.

Comment: In addition to the general retail food refrigeration comments discussed in section VI.F.1.c, EPA received comments on the proposed GWP limits for stand-alone units, specifically. One commenter, a private citizen, expressed support for the 150 GWP limit. Another commenter requested a 300 GWP limit for stand-alone units, claiming that refrigerants between 150 and 300 GWP offer increased energy efficiency benefits and require smaller charge sizes. In particular, the commenter advocated for a limit that accommodates the use of R-454A (GWP 237), which they asserted is the only substitute

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that can exceed the capacity of the refrigerant currently used by the commenter, R-404A, and the use of which would allow for a fast and simple transition. According to the commenter, the only other substitute identified by EPA with comparable volumetric capacity that would meet the 150 GWP limit is R-455A (GWP 146), which the commenter claimed poses non-ideal glide conditions for equipment transitioning out of R-404A. The commenter stated that EPA was not permitted to rely on State HFC regulations to fulfill its statutory duty to evaluate substitutes under the AIM Act, that EPA was required to comply with AIM Act subsection (i)(5), and that there was no indication in the record that EPA had complied with the requirement in subsection (i)(4)(A) to consider best available data.

Response: After review of the general retail food refrigeration comments and the comments specific to stand-alone units, EPA is finalizing the GWP limits for stand-alone units as proposed. The Agency agrees with the comment that a 150 GWP limit is appropriate for this subsector. The Agency disagrees with the commenter requesting a 300 GWP limit for stand-alone units, given the availability of substitutes with GWPs below 150 for use in this subsector under subsection (i)(4). Further, EPA does not agree with the commenter's assessment that the Agency has not relied on best available data in determining the availability of substitutes nor do we agree that EPA was obligated to evaluate substitutes under (i)(5) in carrying out a rulemaking (see section VI.E.1).

The commenter asserts that EPA should revise its restriction for stand-alone units on the basis that its preferred substitute, R-454A, is the only currently available substitute that "can exceed" the volumetric capacity of R-404A. But subsection (i)(4) does not require EPA to set restrictions in a way that would accommodate transition only when the substitutes under consideration outperform the regulated substances currently being used.

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While setting a limit at 300 would permit the use of more substitutes than the Agency's limit of 150, and therefore potentially provide a "faster and simpler" transition for this subsector, that does not mean that the substitutes identified by the Agency for use in stand-alone units are not "available." The commenter does not demonstrate that the substitutes EPA identified as currently available for use in stand-alone units cannot be used, for instance by adjusting or reengineering equipment models to overcome issues of volumetric capacity,[94] or that EPA should not have considered any of its identified substitutes to be available per any of the subsection (i)(4)(B) factors. Further, as noted elsewhere, EPA has recently proposed to approve additional alternatives (*e.g.*, R-454C, R-455A, R-457A, and R-516A) and increase the allowable charge size for existing alternatives (*e.g.*, R-290), that may address the commenter's concern (88 FR 33722, May 24, 2023). Tests on HFC/HFO blends such as R-454C, R-455A, and R-457A show a volumetric capacity either identical or varying in the range of ±5 percent, compared to HCFC-22, indicating that the blends should not create a significant change in volumetric capacity that would require reengineering.[95] The Agency's assessment is that a 150 GWP limit is appropriate for stand-alone units after considering the (i)(4) factors, to the extent practicable, and, particularly relevant to the commenter's points, after evaluating under (i)(4)(B) the availability of substitutes for use in these units. We also note that EPA's ongoing evaluation of additional substitutes under the SNAP program, including for use in stand-alone units, may facilitate the availability of more options for compliance by

[94] In most cases, little or no reengineering will be required to use HFC/HFO blends in place of regulated substances. The largest amount of reengineering will be required for R-744, due to its higher pressure, and for the hydrocarbon refrigerant R-290, because of its higher flammability. However, industry is already in the process of adopting those refrigerants. For example, R-290 is already being used to replace R-404A in retail food stand-alone units like ice cream cabinets and plug-in display cases. (RTOC, 2022)
[95] RTOC, 2022. TEAP 2022 Progress Report (May 2022) available at: *https://ozone.unep.org/science/assessment/teap*.

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January 1, 2025. EPA continues to encourage innovation of refrigerants that meet these restrictions and anticipates the number of substitutes available for use in stand-alone units will continue to grow.

For new equipment, the Agency has identified R-744 (GWP 1), R-290 (GWP 3.3), R-600a (GWP 1), R-441A (GWP 3), HFO-1234ze(E) (GWP 1), and HFO-1234yf (GWP 1) as available substitutes for the higher-GWP HFCs currently used in stand-alone units. In addition to their lower GWPs, some of these substitutes offer additional environmental and economic benefits via increased energy efficiency. Multiple sources, not peer-reviewed, indicate that R-290 offers significant efficiency benefits as compared to traditional higher-GWP refrigerants used for commercial refrigeration, claiming reduced energy usage of 11 to 63 percent for R-290 models compared to similar equipment using HFC-134a[96] and reduced energy consumption of approximately 30 percent with R-290 compared to R-404A.[97] A peer-reviewed study found that energy use in a stand-alone freezer unit can be reduced as much as 34 percent, depending on operating conditions, when using R-290 instead of R-404A.[98]

Use of R-290, R-600a, and other lower-GWP refrigerants in stand-alone equipment has increased significantly in recent years, particularly since SNAP Rules 17, 19, and 21 listed various substitutes as acceptable and provided use conditions that enable these substitutes, including those that are flammable, to be used safely (76 FR 78832, December 20, 2011; 80 FR 19454, April 10, 2015; and 81 FR 86778, December 1, 2016).

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[96] True Manufacturing, 2019, Hydrocarbon (Natural Refrigerant) Brochure. Available at: *https://www.truemfg.com/support/resource-center/#panel2*.
[97] Carel, March 2020. Six Reasons to Use Propane as Refrigerant. Available at: *https://www.carel.com/blog/-/blogs/six-reasons-to-use-propane-as-refrigerant.*
[98] Mastrullo, Rita & Mauro, Alfonso & Menna, Laura & Vanoli, G.P. (2014). Replacement of R404A with propane in a light commercial vertical freezer: A parametric study of performances for different system architectures. Energy Conversion and Management. 82. 54–60. *10.1016/j.enconman.2014.02.069.*

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EPA is aware of several available low and medium temperature stand-alone unit models using substitutes such as R-290 and R-600a. Commercial demand exists for equipment types that use R-290, including reach-in refrigerators and freezers, beverage coolers, and food service equipment, as well as beverage coolers and vending machines that use R-744.[99] These lower-GWP refrigerants have had significant use in other regions of the world.[100] The increased prevalence of these substitutes in stand-alone equipment indicates their availability for use in this subsector, both in terms of technological achievability and commercial demand.

Several States have legal restrictions on the use of high-GWP HFCs and HFC blends in stand-alone equipment.[101] These restrictions became effective between 2020 and 2022. Stand-alone equipment using lower-GWP substitutes in compliance with State regulatory requirements are currently being sold in these markets, clearly indicating that these types of equipment can use substitutes that are available. The Agency does not agree with the commenter that EPA has relied on State prohibitions to fulfill its statutory duty under subsection (i). We have factored in, to the extent practicable, those factors in subsection (i)(4) in determining the use restrictions finalized in this action. The Agency discussed in the proposed rule and a TSD that the State regulations prohibiting the use of HFCs and requiring the use of substitutes is one source of information that is relevant to EPA's assessment of the availability of substitutes in stand-alone units, particularly in terms of technological achievability. See the *Availability of Substitutes* TSD for further information on available HFC and HFC-blend substitutes for stand-alone units.

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[99] See Commercial Demands and Technological Achievability TSD in the docket for a list of products in the affected sectors and subsectors using substitutes.
[100] See TEAP 2022 Assessment Report, section 5
[101] California, Colorado, Delaware, Maine, Maryland, Massachusetts, New Jersey, New York, Rhode Island, Virginia, Vermont, and Washington.

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In addition to the lower-GWP refrigerants already available, EPA continues to evaluate substitutes under the SNAP program and has authority to do so under subsection (i)(5) of the AIM Act as well. The Agency anticipates that this continuing evaluation of additional substitutes, including for use in stand-alone units, may help facilitate the availability of even more options for compliance by January 1, 2025. For example, under the SNAP program, EPA has proposed to list several additional refrigerants that would comply with the final restrictions as acceptable, subject to use conditions, for use in stand-alone units: HFO-1234ze(E), HFO-1234yf, R-457A, R-516A, R-455A, and R-454C (with GWPs of 1, 1, 137, 140, 146, and 146, respectively) (88 FR 33722, May 24, 2023). Concerning the ability to meet appliance efficiency standards, one study found R-454C, R-455A, and R-457A reduced energy consumption by 2.07 to 2.45 percent, 2.95 to 2.9 percent, and 10.48 to 10.69 percent, respectively, compared to R-404A in a stand-alone unit.[102] To the extent that a manufacturer chooses not to use a specific refrigerant because of glide, R-744, R-600a, R-290, HFO-1234ze(E), and HFO-1234yf are all single component refrigerants and therefore have no glide, and R-516A has been listed under ASHRAE Standard 34 as an azeotropic blend, with glide comparable to that of R-404A. The Agency therefore does not agree with the commenter urging EPA to establish GWP limits for stand-alone units that are less stringent than the limit proposed, given that the best available data indicate an existing array of available substitutes.

Comment: EPA received comments requesting an extension of the proposed January 1, 2025, compliance date for stand-alone units. One commenter noted that HFC/HFO-blends often have significantly lower GWPs than HFC-only refrigerants, and

[102] Ranges represent without a receiver to with a receiver. Llopis, Rodrigo, et al., International Journal of Refrigeration, June 2019. DOI: 10.1016/j.ijrefrig.2019.06.013, available at: *http://www.energiazero.org/aermec/gas/Llopis_Low_GWP_R404A_MT_final.pdf*.

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that SNAP has listed many HFC blends as acceptable for stand-alone units, implying relatively minimal environmental impact of their continued use. They agreed that although many manufacturers of stand-alone units have already transitioned to R-290 (GWP 3.3), others chose non-flammable SNAP-approved refrigerants that would not meet the new 150 GWP limit. According to the commenter, additional time is needed for these manufacturers, whose products include ENERGY STAR certified units with non-flammable HFC/HFO blends, to transition to lower-GWP options. Another commenter pointed to the recent updates to UL 60335-2-89 allowing for increased charge sizes up to 500 g for A3 refrigerants in stand-alone units. The commenter concluded that increased charge sizes are necessary to move to substitutes with GWPs less than 150 and that if SNAP does not address larger charge sizes for flammable refrigerants in the next several months, then the compliance date should be delayed until January 1, 2026.

A third commenter cited the need for an additional year for research and development to manufacture new equipment that will meet DOE energy efficiency requirements, for coordinating with compressor and other component manufacturers, and for NRTLs to work through a "backlog" of testing that will result from the transition. They also noted that building codes still need to be updated to allow for use of flammable refrigerants and that manufacturing facilities need time for redesigns to safely handle them.

Response: After review of the general retail food refrigeration comments and the comments specific to stand-alone units regarding the proposed January 1, 2025, compliance date, EPA is finalizing the compliance date as proposed. HFC and HFC blends already identified by the Agency as available substitutes can support the final GWP limits for new stand-alone units. In addition, this rule would not prevent a

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manufacturer from seeking and receiving ENERGY STAR certification for units using refrigerants with a GWP less than 150. Numerous models using the lower-GWP refrigerants R-290 or R-600a, for example, are already listed under the ENERGY STAR Product Finder,[103] as well as those using the higher-GWP, non-flammable HFC/HFO blends mentioned by the commenter.

As discussed above, EPA has taken into account the delayed publication of updates to UL standard 60335-2-89 and the subsequent incorporation of those updates by electing to extend the compliance dates for many subsectors in retail food refrigeration. However, the Agency does not agree that for stand-alone units, a delay in the January 1, 2025, compliance date is appropriate. In general, charge sizes for stand-alone units are relatively small, and stand-alone units containing A3 refrigerants have been in use for several years. The transition to lower-GWP substitutes is further along than in other subsectors within retail food refrigeration. Therefore, challenges associated with the need to update building codes; evaluate substitutes under SNAP; research, develop, test, and certify equipment; update manufacturing facilities; and ensure an adequate supply of trained technicians are less present for smaller charge refrigeration equipment. For other retail food subsectors with complications that could contribute to delays in their transition, EPA is providing additional time to comply for the reasons discussed in the section above.

[103] See www.energystar.gov/productfinder

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ii. Retail food refrigeration–refrigerated food processing and dispensing equipment

Refrigerated food processing and dispensing equipment is designed to make or process and subsequently dispense cold food and beverages, including equipment that functions as a holding tank to deliver the food or beverage at the desired temperature or to deliver chilled ingredients for their processing, mixing, and preparation. This equipment can be self-contained or can be connected via refrigerant piping to a dedicated condensing unit located elsewhere. Some may use a refrigerant in a heat pump or utilize waste heat from the unit to provide hot beverages. Some may also provide heating functions to melt or dislodge ice or for sanitation purposes. Examples include equipment used to make and dispense chilled and frozen beverages; frozen custards, gelato, ice cream, Italian ice, sorbets and yogurts; milkshakes, "slushies" and smoothies; and whipped cream.

Refrigerated food processing and dispensing equipment historically used CFC-12 and HCFC-22 and has more recently adopted HFC-134a and R-404A in medium and low temperature applications, respectively. Both HFC-134a and R-404A are potent GHGs with GWPs of 1,430 and 3,922, respectively.

What restrictions on the use of HFCs is EPA establishing for new refrigerated food processing and dispensing equipment and why?

For new refrigerated food processing and dispensing equipment, EPA proposed a 150 GWP limit restriction that would take effect starting January 1, 2025. EPA received comments, summarized and responded to below, that pointed out that much of the equipment in the refrigerated food processing and dispensing subsector is covered by a different UL standard (UL 621) that has not yet been revised to enable the effective use

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of flammable refrigerants for certain charge sizes. EPA has therefore modified the proposed restrictions in this final action by establishing different restrictions and compliance dates where availability of substitutes is constrained by these factors.

Specifically, in new stand-alone refrigerated food processing and dispensing equipment that is outside the scope of UL 621 and has a refrigerant charge size less than or equal to 500 g, EPA is setting a GWP limit of 150 GWP, as proposed, but beginning two years later than proposed, on January 1, 2027. For new refrigerated food processing and dispensing equipment with a charge size greater than 500 g, within the scope of UL 621, and for systems that use remote condensing units, EPA is not finalizing a GWP limit restriction as proposed, but is instead prohibiting the use of the following HFCs or HFC blends, which have GWPs as high or higher than HFC-134a: R-402A, R-402B, R-404A, R-407A, R-407B, R-407C, R-407F, R-407H, R-408A, R-410A, R-410B, R-411A, R-411B, R-417A, R-417C, R-420A, 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-507A, HFC-134a, HFC-227ea, R-125/290/134a/600a (55/1/42.5/1.5), RB-276,[104] RS-24 (2002 formulation), RS-44 (2003 formulation), GHG-X5, or Freeze 12 (within this section, EPA refers to this list as the "prohibited refrigerants"). New self-contained refrigerated food processing and dispensing equipment with charge sizes greater than 500 g outside the scope of UL 621 and systems that use remote condensing units must comply with the prohibitions beginning January 1, 2027. New stand-alone equipment within the scope of UL 621 must comply with the prohibitions beginning January 1, 2028.

[104] RB-276 is also known as Free Zone and HCFC Blend Delta.

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Comment: In addition to the general retail food refrigeration comments, EPA received a comment from a private citizen in support of the proposed 150 GWP limit for refrigerated food processing and dispensing equipment, specifically. Another commenter approved of the 150 GWP limit, but only for equipment that is self-contained and with charge sizes less than or equal to 500 g. Commenters also requested greater GWP limits than proposed for this subsector. One commenter requested a 3,920 GWP limit to apply to refrigerated food processing and dispensing equipment, while another requested a 1,450 GWP limit for remote condensing units and equipment with charge sizes greater than 500 g. This commenter discussed the applicability of certain safety standards (*e.g.*, UL 621 versus UL 60335-2-89) to various refrigerated food processing and dispensing equipment and noted that flammable refrigerants are not yet permitted in equipment within the scope of UL 621 with charges greater than 150 g, greatly limiting the number of available substitutes. Additionally, EPA received comments requesting an exception for refrigerated food processing and dispensing equipment within the scope of UL 621.

Response: After review of the general retail food refrigeration comments and the comments specific to refrigerated food processing and dispensing equipment regarding the proposed 150 GWP limit, EPA is finalizing the GWP limit as proposed for stand-alone equipment outside the scope of UL 621 with charge sizes less than or equal to 500 g. EPA agrees with the commenters who expressed their support of the proposed GWP limit for this type of equipment, and understands the available HFC and HFC-blend substitutes to be sufficient to replace refrigerants with GWPs greater than 150 for this type of equipment. EPA initially identified substitutes such as R-744 and R-717 as available for use in this subsector for its consideration of availability of substitutes under subsection (i)(4)(B) for the HFCs and HFC blends that EPA is restricting. EPA

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acknowledges that in some situations, particularly in public areas, R-717 may not be allowed by building codes or may be limited in the charge size allowed. R-744 technology continues to advance, allowing for improved appliance energy efficiency in climates found in most of the United States. Additionally, companies expressed interest in using other lower-GWP substitutes for this subsector, with one commenter indicating they are already using refrigerants like R-290 (GWP 3.3) in some of their equipment. Proposed SNAP Rule 26 listings for refrigerated food processing and dispensing equipment, enabled by updates to UL 60335-2-89 and other safety standards, will likely provide further refrigerant options for such types of stand-alone equipment outside the scope of UL 621 and with charge sizes less than or equal to 500 g, once finalized. EPA has proposed to list HFO-1234ze(E), HFO-1234yf, R-290, R-457A, R-516A, R-455A, R-454C, R-454A (with GWPs of 1, 1, 3.3, 137, 140, 146, 146, and 237, respectively) as acceptable, subject to use conditions, under SNAP for use in refrigerated food processing and dispensing equipment (88 FR 33722, May 24, 2023). All but one of these substances meet the GWP limit of 150 for this type of equipment in this subsector, further easing the transition to lower-GWP refrigerants. EPA continues to encourage innovation of refrigerants that meet these restrictions and anticipates the number of substitutes available for use in refrigerated food processing and dispensing equipment will continue to grow.

The Agency therefore disagrees with commenters requesting a higher GWP limit or an exemption uniformly across all types of refrigerated food processing equipment, given the identified available substitutes below 150 GWP for this type of equipment. EPA is aware of actions being taken in various States and local jurisdictions that have or will amend building codes that will increase the availability of substitutes by permitting additional substitutes, including certain flammable substitutes, with GWPs below the

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proposed GWP limit.[105] See section VI.E.2.d for further discussion on EPA's consideration of building codes in identifying available substitutes under subsection (i)(4) of the AIM Act.

For self-contained products within the scope of UL 621, for self-contained products with charge sizes greater than 500 g, and for refrigerated food processing and dispensing systems using remote condensers, EPA is not finalizing a GWP limit as proposed, and is instead prohibiting certain listed refrigerants. The Agency agrees with commenters that these types of equipment face additional challenges to using lower-GWP substitutes. Prohibiting specific refrigerants retains the use of nonflammable options even if such equipment is not added to the scope of UL 60335-2-89 or other appropriate safety standards to allow for additional flammable options in the necessary charge sizes. In addition, refrigerant options for units with charge sizes greater than 500 g or for systems using remote condensing units may not be supported by the expected updates to the safety standards. Therefore, the Agency finds that a more reasonable approach to transitioning such refrigerated food processing and dispensing equipment to lower-GWP options is by prohibiting higher-GWP refrigerants such as R-404A and HFC-134a. The GWPs of the prohibited refrigerants range from 1,430 (HFC-134a) to 3,985 (R-507, R-507A), which is similar to the request of one commenter to set a GWP limit of 1,450 for certain types of refrigerated food processing and dispensing equipment. One commenter indicated it has already transitioned some of its equipment to R-449A, which is not one of the prohibited refrigerants. Other nonflammable options, such as R-448A and R-449B, are also available for these types of equipment and EPA has proposed

[105] See the TSD on building codes in the docket for additional information on building codes and list of substitutes.

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further low-GWP options. As stated in section VI.B of this preamble, this approach—restricting specific substances instead of setting a GWP limit for a given subsector—gives EPA time to identify an appropriate GWP limit for this subsector while still restricting those substances that have the highest adverse environmental impact.

Comment: EPA received several comments on the proposed January 1, 2025, compliance date for various types of refrigerated food processing equipment. Many comments requested additional time for compliance for refrigerated food processing and dispensing equipment within the scope of UL 621–Ice Cream Makers– relative to other applications in this subsector. These comments noted that equipment within the scope of UL 621, such as ice cream, yogurt, custard, and milk shake machines, are not covered by the UL 60335-2-89 standard, and that UL 621 does not yet contain updated safety requirements enabling the use of flammable refrigerants in necessary charge sizes. Additional time to allow for analogous updates to UL 621, as in the 2nd edition of UL 60335-2-89, was requested, ranging from two to six years, including one request that the compliance date for equipment covered by UL 621 be no earlier than six years after updates to that standard are published, or that such equipment be exempted outright. Until updates have been made to UL 621 to allow for use of flammable refrigerants, commenters requested additional time to comply with restrictions (in this case, the prohibited refrigerant list in lieu of a GWP limit) for equipment within the scope of UL 621 or with charge sizes greater than 500 g. One commenter noted the proposed January 1, 2025, compliance date for this type of equipment (remote condensing units or stand-alone units with charges greater than 500 g) as appropriate if the Agency raises the GWP limit to 1,450.

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Other issues related to the compliance date for all types of refrigerated food processing and dispensing equipment were flagged by commenters such as building codes, time for NRTLs to test and list new equipment, glide issues with using A2Ls in direct contact cooling applications, time to source compressors and other components appropriate for use with flammable refrigerants, and design challenges for equipment using the lower-GWP substitutes identified by the Agency. One commenter discussed how food service equipment has unique testing requirements and must be certified by the National Sanitation Foundation standard, which could take an additional four to six months. The commenter stated that equipment must also meet DOE efficiency standards, and was concerned about hydrocarbon refrigerants working efficiently in larger charge equipment. This commenter requested a 5- to 10-year extension of the proposed compliance date for this subsector.

Other commenters noted that UL 621 does not currently allow toxic refrigerants such as R-717, a substitute identified by EPA for use in refrigerated food processing equipment. According to these commenters, using higher toxicity refrigerants (ASHRAE Standard 34 safety group classification "B" substances) in equipment for producing fresh food for consumption could potentially lead to harm if ingested by the consumer under circumstances of a refrigerant leak. Commenters also pointed to challenges of transitioning to high-pressure refrigerants, such as R-744, in small equipment. For these reasons, commenters requested a delayed compliance date for refrigerated food processing and dispensing equipment under the scope of UL 621 (*e.g.*, ice cream makers) with charge sizes less than or equal to 500 g.

Response: After review of the comments related to refrigerated food processing and dispensing equipment and consideration of the (i)(4) factors, EPA is finalizing a

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compliance date of January 1, 2027, for self-contained equipment outside the scope of UL 621 (for both those with charge sizes less than or equal to 500 g and those with charge sizes greater than 500 g) and for refrigerated food processing and dispensing equipment with a remote condenser. EPA is establishing a January 1, 2028, compliance date for self-contained refrigerated food processing and dispensing products within the scope of UL 621.

After further evaluation of the substitutes available to this subsector, EPA agrees that the proposed January 1, 2025, compliance date would not provide sufficient time for refrigerated food processing and dispensing equipment within the scope of UL 621. The current status of UL 621 limits the availability of flammable lower-GWP refrigerants for use in equipment covered by that standard. EPA agrees with commenters that for equipment in this subsector within the scope of UL 621, additional time is warranted to ensure the availability of technologically achievable refrigerants. In particular, approximately two more years will be needed to update UL 621, or incorporate this type of equipment into another standard such as UL 60335-2-89, to support the use of lower-GWP, flammable refrigerants and then another two years for EPA to list substitutes for use with UL 621 if those mentioned above do not prove feasible and for manufacturers to design and test equipment following the updated UL 621 standard. EPA is therefore finalizing a compliance date of January 1, 2028, to provide additional time for publication of updates to UL 621 to allow the use of flammable refrigerants. However, EPA disagrees that a delay of up to ten years following updates to UL 621 or an outright exemption for equipment within the standard's scope would be appropriate, given the updates that are already underway for this subsector.

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EPA is delaying the compliance dates for other equipment in this subsector to allow further progress under SNAP evaluations, safety standards, equipment design, and building codes. EPA finds a two-year delay to January 1, 2027, to be sufficient for stand-alone equipment not covered by UL 621 with charge sizes less than or equal to 500 g because UL 60335-2-89 addresses some types of self-contained refrigerated food processing and dispensing equipment allowing up to 500 g of A3 refrigerants. While similar equipment in the stand-alone unit subsector has already begun using hydrocarbon refrigerants such as R-290 in recent years, review of these substitutes for use in refrigerated food processing and dispensing equipment is still ongoing under SNAP and necessitates further research, development, and testing of equipment using substitutes that meet the 150 GWP restriction. Therefore, the Agency is finalizing a compliance date of January 1, 2027, for stand-alone equipment not covered by UL 621 with charge sizes less than or equal to 500 g.

In alignment with many commenters, EPA is also delaying the compliance date by two years, to January 1, 2027, for refrigerated food processing and dispensing equipment outside the scope of UL 621 with either a greater than 500 g charge size (for self-contained equipment) or with a remote condenser. EPA appreciates that one commenter found the proposed January 1, 2025, compliance date appropriate for equipment with larger charge sizes, given the tremendous product development the organization has already completed for refrigerants below 1,450 GWP. However, after considering the comments as a whole, and that the list of prohibited refrigerants for these types of equipment may not exactly conform with the GWP limit suggested by the commenter agreeing to a 2025 compliance date, EPA is providing two additional years to comply for this class of equipment. This additional time will allow manufacturers to

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investigate and implement substitutes such as R-448A, R-449A, and R-449B (all A1 refrigerants) for types of equipment that would not be able to use A3 refrigerants such as R-290 or R-600a under the UL 60335-2-89 safety standard. It will also provide time for resolution of current obstacles to adopting A2L refrigerants such as building codes, testing, development, and certification of equipment, and pending SNAP listings. EPA disagrees that a compliance delay of up to ten years would be appropriate for this type of equipment, given the updates that are already underway for this subsector, including an updated UL safety standard and availability of substitutes.

iii. Retail food refrigeration–remote condensing units

The third category of equipment under retail food refrigeration, remote condensing units, exhibit refrigerating capacities typically ranging from 1 kW to 20 kW (0.3 to 5.7 refrigeration tons) and are composed of one (and sometimes two) compressor(s), one condenser, and one receiver assembled into a single unit, normally located external to the sales area. This equipment is connected to one or more nearby evaporator(s) used to cool food and beverages stored in display cases and/or walk-in storage rooms. A cascade system might be used, *e.g.*, to reach low temperatures in a long-term storage room. Remote condensing units are commonly installed in convenience stores and specialty shops such as bakeries and butcher shops. Having historically used HCFC-22, newly manufactured units now primarily use R-404A or HFC-134a. Other HFC blends—including R-407A, R-407C, R-407F, and R-507A—are also used.

What restrictions on the use of HFCs is EPA establishing for systems using new remote condensing units and why?

EPA is finalizing GWP limits for remote condensing units as proposed. Analogous to supermarket systems, IPR systems, and cold storage warehouses, EPA is

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distinguishing systems using remote condensing units by their refrigerant charge capacity. See section VI.F.1.a for a discussion of EPA's decision to finalize this distinction. Systems with refrigerant charge capacities greater than or equal to 200 lb have a GWP limit of 150. Systems with refrigerant charge capacities less than 200 lb, and for the high temperature side of cascade systems irrespective of the charge capacity, have a GWP limit of 300.[106] In response to comments, and after further consideration of the (i)(4) factors, EPA is finalizing a compliance date of January 1, 2026, rather than January 1, 2025.

Comment: In addition to the retail food refrigeration comments that are applicable to this subsector, discussed in section VI.F.1.c, EPA received comments from several environmental groups requesting more stringent restrictions for systems using remote condensing units related to the varying technical distinctions of the equipment. In general, commenters urged EPA to lower the proposed GWP limits, decrease the proposed 200 lb charge size threshold to 50 lb or remove it entirely, and/or remove the distinction for the high temperature side of cascade systems.

One such commenter urged a 10 GWP limit for all charge sizes of remote condensing units, pointing to R-744 as the only currently acceptable option below the 150 GWP limit for supermarkets, an example they claim applies similarly to remote condensing units. The commenter expressed confusion concerning EPA's decision to set GWP limits up to 300 when other refrigerant options in the 10 to 300 GWP range will be unavailable for use before the proposed January 1, 2025, compliance date. Further summary of comments related to the differing GWP limits based on technical distinctions

[106] The GWP limit for the low temperature side of a cascade system, either 150 or 300, is based on the refrigerant capacity of the low-side system. The 300 GWP limit applies to the high temperature side of a cascade system regardless of the total refrigerant capacity.

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in IPR, supermarket systems, remote condensing units, and cold storage warehouses can be found in the IPR section, VI.F.1.a.

Response: After reviewing the comments, EPA is finalizing GWP limits for this subsector as proposed. These final limits are consistent with comments supporting the GWP limits proposed for the entire retail food refrigeration sector and are supported by the substitutes identified by the Agency as available for use in remote condensing units under subsection (i)(4)(B). EPA identified available substitutes for the restricted substances, including R-744 (GWP 1) and R-717 (GWP 1). R-744 remote condensing units are commercially available in several global markets, including in the United States. EPA's SNAP program recently listed R-471A (GWP 144) and R-515B (GWP 287) as acceptable in supermarket systems (September 8, 2023, 88 FR 61977). Additionally, EPA has proposed to list HFO-1234ze(E), HFO-1234yf, R-457A, R-516A, R-455A, R-454C, R-454A (with GWPs of 1, 1, 137, 140, 146, 146, and 237, respectively) as acceptable, subject to use conditions, under SNAP for use in supermarket systems (88 FR 33722, May 24, 2023). Other technologically achievable substitutes that may potentially become available in the future for supermarket systems in the high temperature side of a cascade system or where charge capacities are less than 200 lb, include R-480A (GWP 291) and R-457B (GWP 249). All of these substances would meet the GWP limit of 300 for this subsector, and all except R-454A and R-457B meet the GWP limit of 150. The already available substitutes have been evaluated by EPA to be sufficient to meet these restrictions while the potential for a greater array of options in the future will further ease the transition to lower-GWP refrigerants. EPA continues to encourage innovation of refrigerants that meet these restrictions and anticipates the number of substitutes available for use in retail food remote condensing units will continue to grow.

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Comment: EPA did not receive comments on the proposed January 1, 2025, compliance date specific to remote condensing units, though the Agency did receive comments regarding the proposed compliance dates for retail food refrigeration generally.

Response: After consideration of the subsection (i)(4) factors under the AIM Act, EPA is finalizing a January 1, 2026, compliance date rather than the proposed date of January 1, 2025, for remote condensing units. For EPA's response to these comments and discussion on the Agency's decision to provide an additional year to comply, see section VI.F.1.c.iv.

iv. Retail food refrigeration–supermarket systems

Supermarket systems are the fourth category of equipment under retail food refrigeration, also known as multiplex or centralized systems. They operate with racks of compressors installed in a machinery room where different compressors turn on to match the refrigeration load necessary to maintain temperatures. Two main designs are used: direct and indirect systems. In a direct system, the refrigerant circulates from the machinery room to the sales area, where it evaporates in display-case heat exchangers, and then returns in vapor phase to the suction headers of the compressor racks. Supermarket walk-in cold rooms are often integrated into the system and cooled similarly, but a dedicated condensing unit can be provided for a given storage room.

Indirect supermarket designs include secondary loop systems and cascade refrigeration systems.[107] Indirect systems use a chiller or other refrigeration system to cool a secondary fluid that is then circulated throughout the store to the cases. Compact

[107] See section VI.F.1.a of this preamble for a description of cascade systems.

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chiller versions of an indirect system rely on a lineup of 10–20 units, each using small charge sizes. As the refrigeration load changes, so does the number of active chillers. Each compact chiller is an independent unit with its own refrigerant charge, reducing the potential volume of refrigerant that could be released from leaks or catastrophic failures. Despite the term "chiller" used in the description, these systems are considered supermarket systems under this rulemaking.

Another type of supermarket design, often referred to as a distributed refrigeration system, uses an array of separate compressor racks located near the display cases rather than having a central compressor rack system. Each of these smaller racks handles a portion of the supermarket load, with 5 to 10 such systems in a store.

Supermarket rack systems historically used CFC-12, R-502, HCFC-22, and other blends containing HCFCs in a centralized design. While some of these systems remain in use, others have been retrofitted to replace the ODS refrigerant using a blend containing an HFC (*e.g.*, R-404A, R-422A, R-422B, R-422D, R-427A, R-438A, and R-507A) or have been replaced with a newly manufactured system with refrigerant blends containing HFCs (*e.g.*, R-404A, R-507A, R-407A, R-407C, and R-407F). More recently, some new supermarket systems have also been using non-fluorinated refrigerants, such as CO_2, or HFC/HFO blends, such as R-448A, R-449A, and R-449B.

What restrictions on the use of HFCs is EPA establishing for supermarket systems?

Analogous to remote condensing units, IPR systems, and cold storage warehouses, EPA is distinguishing larger and smaller supermarket systems by their refrigerant charge capacity. See section VI.F.1.a for a discussion of the safety standards driving this distinction. EPA is prohibiting the installation of new supermarket systems

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using HFCs and HFC blends with a GWP of 150 or greater when the refrigerant charge capacities are greater than or equal to 200 lb, beginning January 1, 2027. For new supermarket systems with refrigerant charge capacities less than 200 lb, and for the high temperature side of cascade systems irrespective of the total charge capacity, EPA is establishing a GWP limit of 300,[108] beginning January 1, 2027.

EPA is finalizing GWP limits for supermarket systems as proposed; however, in response to comments received on the proposal and in consideration of the subsection (i)(4)(B) factors under the AIM Act, the Agency is finalizing a compliance date that is two years later than proposed (*i.e.*, January 1, 2027, rather than January 1, 2025).

For its consideration of availability of substitutes under subsection (i)(4)(B), EPA identified substitutes that are available in place of the restricted substances for systems with larger refrigerant charge capacities. These include R-717, which can be used in a secondary loop (indirect) supermarket refrigeration system, and R-744, which can be used for centralized direct and indirect supermarket refrigeration systems. Further, the restrictions EPA is finalizing would allow for the use of HFC/HFO blends. For example, EPA has recently proposed HFC/HFO blends R-454C, R-457A, R-455A, and R-516A as acceptable for use in supermarket systems under SNAP (88 FR 33722, May 24, 2023) and all have GWPs below the 150 limit. Further, EPA's SNAP program has listed additional lower-GWP substitutes as acceptable for use in supermarket systems (88 FR 61977, September 8, 2023) since issuing the proposed rule, including R-471A and R-515B (with GWPs of 144 and 287, respectively). Other lower-GWP refrigerants that

[108] The GWP limit for the low temperature side of a cascade system, either 150 or 300, is based on the refrigerant capacity of the low-side system. The 300 GWP limit applies to the high temperature side of a cascade system regardless of the total refrigerant capacity.

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might become available in the future include HFC/HFO blends such as R-459B, R-465A, R-468A, R-476A, R-479A, and R-482A .

These final restrictions support the transition to lower-GWP substitutes and innovative technologies that have been used widely in other parts of the world, such as Europe and Canada, and have seen increased use in the United States. EIA maps multiple supermarkets where lower-GWP refrigerants are being used, which includes Texas and Florida.[109] EPA's GreenChill Partnership includes a Certified Store program where individual food retail stores voluntarily submit applications detailing the types of refrigerants used in the store, refrigerant emissions, and refrigerant quantities; to date, 47 percent of certified stores have used refrigerants with a GWP less than 150, primarily R-744. The number of platinum-level certified stores in the South, Southwest, and Southeast regions, most using refrigerants with a GWP less than 150, increased 40 percent from 2021 to 2022.[110] ATMOsphere indicated that as of December 2022 there were over 1,000 stores globally using transcritical CO_2 systems.[111] The global market of transcritical R-744 systems, which are manufactured by multiple U.S. companies, was expected to grow at a compound annual growth rate of 12.69 percent between 2018 and 2025.[112] R-744 systems may also provide additional environmental

[109] *https://www.climatefriendlysupermarkets.org/map*, accessed August 29, 2023.
[110] "GreenChill Certified Store Achievements," webpage, accessed September 20, 2023. Available at: *https://www.epa.gov/greenchill/greenchill-certified-store-achievements*
[111] ATMOsphere (2023). Natural Refrigerants: State of the Industry. Available at: *https://issuu.com/shecco/docs/2022_atmo_marketreport*
[112] Global Transcritical CO_2 Systems Market by Function (Refrigeration, Air Conditioning, Heating), Application (Heat Pumps, Food Processing, Others), Region, Global Industry Analysis, Market Size, Share, Growth, Trends, and Forecast 2018 to 2025, FiorMarkets, March 2019. Report description available at: *https://www.fiormarkets.com/report/global-transcritical-co2-systems-market-by-function-refrigeration-376006.html.*

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and economic benefits via increased energy efficiency in some cases, though R-744 systems can experience declining efficiencies in high ambient temperatures.

Comment: In addition to the general retail food refrigeration comments discussed below, EPA received comments on the proposed GWP limits specific to supermarket systems. One industry commenter supported the proposed GWP limits of 150 and 300 based on the 200 lb charge size, in addition to the 300 GWP limit for the high temperature side of a cascade system. Another suggested either a 1,500 or 700 GWP limit, citing difficulties converting supermarkets to A2L refrigerants, and that EPA should allow economics to be a design factor. Similarly, another commenter objected to the 300 GWP limit for supermarkets with charge capacities less than 200 lb, citing heightened impacts on food deserts, which rely on small, local convenience stores for their access to food, and typically use smaller refrigerant capacity systems. Instead, the commenter suggested a 1,500 GWP limit for supermarket systems with charge sizes less than 50 lb.

Environmental groups urged EPA to finalize lower GWP limits than proposed for supermarket systems, decrease the proposed 200 lb charge size threshold to 50 lb or remove it entirely, and/or remove the distinction for the high temperature side of cascade systems. One commenter claimed that there is no need for indirect cascade systems when the same capacity direct expansion system can be designed with refrigerants that have GWPs less than 150. Another asserted that because R-744 is currently used in supermarkets in California, an area with a hot climate, such systems are therefore suitable for supermarkets across the country. Another commenter urged a 10 GWP limit for all charge sizes of supermarket systems, pointing to R-744 as the only currently acceptable option below the 150 GWP limit. They discussed how fluorinated substances like R-

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454C, with a GWP of 146, are not yet available on the market, will impose unknown costs to businesses, have significantly greater potential impacts on global climate change compared to R-744, and could pose environmental justice concerns not addressed by the proposed rule. This commenter also stated that having two GWP limits based on charge size could encourage manufacturers to move to smaller systems with higher-GWP HFCs instead of transitioning from HFCs altogether. The commenter expressed confusion over the Agency's proposal to set GWP limits up to 300, when other supermarket system refrigerant options in the 10 to 300 GWP range will be unavailable for use before the proposed January 1, 2025, compliance date.

Response: After review of the comments received, the Agency disagrees with assertions that EPA should adopt GWP limits as high as 700 or 1,500, or as low as 10, for this subsector. Instead, the Agency has determined that providing additional time for compliance, rather than increasing GWP limits, is a more appropriate way to address the concerns raised by commenters about the availability of substitutes for use in supermarket systems. As discussed in this section, a number of substitutes for use in this subsector are already currently available and in use in all regions of the country, and EPA has identified a number of additional substitutes that will meet the GWP limits at the levels the Agency proposed that will be available, consistent with the subsection (i)(4)(B) factors, by January 1, 2027. Therefore, EPA is finalizing the level of the GWP limits for supermarket systems as proposed.

The Agency does not agree that the higher limits suggested by commenters are reasonable in consideration of subsection (i)(4)(B) factors, given that many refrigerant options with GWPs lower than 150 and 300 are already available for use in this subsector. As other commenters noted, currently available substitutes include R-717,

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which can be used in secondary loop (indirect) supermarket refrigeration systems, and R-744, which can be used for centralized direct and indirect supermarket refrigeration systems. Many supermarket systems in various regions of the United States already use refrigerants with GWPs below the GWP limits, including R-744 even in warmer climates. Additionally, consistent with the Agency's position at proposal that the options for this subsector will continue expand, EPA's SNAP program has recently listed two non-flammable blends, R-471A (GWP 144) and R-515B (GWP 287), as acceptable for use in supermarket systems.[113]

Similarly, the Agency does not agree that a higher GWP limit (*e.g.*, 1,500 GWP) is appropriate for systems with refrigerant charge capacities less than 200 lb, including those with charge sizes less than 50 lb as requested by one industry commenter. EPA recognizes that convenience stores and smaller food retailers can be critical to communities, sometimes referred to as food deserts, that are not served by larger supermarkets. However, these establishments often do not use supermarket systems, as described in this subsector, but rather use smaller charge systems such as self-contained cases and remote condensing units. Many currently available models of self-contained cases are already using refrigerants with a GWP of less than 150, and, as discussed in section VI.F.1.c.iii., EPA has determined that, given existing and expanding options of lower-GWP refrigerants, new remote condensing units will be able to meet the 150 and 300 GWP limits by January 1, 2026. Even some larger supermarkets are implementing innovative designs using stand-alone equipment or smaller, remote condensing units operating with R-744 or hydrocarbon refrigerants, such as R-290 and R-600a, to

[113] 88 FR 61977 (Sept. 8, 2023).

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supplement, or even replace, supermarket rack systems. See the *Availability of Substitutes TSD* for further information on available HFC and HFC-blend substitutes for supermarket systems. We therefore do not agree that a GWP limit of up to 1,500 is necessary to ensure that smaller supermarkets or convenience stores, which we agree are critical for food security in certain communities, have options for new equipment.

In addition to R-744, R-717, and hydrocarbons that are already available for use in this subsector, and the recently listed R-471A and R-515B, EPA has proposed to list HFO-1234ze(E), HFO-1234yf, R-457A, R-516A, R-455A, R-454C, R-454A (with GWPs of 1, 1, 137, 140, 146, 146, and 237, respectively) as acceptable, subject to use conditions, under SNAP for use in supermarket systems. All of these substances meet the GWP limit of 300 for this subsector, and all except R-454A meet the GWP limit of 150. Although the already available substitutes have been evaluated by EPA to be sufficient to meet these restrictions, the potential for a greater array of options in the future will further ease the transition to lower-GWP refrigerants. EPA continues to encourage innovation of refrigerants that meet these restrictions and anticipates the number of substitutes available for use in supermarket systems will continue to grow. ASHRAE continues to receive applications for the designation of new refrigerants in the ASHRAE 34 standard. There has also been a notable increase in submissions for new refrigerants under EPA's SNAP program for this subsector. As discussed further in EPA's response to comments regarding the compliance deadline for supermarket systems, below, EPA understands that allowing additional time to comply will provide an opportunity for the applicable UL safety standard updates to be reflected in ways that will continue to increase the availability of substitutes for use in this subsector.

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While EPA is not certain what was meant by the comment to "allow economics to be a design factor," EPA agrees that the AIM Act's phasedown of HFCs will mean that HFCs will become increasingly scarce, and scarcity may lead to price increases in the event that demand also remains high. However, EPA does not agree that the HFC phasedown established by the AIM Act negates the need to promulgate regulations under subsection (i) including the establishment of GWP limits for supermarket systems.

EPA is also not electing to establish restrictions as low as 10 GWP for this subsector, even though, as commenters pointed out, some of the refrigerants available for use in supermarket systems, such as R-744 and R-717, have very low GWPs. EPA does not agree that it is appropriate to adopt restrictions based only on the lowest GWP substitutes, as doing so would inappropriately limit the overall availability of substitutes to meet the restrictions. Rather, EPA has established limits for this subsector to encourage the continued development and innovation of substitutes, and to ensure that there will be sufficient substitutes to support a smooth transition of this subsector away from higher-GWP HFCs. See section VI.E.5 for further discussion on EPA's decision not to tailor restrictions to the GWPs of specific substitutes.

Regarding the request for EPA to use a 50 lb or lower refrigerant charge capacity rather than a 200 lb capacity as the threshold between the 150 GWP limit and the 300 GWP limit, EPA does not agree that a 50 lb refrigerant charge capacity threshold is appropriate in this context. Further discussion on EPA's decision to finalize the 200 lb cutoff and the distinction of a high temperature side of cascade systems when setting GWP limits can be found in section VI.F.1.a.

For these reasons, in addition to those described in the Agency's response to comments that are relevant to all of retail food refrigeration, EPA is finalizing the 150

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and 300 GWP limits for the supermarket systems subsector as proposed and is extending compliance dates to mitigate some of the concerns raised by the commenters regarding availability of substitutes in the near term.

Comment: In addition to the comments received on compliance dates applying to all of retail food refrigeration, two commenters urged EPA to provide additional time to comply for supermarket systems, specifically. One commenter requested a January 1, 2026, compliance date to provide additional time for A2L design development. Another commenter requested flexibility based on availability of refrigerants, installation availability, and other supply chain constraints and objected to EPA's inclusion of R-454C, R-471A, and R-455A as available substitutes given they are not SNAP-approved.[114] The commenter noted that even if such options were SNAP-approved, building codes limit the implementation of A2Ls in supermarkets and would also need to be updated prior to A2L use. They also referenced challenges related to R-744 systems, noting strained supply as the global market turns to R-744, technological challenges, limited technical expertise, and increases in energy costs when used in warmer climates. Additionally, one comment from industry appears to apply to the entire retail food refrigeration section subsector, but EPA considers many of the concerns described to be mostly relevant to supermarket systems. This comment requested a 2032 compliance date for retail food refrigeration and can be found summarized in section VI.F.1.c.

Response: After review of the comments received regarding the proposed January 1, 2025, compliance date for retail food refrigeration, generally, and supermarket

[114] As discussed in section VI.E.2, EPA considers the listing of substitutes as acceptable under the SNAP program, which evaluates safety and other characteristics, to be informative in its evaluation of the availability of those substitutes.

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systems, specifically, EPA is finalizing a compliance date of January 1, 2027, for supermarket systems.

EPA understands that supermarket systems planning to transition to lower-GWP substitutes may need building codes to be updated before transitioning to mildly flammable, flammable, or toxic refrigerant options in certain jurisdictions. As discussed in the Building Codes TSD, such updates can take several years, and many jurisdictions have yet to adopt recent editions of safety standards that permit the use of flammable or toxic refrigerants in larger quantities through the requirement of additional mitigation strategies. However, to date, the vast majority of States have amended their regulatory codes or have passed legislation to specifically permit the use of SNAP-listed low-GWP refrigerants. Fewer than a dozen States still require additional legislative or regulatory updates to permit the use of low-GWP refrigerants in building codes.[115] EPA is aware of ongoing efforts by industry groups and other stakeholders to work with State and local officials to update building codes to allow for alternative refrigerants. EPA has had and will continue to have discussions concerning agency rulemaking and meet with relevant stakeholders, including State officials. In providing two additional years for compliance, EPA is enabling those remaining jurisdictions to update their building codes or legislation accordingly, an approach recommended by many industry commenters. However, EPA can consider a substitute to be available before every building code in every jurisdiction across the United States permits its use (*see* section VI.E.2).

EPA recognizes that for certain subsectors, moving to flammable refrigerants will require new design considerations, equipment testing, trainings, and safety precautions.

[115] See Building Codes TSD at 5-6.

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However, many food retailers already use hydrocarbons for other retail food refrigeration subsectors such as stand-alone units, and that experience will ease the adoption of flammable refrigerants in this subsector. Design, testing, and implementation of A2L refrigerants in future stores is underway, but still ongoing. Therefore, EPA is delaying the compliance date for this subsector to better accommodate the design cycle of equipment following adoption of safety standards and to ensure availability of substitutes for use, as one of the factors considered.

EPA disagrees that finalizing a compliance date as late as 2032 for supermarket systems would be appropriate, given that supermarkets across the country, in varied climates, have already successfully transitioned to refrigerants meeting the limits finalized in this rule. As discussed in detail in responses to comments regarding the adoption of updates to safety standards UL 60335-2-89 in section VI.F.1.c, EPA considered the impacts and required timing needed to reflect the updates to those safety standards in building code updates, SNAP listings, equipment testing and design, and service technician training, and the Agency accordingly adjusted a number of compliance deadlines for the restrictions applicable to the retail food refrigeration subsector. EPA's finalization of the January 1, 2027, compliance date for the supermarket systems subsector reflects the time necessary for those remaining issues associated with safety standard updates to be resolved. We note that the safety standards were updated in 2021, and many commenters from industry indicated that a one-year extension to January 1, 2026, would be sufficient to resolve remaining issues. The additional two years beyond the proposed compliance date provided in this final action will ensure that the handful of States and jurisdictions (fewer than a dozen) that do not yet allow for use of newer refrigerants (*e.g.*, lower flammability refrigerant blends) will make needed updates to

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building codes or laws, that industry continues training technicians to install and service these systems, which EPA acknowledges will differ compared to other types of servicing needs, and will provide necessary time for equipment design and testing. Further, EPA recognizes the costs associated with moving to substitutes, but the relative cost difference of using substitutes in place of HFCs will diminish over time as the phasedown continues. The AIM Act's phasedown of HFCs will mean that HFCs will become increasingly scarce, and scarcity may lead to price increases in the event that demand also remains high. In this respect, the estimated costs are conservative because such effects are not incorporated into the analysis in the RIA Addendum or the Costs and Environmental Impacts TSD. Moreover, as detailed in the Costs and Environmental Impacts TSD, EPA is assuming cost savings accrue over time with the transition to CO_2 supermarket systems. Information from industry commenters showed that four different types of CO_2 supermarket systems displayed lower energy consumption compared to the baseline system in the most populous city in the United States (New York), two CO_2 supermarket system types resulted in lower energy use in the second most populous city in the United States (Los Angeles), and one type of CO_2 supermarket system reduced energy consumption in all cities shown, by 10% (Houston) to 35% (New York).[116]

Although noted as available substitutes in the proposed rule and TSD, EPA recognizes that refrigerants such as R-454C and R-455A have not yet been SNAP-approved for use in supermarket systems. However, following the updates to UL 60335-2-89, discussed in greater detail in section VI.E.2.c and VI.F.1.c, EPA has proposed to list many additional refrigerant options as acceptable for use in supermarket systems,

[116] January 30, 2023. Available at *https://www.regulations.gov* in Document ID No. EPA-HQ-OAR-2021-0643-0209.

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including HFO-1234ze(E), HFO-1234yf, R-457A, R-516A, R-455A, R-454C, R-454A (with GWPs of 1, 1, 137, 140, 146, 146, and 237, respectively). Further, since the proposed rule, EPA's SNAP program has listed additional lower-GWP substitutes as acceptable for use in supermarket systems (September 8, 2023; 88 FR 61977), including R-471A and R-515B (with GWPs of 144 and 287, respectively). EPA anticipates that by the extended deadline of January 1, 2027, manufacturers will have more available substitutes from which to select for the design of new systems, and that the additional time will allow further research, development, and safety testing of new equipment using newer refrigerants. For these reasons, in addition to those described in the Agency's response to comments that are relevant to all of retail food refrigeration, EPA has determined extending the compliance date for supermarket systems by two years to be reasonable. This approach is consistent with many of the comments received from industry, including large trade associations that represent this subsector.

d. Vending Machines

Vending machines are a type of self-contained commercial refrigeration product that includes mechanical and electronic components required to secure, sell, and dispense refrigerated food and beverages, including cold drinks in cans or bottles, ice cream, milk, cold drinks in cups, and perishable food items. Hot beverages may also be provided via a heat pump or through recycled waste heat from the refrigeration cycle, particularly for dual hot/cold beverage vending machines.

Lower-GWP refrigerants, primarily R-290 and R-744, are technologically achievable for use in vending machines and the use of these substitutes is increasing, indicating commercial demands. Two of the largest vending machine customers in the

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U.S. market, Coca-Cola and PepsiCo, have been using R-744 over the past decade.[117,118] Industry safety standards and model building codes were also revised in 2021 to allow the use of other lower-GWP substitutes. ASHRAE amended the safety standard ASHRAE 15 to allow vending machines with up to 114 grams of R-290 to be used in locations where they were not previously allowed under previous editions of industry standards. UL also modified standard UL 541, "Standard for Safety for Refrigerated Vending Machines," covering this equipment "for the unrestricted placement of vending machines refrigerated with advanced, environmentally-friendly coolants."[119] Beginning January 1, 2020, the National Automatic Merchandising Association (NAMA) Foundation partnered with DOE in a two-year, $400,000 cooperative research and development agreement on energy efficient vending machines utilizing refrigerants such as R-290.[120]

For its consideration of availability of substitutes under subsection (i)(4)(B), EPA identified available substitutes in place of the restricted substances, including R-290 (GWP 3.3), R-600a (GWP 1), R-744 (GWP 1), and R-441A (GWP 3). Other refrigerants that meet this GWP limit and are currently under development and evaluation include R-451A (GWP 147), R-454C (GWP 146), R-455A (GWP 146), R-457A (GWP 137), R-471A (GWP 144), and R-476A (GWP 147).

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[117] Coca-cola, January 2014, Coca-cola Installs 1 Millionth HFC-Free Cooler Globally, Preventing 5.25MM Metric Tons of CO_2. Available at: *https://www.coca-colacompany.com/press-releases/coca-cola-installs-1-millionth-hfc-free-cooler*.
[118] PepsiCo, 2020. Sustainability Focus Area: Climate. Available at: *https://www.pepsico.com/our-impact/sustainability/focus-area/climate*.
[119] Karnes, B, March 2021, Revisions to UL 541, the Standard for Refrigerated Vending Machines. Available at: *https://www.ul.com/news/revisions-ul-541-standard-refrigerated-vending-machines.*
[120] NAMA, 2019. NAMA Foundation Annual Report 2019. Available at: *https://namanow.org/wp-content/uploads/2019-NAMA-Foundation-Annual-Report.pdf.*

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What restrictions on the use of HFCs is EPA establishing for vending machines?

EPA is prohibiting the manufacture and import of vending machines that use HFCs and blends containing HFCs that have a GWP of 150 or greater beginning January 1, 2025. Effective January 1, 2026, EPA is prohibiting the subsequent sale, distribution, offer for sale or distribution, or export of new vending machines manufactured or imported before January 1, 2025, that use HFCs with GWPs that exceed the limit. EPA is finalizing both the GWP limit and compliance date for vending machines as proposed.

Comment: EPA received one comment disagreeing with the proposed 150 GWP limit for vending machines. This commenter requested a 300 GWP limit instead, citing the proposed limit as unnecessary and unrealistic.

Response: EPA disagrees with the commenter that setting a vending machine GWP limit at 300 would be appropriate. Already, models with very low-GWP refrigerants such as R-744 and R-290 are available, providing substitutes for higher-GWP HFCs and HFC blends. For example, Coca-Cola had installed 1.5 million beverage coolers, fountains, and vending machines using R-744 or R-290 worldwide and almost 100,000 such pieces of equipment in North America by 2015.[121] Further, DOE and vending machine manufacturers worked together beginning December 2019 and identified R-290 as a "viable, business-tenable and sustainable alternative" to high-GWP refrigerants as of 2022.[122] Current information shows that there are refrigerants available

[121] Coca-Cola's HFC-free cooler count reaches 2.5 million", R-744.com, dated November 29, 2017. Available online at *https://r744.com/coca-cola-hfc-free-coolers-count-reaches-2-5-million/*

[122] **"**NAMA Partners With DOE On More Energy-Efficient Vending Machines," Vending Times, Dec. 16, 2019. Available online at: *https://www.vendingtimes.com/blogs/nama-partners-with-doe-on-more-energy-efficient-vending-machines*; Press release, "NAMA Presses Congress on ERTC Fix During 2022 Fly-In & Advocacy Summit," July 18, 2022. Available online at: *https://namanow.org/nama-presses-congress-on-ertc-fix-during-2022-fly-in-advocacy-summit*

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with a GWP of less than 150 for vending machines. Therefore, EPA is finalizing the GWP limit for this subsector as proposed.

Comment: EPA received one comment requesting EPA extend the proposed January 1, 2025, compliance date for vending machines noting that even the petitioned January 1, 2026, date by AHRI was too early. The commenter cited barriers to transition including the supply chain for components, outdated building codes, safety standards and their respective testing and listing requirements, and the necessity of satisfactory performance for food industry equipment for maintaining food safety.

Response: In consideration of the comment received and the availability of substitutes for use in this subsector, EPA is finalizing the January 1, 2025, compliance date for vending machines as proposed. The Agency recognizes that there are challenges associated with moving to more flammable refrigerant options, however, the commenter itself stated that some of the products have already changed to lower-GWP refrigerants identified by EPA. R-744 has also been in use for over a decade, signaling that the transition for vending machines is well underway. Vending machines have smaller charge sizes than other types of commercial refrigeration equipment and are therefore less affected by building codes. Relevant standards have already been updated to allow up to 114 g of A3 refrigerant in vending machines, with many models already using R-290. Non-flammable refrigerants like R-744 have also been implemented in models where flammability may pose greater safety concerns. EPA understands that NRTLs must test and list new equipment to certify compliance with various safety standards. However, given that much of the subsector has already transitioned, fewer models will need to be updated and certified to comply with restrictions by the date of compliance. Therefore, for the reasons described, EPA is finalizing the compliance date as proposed.

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e. Cold Storage Warehouses

Cold storage warehouses are refrigerated facilities used for the storage of temperature-controlled substances. Refrigeration systems within cold storage warehouses can be divided into two categories: central plant systems and packaged systems. Central plants are custom-built refrigeration systems that are typically used in large refrigerated warehouses with cooling capacities that range from 20 to 5,000 kW. Central plant systems deliver cool air to the refrigerated space through evaporators, which are typically suspended from the ceiling in the refrigerated space. The evaporators are connected through a piping network to multiple compressors located in a central machine room, and a condenser, which is typically mounted outside near the compressor. Central plant systems may have a direct or indirect (secondary loop) design. Direct systems circulate a primary refrigerant throughout the refrigerated space. In an indirect system, a primary refrigerant cools a secondary refrigerant in the machine room, and the secondary refrigerant is then circulated throughout the refrigerated space.

Packaged systems (also known as unitary systems) are self-contained systems that combine an evaporator, compressor, and condenser in one frame. Packaged systems are commonly installed on the roof of a refrigerated warehouse above the air-cooling units that are within the refrigerated space. The evaporator is located inside the refrigerated space while the condensing unit, which is usually protected by weather resistant housing, is located outside. Packaged systems are most commonly used in small, refrigerated warehouses that have a capacity of 20 to 750 kW.

In response to the phaseout of ODS under the CAA and the Montreal Protocol, many cold storage warehouses transitioned from using CFCs to HCFC-22, and then later

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from HCFC-22 to HFCs—primarily R-404A and R-507A, which have GWPs of 3,922 and 3,985, respectively.[123] Manufacturers transitioned to R-717, as well.

What restrictions on the use of HFCs is EPA establishing for cold storage warehouses?

As proposed, EPA is prohibiting the installation of new cold storage warehouse systems using HFCs and blends containing HFCs with a GWP of 150 or greater when the system's refrigerant charge capacity is equal to or greater than 200 lb. For cold storage warehouse systems with refrigerant charge capacities less than 200 lb and for the high temperature side of cascade systems, EPA is establishing a GWP of 300. In response to comments received on the proposal, EPA is finalizing a compliance date of January 1, 2026, one year later than the proposed compliance date of January 1, 2025.

As with supermarket systems, IPR systems, and remote condensing units, EPA is distinguishing between larger cold storage warehouse systems and smaller systems with a refrigerant charge capacity of 200 lb being the dividing line. EPA is also establishing a higher GWP limit of 300 for the high temperature side of a cascade system, based on safety standards as discussed in section VI.F.1.a of the preamble.

For its consideration of availability of substitutes under subsection (i)(4)(B), EPA identified several substitutes that are available in place of the substances that EPA is restricting. For systems with refrigerant charge capacities equal to or greater than 200 lb, these include R-717 vapor compression (GWP 1), R-744 (GWP 1), and HCFO-1233zd(E) (GWP 4). Another substitute is R-471A (GWP 144), which SNAP has listed as acceptable for cold storage warehouse use under Notice 38 (88 FR 61977, September 8, 2023). Additionally, EPA has proposed to list as acceptable R-454C (GWP 146) for

[123] Refrigeration, Air Conditioning, and Heat Pumps Technical Options Committee 2018 Assessment Report, Technical and Economic Assessment Panel, UNEP, February 2019. Available at: *https://ozone.unep.org/sites/default/files/2019-04/RTOC-assessment-report-2018_0.pdf.*

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use in larger cold storage warehouse systems and R-454A (GWP 237) for use in smaller systems, subject to use conditions. Other low-GWP refrigerants EPA has proposed acceptable for these systems are HFO-1234yf (GWP 1), HFO-1234ze(E) (GWP 1), R-457A (GWP 137), and R-516A (GWP 140). (88 FR 33722, May 24, 2023). Newer technologies with smaller charge sizes of R-717 that are removed from the general public are low-charge packaged ammonia systems, ammonia/CO_2 cascade systems, and ammonia secondary loop systems.[124] Given that EPA's evaluation of these refrigerants is underway, the Agency anticipates additional substitutes below the GWP limits may be available for use in this subsector in the future. Several other types of systems that operate using thermodynamic cycles other than vapor compression such as absorption, evaporative cooling, desiccant cooling, and Stirling cycle systems can also be used in this subsector and may be appropriate for meeting the restrictions finalized.

A significant portion of cold storage warehouses have transitioned from, or completely avoided, using higher-GWP HFCs. Most cold storage warehouses in the United States use R-717. ASHRAE designates R-717 as a lower flammability, higher toxicity (B2L) refrigerant and it is not used extensively in many other subsectors of the RACHP sector. However, many users consider R-717 to be a cost-effective option for use in cold storage warehouses given its long-standing use, lower cost per kilogram, and energy savings[125] despite a higher capital cost for the equipment compared to HFC systems. Certain characteristics of cold storage warehouses also tend to reduce their proximity to people and thus the risk of using R-717. For example, because cold storage

[124] ICF, 2016. Market Characterization: Fire Suppression, Commercial Comfort Cooling, Cold Storage, Refrigerated Food Processing and Dispensing Equipment, and Household Refrigeration Industries in the United States. Prepared for U.S. EPA. March, 2016.
[125] Ibid.

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warehouses are often large in order to achieve economies of scale and require a large amount of land use—as opposed to other systems that might be located on a building roof or a small slab next to the building—they are typically located away from population centers where land costs and taxes may be higher. In addition, the transportation of goods is typically done in large volumes—by truck or train—to reduce costs, which in turn reduces the workforce needed and the number of people at the warehouse and, in particular, near the refrigeration equipment.

Comment: Several commenters generally supported EPA's proposed GWP limit of 150 for commercial refrigeration equipment with over 200 lb of refrigerant charge; however, many of these commenters recommended that EPA eliminate or modify the GWP limit of 300 that was proposed for charge sizes less than 200 lb. Some commenters recommended a 50 lb charge size threshold and noted this would be consistent with California's regulations. One group described a 10 lb charge capacity cutoff as more appropriate than 200 lb and recommended a single GWP limit of 10 for all charge sizes. A summary of other comments related to the GWP restrictions and charge sizes can be found in the IPR section VI.F.1.a.

Response: After review of the comments received, EPA is finalizing, as proposed, a 150 GWP limit for units with refrigerant charge capacities greater than or equal to 200 lb, a 300 GWP limit for new cold storage warehouses with refrigerant charge capacities less than 200 lb, and a 300 GWP limit for units in the high temperature side of cascade systems, irrespective of the charge capacity. See response above in the IPR section VI.F.1.a for more discussion about the relationship between GWP restrictions and charge size.

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Comment: One commenter objected generally to the proposed GWP limits for cold storage warehouses due to a lack of available replacement technology sufficient for transition. Many commenters expressed that EPA's proposed GWP limits may require the use of toxic and/or flammable refrigerant options and stated that for safety reasons, A1 refrigeration options are needed for their operations.

Response: EPA does not agree with the commenters' assertions that there is a lack of available alternatives. The Agency noted a number of available alternatives earlier in the section, in the proposed rule, and in other supporting information. EPA identified several substitutes in place of the restricted substances for cold storage warehouses. Of these, options with an ASHRAE classification of A1 (low toxicity, nonflammable at standard conditions) are HCFO-1233zd(E) and R-471A.

Comment: One commenter expressed support for the proposed 2025 transition date for commercial refrigeration, including cold storage warehouses. Some commenters requested a date of January 1, 2026, to allow for updated building codes, equipment readiness, testing of new refrigerants, and SNAP listing of replacements. Many commenters stated the compliance dates are unrealistic, and that more time was needed for manufacturers to find a solution that can be designed, tested, sold, and produced by these dates. One commenter stated the compliance date of January 1, 2025, is extremely challenging for cold storage warehouses, and a major limitation on the HFC transition was the lack of SNAP-approved low-GWP listings for refrigeration, hindering their ability to conduct field trials and installations. See other comments related to the proposed compliance date in IPR section VI.F.1.a.

Response: After review of the comments received applicable to the proposed compliance date for cold storage warehouses, and consideration of the (i)(4) factors under

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the AIM Act, EPA is finalizing a compliance date of January 1, 2026, rather than the proposed date of January 1, 2025. EPA's assessment is that in many cases cold storage warehouses already use refrigerants with GWPs below the limit the Agency is finalizing today; however, the Agency's understanding, informed by the comments, is that for certain situations, particularly where updates for building codes are necessary, additional time is needed. EPA does not agree with the commenters' assertions that there is a lack of available alternatives. As described above, EPA identified several substitutes in place of the restricted substances for cold storage warehouses. For EPA's response to these comments and discussion on the Agency's decision to provide an additional year to comply, see section VI.F.1.e.

Comment: Many commenters expressed some opposition to EPA's comment that cold storage warehouses are typically located away from population centers, reducing their proximity to people and thus reducing the risk of using R-717. The commenters stated that cold storage warehouse locations are based on market demand, land, and freight costs, but for servicing reasons, they must be close to the population centers.

Response: EPA acknowledges there may be certain circumstances where it is beneficial for cold storage warehouses to be built near population centers; however, EPA understands that there has been and continues to be a tendency for cold storage warehouses to be located away from densely populated areas for the reasons described above. Other alternative refrigerants besides R-717 are available, as noted above, which can be used if the cold storage warehouse is located in closer proximity to people.

f. Ice Rinks

Ice rinks use a system of refrigeration equipment to move a fluid through pipes embedded in concrete flooring to freeze layers of water. Ice rinks may be used by the

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public for recreational purposes as well as by professionals. These systems frequently use secondary loop refrigeration systems, in some cases consisting of a chiller along with associated pumps that move the chilled water or glycol working fluid. Another configuration sometimes used is a direct expansion system wherein the refrigerant flows under the ice and directly back to a compressor and condenser. System capacities vary based on the size of the ice rink and the required cooling load. Typical sizes for ice rink chillers are 50-, 100-, 150-, or 200-ton units. The ice surface is ideally maintained between 24 to 28 °F (-4.4 to -2.2 °C) depending on the application and users of the ice rink (*e.g.*, figure skating versus hockey).

Ice rinks used CFC/HCFC refrigerants prior to restrictions under the Clean Air Act, and then higher-GWP HFC blends such as R-404A and R-507A. More recently, some ice rinks used the HFCs blends R-449A, R-450A, and R-513A. R-717 and R-744 are also commonly used.

What restrictions on the use of HFCs is EPA establishing for ice rinks?

EPA is prohibiting the installation of ice rink systems using HFCs or blends containing HFCs that have a GWP of 700 or greater beginning January 1, 2025. EPA had proposed restrictions for installation of new ice rinks to begin January 1, 2025, but had proposed a GWP limit of 150 rather than 700.

For its consideration of availability of substitutes under subsection (i)(4)(B) at proposal, EPA identified the following available substitutes: R-717 (GWP 1), R-744 (GWP 1), and HCFO-1233zd(E) (GWP 4). R-471A (GWP 144) also meets the GWP limit and can serve as a potential substitute. Under the restriction being finalized, R-450A (GWP 601) and R-513A (GWP 630) are also potentially available substitutes.

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Most new ice rinks use R-717 as a refrigerant due to its energy efficiency, while others are being designed to use R-744 and other lower-GWP substitutes.[126] Although R-717 is a B2L (higher toxicity, lower flammability) refrigerant, risks to the general public are addressed by confining the R-717 to separate equipment (*i.e.*, the high-temperature side of a chiller) in locations with access limited to trained service personnel only. In TSDs submitted with their petition, CARB estimated that more than 80 percent of ice rinks in California use R-717.[127] According to EIA's petition, a majority of National Hockey League ice arenas also employ R-717, and the use of R-744 is becoming an increasingly popular option for ice rinks. This information indicates the technological achievability and commercial demand of these substitutes.

In areas where safety or toxicity reasons prevent the use of R-717, lower-GWP (hydrochlorofluoroolefin) HCFO or HFO chillers and lower-GWP transcritical R-744 systems are options available for use in ice rink systems. EPA has also recently listed HCFO-1233zd(E) as acceptable through the SNAP program for use in new ice rinks (87 FR 3037, January 20, 2022).

Comment: A few commenters suggested that the GWP limit for ice rinks be increased to 700. The commenters proposed chillers and ice rinks be categorized the same since chillers are used for ice rinks, except for minor differences in certain components and controls. The commenters stated that this would also prevent costs and delays that would occur by making a specialized category for ice rinks. Increasing the

[126] Packages – Design and Build, Toromont|CIMCO Refrigeration. Available at: *https://www.cimcorefrigeration.com/packages-design-build*.
[127] Staff Report: Initial Statement of Reasons, CARB, October 2020. Available at: *https://ww2.arb.ca.gov/rulemaking/2020/hfc2020.*

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GWP limit to 700 would preserve the ability for industry to have a wider choice of refrigerant options.

One commenter expressed support for the GWP limit of 150 and noted that there is no clear information available to suggest a significant number of jurisdictions have local codes that do not allow the use of R-717. Ammonia has been widely used for many years and other refrigerant systems using less than 150 GWP refrigerants, including R-744 systems, are available for use in locations that prefer to avoid use of R-717.

Response: After review of the comments received, EPA is finalizing a 700 GWP limit for ice rinks. The Agency maintains that there are available substitutes with GWPs below 150; however, EPA is applying a 700 GWP limit to use of HFCs in ice rinks because EPA agrees with commenters that many of these refrigerant systems would utilize chillers that are available for other applications. Most ice rink systems are similar to chillers and frequently use secondary loop refrigeration systems, which typically cool water, that is circulated for cooling purposes. In most chiller applications the cool water or working fluid is used for comfort cooling throughout a building or other location, but for ice rinks, the cool water or working fluid is used to freeze layers of water, which forms the ice. Although the water or working fluid may be used for different cooling purposes in each application, equipment used across these two subsectors is commonly used interchangeably. We therefore agree that ice rinks and chillers should be similarly restricted under this rule. Because ice rinks typically maintain the ice surface between 24 and 28 °F (-4.4 to -2.2 °C), it is inappropriate to adopt the temperature thresholds of -30 °C (-22 °F) and -50 °C (-58 °F) that apply to chillers for comfort cooling and for IPR.[128]

[128] EPA is not combining the categories of chillers and ice rinks in this rule, nor does EPA plan to change the SNAP end-uses to combine chillers and ice-skating rinks into a single end-use.

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With respect to the comments requesting a GWP limit of 700, the Agency agrees that this limit is reasonable under the (i)(4) factors and with the technical similarities to chillers. While the Agency acknowledges more substitutes may be available with a GWP limit of 700, including R-450A and R-513A, the Agency understands that the lower GWP refrigerants like R-744 will continue to be used for both ice rinks with chillers and direct expansion ice rinks. R-717 will typically be used in chillers together with brine, CO_2, or another secondary fluid. As noted by a commenter, the use of R-717 in ice rinks may be restricted in a small number of jurisdictions, and in light of these potential limitations of R-717 due to flammability and toxicity risks, especially the direct expansion ice rinks where the refrigerant is sent directly to evaporators to form the ice. Therefore, EPA is establishing a GWP limit that retains more refrigerant options for this subsector.

In addition to the lower-GWP refrigerants already available, EPA continues to evaluate substitutes under the SNAP program, and has authority to do so under subsection (i)(5) as well, on an ongoing basis. The Agency anticipates that this continuing evaluation of additional substitutes, including for use in ice rinks, may expand further the availability of more options for compliance by January 1, 2025. For example, under the SNAP program, in SNAP Rule 26 EPA has proposed to list as acceptable subject to use conditions several additional refrigerants that would comply with today's final rule, for use in ice rinks with a remote compressor: HFO-1234ze(E), HFO-1234yf, R-457A, R-516A, R-455A, and R-454C (with GWPs of 1, 1, 137, 140, 146, and 146, respectively) (88 FR 33722; May 24, 2023). These refrigerants are classified as A2L and may face challenges for direct expansion ice rinks in some jurisdictions. Therefore, for ice rinks EPA is finalizing a GWP limit of 700 consistent with the GWP limit for chillers

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given the technical similarities of these subsectors and given the need for additional options for direct expansion ice rinks.

g. Automatic Commercial Ice Machines

Automatic Commercial Ice Machines (ACIMs), either self-contained or remote condensing, are used in commercial establishments such as hotels, restaurants, and convenience stores to produce ice for consumer use. For purposes of this rule, ice-making equipment used in residential settings are covered under household refrigerators and freezers. Self-contained units are a type of ACIM in which the ice-making mechanism and the storage compartment, if provided, are in an integral cabinet. They contain both evaporator and condenser, have no external refrigerant connections, and are entirely factory-charged with refrigerants and factory-sealed, generally containing smaller refrigerant charges. These products are analogous to other self-contained equipment, such as vending machines and stand-alone refrigerated display cases.

Remote condensing ACIMs have the condenser separated from the portion of the machine making the ice and have refrigerant lines running between the two. Like other types of remote condensing RACHP systems, remote condensing ACIMs utilize a split-system design where the evaporator (which freezes water into ice) is located indoors, while the condensing unit (which rejects heat, usually to surrounding air although water cooling is also a possibility) is located elsewhere, such as outside the building. In remote-compressor systems, a type of remote condensing ACIM, the heat is still rejected away from the ice-making evaporator, either inside in a separate room or outdoors, but the compressor is located outdoors via interconnected refrigerant piping. These designs require field-assembled refrigerant piping to connect the indoor unit with the remote condensing unit, which significantly increases its necessary refrigerant charge in

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comparison to that of a self-contained unit. Modular ice machines are designed to sit on top of a separate unit, such as an ice bin, beverage machine, or ice dispenser and typically produce 250 to 1,000 lb of ice per day. Higher glide refrigerant blends have not been typically used as substitutes for remote condensing ACIMs.

ACIMs can also be divided between batch type machines (*e.g.*, providing cubed ice) and continuous type machines (*e.g.*, providing flaked ice). Batch type (also called cube type) ice machines harvest ice with alternating freezing and harvesting periods. Batch type ACIMs can be used in a variety of applications but are generally used to generate ice for use in beverages. Batch type ACIMs are often employed in hotels, hospitals, and restaurants where beverages are served. Continuous type ice makers produce ice through a continuous freeze and harvest process and include flake and nugget ice machines. Flake ice is used primarily in food displays, such as seafood grocery store displays or salad bars, whereas nugget ice (also known as chewable ice) is primarily used in beverage applications such as smoothies and blended cocktails.

R-404A and R-410A have been the most common HFC refrigerants currently used in ACIMs, which replaced the use of ozone depleting HCFCs such as R-22. R-404A is used in remote condensing ACIMs, while both R-404A and R-410A have been commonly used in self-contained ACIMs.

What restrictions on the use of HFCs is EPA establishing for automatic commercial ice machines?

For new batch type self-contained ACIMs with a harvest rate[129] less than or equal to 1,000 lb of ice per 24 hours, and new continuous type self-contained ACIMs with a

[129] The Department of Energy's regulations for commercial ice machines define harvest rate as "the amount of ice (at 32 degrees F) in pounds produced per 24 hours." 10 CFR 431.132. For purposes of this rule, the harvest rate of an ACIM shall be determined in accordance with 10 CFR 431.134.

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harvest rate less than or equal to 1,200 lb of ice per 24 hours, EPA is restricting the use of HFCs and HFC blends with GWPs of 150 or greater, beginning January 1, 2026.

For new batch type self-contained ACIMs with a harvest rate greater than 1,000 lb of ice per 24 hours, and new continuous type self-contained ACIMs with a harvest rate greater than 1,200 lb of ice per 24 hours, EPA is restricting the use of the following HFCs and HFC blends, beginning January 1, 2027: R-402A, R-402B, R-404A, R-407A, R-407B, R-407C, R-407F, R-408A, R-410A, R-410B, R-411A, R-411B, R-417A, R-417C, R-420A, 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-442A, R-507A, HFC-134a, R-125/290/134a/600a (55/1/42.5/1.5), RB-276, RS-24 (2002 formulation), RS-44 (2003 formulation), GHG-X5, G2018C, and Freeze 12.

For new remote condensing ACIMs, EPA is restricting the use of the following HFCs and HFC blends, beginning January 1, 2027: R-402A, R-402B, R-404A, R-407B, R-408A, R-410B, R-417A, R-421A, R-421B, R-422A, R-422B, R-422C, R-422D, R-424A, R-428A, R-434A, R-438A, R-507A, R-125/290/134a/600a (55/1/42.5/1.5), RS-44 (2003 formulation), and GHG-X5.

Currently available substitutes identified for self-contained ACIM where the harvest rate is less than or equal to 1,000 lb of ice per day (batch type) or 1,200 lb of ice per day (continuous type) include R-290 (GWP 3.3) and R-717 (GWP 1), and where the harvest rate is greater than that amount R-513A (GWP 630) and R-450A (GWP 601) are available substitutes. EPA has proposed to list many additional refrigerants as acceptable for use in ACIMs in proposed SNAP Rule 26 (88 FR 33722, May 24, 2023). Substitute refrigerants R-455A (GWP 146) and R-454C (GWP 146) also meet the restrictions and could serve as additional potential candidates for use in place of the HFCs and HFC

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blends that EPA is restricting in self-contained units. Other proposed refrigerants such as R-454B (GWP 465) and HFC-32 (GWP 675), which are being pursued for other R-410A applications, and R-448A (GWP 1,386), R-449A (GWP 1,396), R-449B (GWP 1,411), and R-454A (GWP 237), which are being pursued for other R-404A applications, are potential candidates for self-contained batch and continuous type ACIMs with harvest rates greater than 1,000 lb of ice per day and 1,200 lb of ice per day, respectively. Available substitutes for remote condensing ACIMs include R-448A, R-449A, R-449B, and HFC-134a.

EPA's proposed restrictions included: the use of HFCs and HFC blends with GWPs of 150 or greater for self-contained ACIMs with charge sizes less than or equal to 500 g, beginning January 1, 2025; the use of certain HFCs and HFC blends—R-404A, R-507, R-507A, R-428A, R-422C, R-434A, R-421B, R-408A, R-422A, R-407B, R-402A, R-422D, R-421A, R-125/290/134a/600a (55/1/42.5/1.5), R-422B, R-424A, R-402B, GHG-X5, R-417A, R-438A, R-410B, R-407A, R-410A, R-442A, R-417C, R-407F, R-437A, R-407C, RS-24 (2004 formulation), and HFC-134a—in new self-contained ACIMs with refrigerant charge capacities exceeding 500 g, beginning January 1, 2025; and the use of certain HFCs and HFC blends—R-404A, R-507, R-507A, R-428A, R-422C, R-434A, R-421B, R-408A, R-422A, R-407B, R-402A, R-422D, R-421A, R-125/290/134a/600a (55/1/42.5/1.5), R-422B, R-424A, R-402B, GHG-X5, R-417A, R-438A, and R-410B—in new remote condensing ACIMs, beginning January 1, 2025. In finalizing these lists of HFCs and HFC blends, we are correcting an error in the date of formulation for RS-24 and we are adding several blends that contain HFCs that were inadvertently left off the lists and that have higher GWPs than the proposed prohibited

HFC or HFC blend with the lowest GWP (HFC-134a for self-contained units and R-410B for remote systems).

EPA is finalizing three different sets of restrictions on the use of HFCs and HFC blends in ACIMs, depending on the type of equipment. Originally, the Agency proposed to set GWP limits for self-contained ACIMs based on charge capacity, rather than the harvest rate for ice production. However, in response to the comments received, the Agency has adjusted the categorization of self-contained ACIMs to distinguish equipment by its ice harvest (production) rate, rather than charge capacity, to better evaluate the availability of substitutes for use in the various applications in this subsector. Distinguishing self-contained ACIMs by harvest rate is consistent with the Department of Energy's energy conservation standards applicable to this subsector. Table 4 below summarizes the final restrictions on HFCs and their compliance dates for various ACIM applications.

Table 4: HFC Restrictions for Automatic Commercial Ice Machines

ACIM Type	Batch or continuous	Harvest Rate	HFC restriction	Compliance date
Self-contained	Batch	Less than or equal to 1,000 pounds ice per 24 hours	GWP less than 150	January 1, 2026
Self-contained	Continuous	Less than or equal to 1,200 pounds ice per 24 hours	GWP less than 150	January 1, 2026
Self-contained	Batch	Greater than 1,000 pounds ice per 24 hours	Listed blends prohibited: R-402A, R-402B, R-404A, R-407A, R-407B, R-407C, R-407F, R-408A, R-410A, R-410B, R-411A, R-411B, R-417A, R-417C, R-420A, 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-442A, R-507A, HFC-134a, R-125/290/134a/600a (55/1/42.5/1.5), RB-276, RS-24 (2002	January 1, 2027

			formulation), RS-44 (2003 formulation), GHG-X5, G2018C, Freeze 12	
Self-contained	Continuous	Greater than 1,200 pounds ice per 24 hours	Listed blends prohibited: R-402A, R-402B, R-404A, R-407A, R-407B, R-407C, R-407F, R-408A, R-410A, R-410B, R-411A, R-411B, R-417A, R-417C, R-420A, 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-442A,R-507A, HFC-134a, R-125/290/134a/600a (55/1/42.5/1.5), RB-276, RS-24 (2002 formulation), RS-44 (2003 formulation), GHG-X5, G2018C, Freeze 12	January 1, 2027
Remote condenser	All	All	Listed blends prohibited: R-402A, R-402B, R-404A, R-407B, R-408A, R-410B, R-417A, R-421A, R-421B, R-422A, R-422B, R-422C, R-422D, R-424A, R-428A, R-434A, R-438A, R-507A, R-125/290/134a/600a (55/1/42.5/1.5), RS-44 (2003 formulation), GHG-X5	January 1, 2027

Comment: EPA received several comments from industry on its proposed approach to categorizing ACIM equipment when setting restrictions. One commenter expressed support for setting GWP limits based on a 500 g charge capacity, as proposed. Another commenter disagreed with the proposed approach, and instead recommended the Agency distinguish equipment by the cooling capacity of the compressor, recommending 3,000 BTU/hr as a possible threshold between smaller and larger equipment. The commenter stated that this approach would better characterize the componentry requirements of the market to inform compressor manufacturers' product development, based on the exact cooling capacity needs of the OEMs. This same commenter stated that for equipment design engineers, this approach would clarify the refrigerants available for use at the point of compressor selection, rather than when selecting a refrigerant charge for the equipment, given that charge is subjective and can be adjusted based on the design preferences of the engineer. Similarly, another commenter also disagreed with using charge capacity to distinguish equipment; instead, they requested EPA categorize self-contained ACIMs by pounds of ice produced per 24 hours, analogous to DOE's energy

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conservation standards, recommending a 1,000 lb/day threshold when setting restrictions. This commenter described how the refrigerant charge could be manipulated by manufacturers to comply with the proposed restrictions that they viewed as more lenient—simply increasing the charge of equipment to surpass the 500 g threshold, even in cases where a smaller charge would provide sufficient cooling capacity.

One commenter disagreed with differentiating self-contained ACIMs by charge size, or any other factor related to the cooling capacity or harvest rate of the machine, and instead requested that all self-contained ACIMs be treated the same when setting restrictions. This commenter explained that for smaller self-contained equipment, only hydrocarbon refrigerants were viable options under the proposed restrictions, and that building codes may limit the refrigerant charge below what is necessary, even if updated safety standards have expanded the allowable charges for flammable refrigerants. By removing the proposed charge requirement in self-contained equipment, the commenter stated that smaller equipment would be able to continue using non-flammable refrigerants where flammable refrigerants may not be feasible.

Response: After review of the comments received, EPA is finalizing GWP limits for self-contained ACIMs based on the harvest rate of ice production rather than the proposed basis of charge size of the equipment. One commenter agreed with the proposed approach to setting restrictions and EPA has considered how the availability of substitutes for use in ACIMs is affected by various technical specifications and concludes that setting restrictions based on ice production rates better distinguishes equipment capable of meeting lower GWP limits from equipment that may need additional refrigerants with higher GWPs. One commenter recommended using the cooling capacity of the compressor as a threshold for setting restrictions; however, EPA understands

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through conversations with industry stakeholders that a categorization based on harvest rate of ice production per day is more familiar for ACIM manufacturers, is more likely to be considered by customers purchasing ACIMs than cooling capacity, and mirrors DOE's approach to setting energy conservation standards.

Setting restrictions for self-contained ACIMs based on the cooling capacity of their compressors is technically similar to the categorization finalized in this rulemaking—cooling capacity is directly related to the equipment's harvest rate of ice production. This equipment categorization approach will similarly clarify the cooling needs of OEMs for compressor manufacturers and help design engineers more easily identify which refrigerants are allowed in certain equipment, compared to the proposed approach of categorizing based on charge size. EPA also recognizes that equipment with near 500 g charges could face unclear restrictions on the use of certain HFCs and HFC blends, depending on how a design engineer chooses to design and charge the self-contained equipment. The ability to manipulate the charge of the system could generate a regulatory loophole for OEMs who could unnecessarily add refrigerant charge as a way to continue to use refrigerants with GWPs above the finalized restrictions. For these reasons, EPA is categorizing self-contained ACIM equipment based on the harvest rate of ice production, rather than on the refrigerant charge of the equipment.

In selecting the harvest rate of ice production threshold for distinguishing applicable restrictions, EPA considered the available substitutes for various types of ACIMs and how updates to relevant standards have affected the refrigerant options. All categories of ACIM are covered by UL Standard 60335-2-89. The 2nd edition of this standard, published in October 2021, recently increased the allowable charge limits for flammable refrigerants in commercial refrigeration equipment, including both higher- and

lower flammability refrigerants (ASHRAE flammability safety categories 2 and 3, and 2L). For self-contained equipment using R-290, UL 60335-2-89, 2nd edition increased the charge limit from 150 g per refrigerant circuit to either 300 g or 500 g per refrigerant circuit, depending on construction. For self-contained ACIM, the 2nd edition set a 300 g limit for R-290 for "packaged refrigerating units and appliances with doors and/or drawers enclosing one or more refrigerated compartments." (22.110 DV.2). This limit applies to "unprotected" designs where the refrigerant can leak into the ice storage bin. For protected units, in which the refrigerant cannot leak into the bin, 500 g of R-290 (and a similar amount for other A3 refrigerants) is allowed in the 2nd edition. Further, UL 60335-2-89 restricts the allowable charge size of flammable refrigerant in these appliances for "self-contained appliances used in a public corridor or lobby" (22.110 DV.2). Certain flammable refrigerants (*i.e.*, A3s and A2s) are not allowed in any quantities in split-systems with field-constructed refrigerant piping (22.110 DV.3). For further discussion on the updates to UL 60335-2-89, see section VI.E.2.c.

One commenter suggested setting this threshold at a harvest rate of 1,000 lb of ice per day and EPA agrees that such a rate is appropriate for distinguishing batch type equipment capable of using lower-GWP refrigerants from those that need continued use of higher-GWP options. However, for continuous type equipment, EPA finds that a 1,200 lb of ice per day is appropriate. These limits are consistent with comments made to DOE by AHRI and an ACIM manufacturer.[130] Currently, ENERGY STAR has certified ice makers capable of producing as much as 566 lb of ice per day using charge sizes of R-290 below the current 150 g charge limit per SNAP Rule 21, a use condition based on the

[130] See EERE-2017-BT-STD-0022-0050 and EERE-2017-BT-STD-0022-0047, respectively, available at www.regulations.gov.

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earlier industry safety standard for commercial ice machines, UL 563, 8th edition (81 FR 86778, December 1, 2016). However, in response to the updates included in the 2nd edition of UL 60335-2-89, on May 24, 2023, EPA proposed to increase the allowable charge capacity of R-290 in ACIMs to 500 g in SNAP Rule 26 (88 FR 33722, May 24, 2023). While equipment using 500 g charges of R-290 could likely produce up to the finalized 1,000 lb of ice per day (batch type) and 1,200 lb of ice per day (continuous type), EPA finds that the chosen harvest rates provide reasonable limits under which we have assessed as being capable of transitioning to R-290, or other available substitutes with GWPs less than 150, in the finalized compliance timeline. Such limits do not preclude manufacturers from pursuing R-290 or other lower-GWP substitutes for equipment with harvest rates that exceed those limits. Additionally, EPA has proposed to list R-455A (GWP 146) and R-454C (GWP 146) for use in this subsector, which could also work as potential candidates for these types of ACIMs.

Given that there will likely be a greater number of available refrigerant options for equipment harvesting up to 1,000 lb of ice per day (batch type) or 1,200 lb of ice per day (continuous type) by the compliance date for this subsector in addition to R-290, which is already used widely in ACIMs, EPA considers these harvest rates appropriate thresholds for distinguishing self-contained equipment. The one-year extension of the compliance date provided in this final action will help facilitate the transition to lower-GWP refrigerants for OEMs of smaller self-contained ACIMs harvesting less than 1,000 lb of ice per day (batch type) or 1,200 lb of ice per day (continuous type).

EPA considers the available substitutes for higher-GWP HFCs and HFC blends to differ for smaller and larger ACIMs. Neat (*i.e.*, zero glide) refrigerants, such as R-290, are widely used in smaller, self-contained ACIMs, where smaller charge sizes of

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refrigerant are capable of providing the required cooling capacity at lower harvest rates. In larger equipment, higher rates of ice production mandate larger charge sizes, compounding flammability concerns with A3 refrigerants. Equipment harvesting ice at higher rates may still need access to non-flammable options, in addition to other, lower-flammability options, which may be limited in their technological achievability because of various factors such as glide. Although building codes limit the charge of flammable refrigerants at points of public egress, and are underway to being updated to incorporate recent additions of safety standards, in such cases, smaller charges of A3 refrigerants (*e.g.*, less than approximately 114 g of R-290) are still allowable, in addition to lower-flammability refrigerants, such as the SNAP proposed A2L refrigerants R-454C and R-455A. Extending the compliance deadline from January 1, 2025, to January 1, 2026, will provide additional time for building codes to be updated; for research, development, and testing of new self-contained ACIM models; and for additional substitutes to enter the market for this subsector. Therefore, smaller equipment capable of using lower-GWP refrigerants will have a sufficient number of refrigerant options to select from, highlighting the usefulness of distinguishing self-contained ACIMs by their rate of ice production when setting restrictions. For these reasons, EPA disagrees with the commenter that suggested removing the distinction, either by charge size or rate of ice production, of smaller and larger self-contained ACIMs.

Comment: Two commenters agreed with EPA's proposed restrictions for all types of self-contained ACIMs. Others disagreed, including one that requested a 700 GWP limit for all self-contained equipment, regardless of charge size. They stated that a 150 GWP limit would not be feasible, given the limited charge sizes of A3 and A2L refrigerants allowed by safety standards at public points of egress, and the insufficient

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supply available to OEMs of components with refrigerants with a GWP below 150 GWP. Another commenter stated that there is currently insufficient data for setting restrictions that will comport with building codes, and instead suggested applying the same list of prohibited substances proposed for remote condensing ACIMs to self-contained ACIMs.

Other commenters only supported the restrictions as proposed—a 150 GWP limit—for smaller (less than or equal to a 500 g charge, as proposed) self-contained ACIMs. Of these commenters, some agreed with the GWP limit set at a 500 g charge size, while one agreed with the limit, but recommended setting the threshold at a harvest rate of 1,000 lb of ice per day instead of a charge size, and another approved of a 150 GWP limit, but only in very small self-contained equipment, requesting a 114 g charge size threshold for setting restrictions, instead. This commenter stated that R-290 is the only currently feasible substitute for this type of equipment, and explained that in certain circumstances, safety standards, SNAP use conditions, and building codes limit its charge well below 500 g due to its flammability. The commenter asserted that other options identified by the Agency are either limited by toxicity concerns, refrigerant glide technical challenges, a limited supply of components, or missing SNAP listings, and therefore, the commenter argued that there are insufficient available substitutes below 150 GWP for self-contained ACIM with charge sizes greater than 114 g.

Many of these same commenters, although supportive of the 150 GWP limit for smaller self-contained ACIMs, disagreed with the proposed restrictions for larger (above 500 g, as proposed) equipment. One requested removing R-410A from the list of prohibited substances for larger self-contained equipment, but only if sufficient time was allowed. They explained that for certain larger ACIM, there are currently no suitable SNAP-approved substitutes for R-410A. However, they noted that prohibiting the use of

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R-410A would be appropriate if provided additional time to comply, and that once the supply of components to replace R-410A has improved, a 700 GWP limit could be appropriate for this type of equipment. Other commenters requested a 2,500 GWP limit in place of a prohibited substances list.

Several commenters supported the proposed list of prohibited substances for use in remote condensing ACIM. Other commenters disagreed. One commenter mentioned that removing R-404A from the prohibited substances list would ease some of the immediate development burden in remote models. Other commenters requested a GWP limit in place of a prohibited substances list for remote condensing ACIMs. As for larger self-contained ACIMs, two commenters requested a 2,500 GWP limit, while, in contrast to all other comments received, another commenter noted their support of a much lower 150 GWP limit.

Response: In response to the comments received and its evaluation of the availability of substitutes for use in this subsector, EPA is finalizing all GWP and refrigerant-specific restrictions for ACIM as proposed. Notably, the metric for distinguishing which restrictions apply to different sizes of self-contained equipment has been changed from the proposed rule, as described in this section above, but the GWP limit for smaller units is finalized as proposed. EPA recognizes the challenges for ACIMs used at points of egress for the public, but notes that research and design for self-contained units with harvest rates less than or equal to 1,000 lb of ice per day (batch type) and 1,200 lb of ice per day (continuous type) that are able to use R-290 in sufficiently small charges has been identified by commenters as already underway. Many smaller self-contained units already use R-290, and with a pending SNAP listing proposal to allow charges of R-290 up to 500 g, EPA is confident in the industry's ability to meet a

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150 GWP limit in this type of equipment. Commenters also noted ongoing research to use other SNAP proposed A2L refrigerants below 150 GWP, R-454C, and R-455A, where an A3 refrigerant may not be feasible. Therefore, given the additional year to comply, EPA considers a 150 GWP limit for self-contained ACIM with harvest rates less than or equal to 1,000 lb of ice per day (batch type) and 1,200 lb of ice per day (continuous type) as appropriate, in agreement with many of the comments and other public information.

For self-contained ACIM with harvest rates greater than 1,000 lb of ice per day (batch type) or 1,200 lb of ice per day (continuous type), EPA appreciates the request by one commenter for a 700 GWP limit. At this time, the Agency considers additional options with GWPs greater than 700, particularly non-flammable refrigerants, as necessary, because of the lack of available substitutes due to safety concerns with large charge sizes of flammable refrigerants. However, as the industry continues its transition away from some of the highest-GWP refrigerants, EPA may choose to set a GWP limit for this type of equipment at a later date. As noted by a second commenter, a limit similar to 700 GWP may be appropriate in the future, depending on EPA's evaluation of the availability of substitutes and their technological achievability in larger self-contained ACIMs. EPA disagrees with commenters who requested a 2,500 GWP limit in place of a list of prohibited substances. Such a limit would allow for continued use of R-410A (GWP 2,088) in self-contained equipment with higher harvest rates, an HFC-blend refrigerant proposed as prohibited. Similarly, the Agency disagrees with the commenter who asked for the list of prohibited substances proposed for remote condensing ACIMs, which is less restrictive than the list for larger self-contained equipment and does not restrict R-410A, to apply to all types of ACIMs. Given there are already several

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refrigerants listed by EPA's SNAP program for ACIMs that are not prohibited, such as R-448A, R-449A, and R-449B, that SNAP recently listed the nonflammable, azeotropic (minimal glide) refrigerant R-515B, and that EPA has proposed to list several additional refrigerants as acceptable for use in ACIM that are zero or low glide and could serve as R-410A substitutes (*e.g.*, HFC-32, R-454B), EPA expects there will be a greater number available for use by the extended date of compliance of January 1, 2027. Further, a commenter explicitly noted that restricting the use of R-410A would be appropriate if the Agency allotted additional time for component supply to improve and to develop equipment using new substitutes. The Agency therefore considers the industry capable of transitioning out of certain specified higher-GWP HFCs and HFC blends, including R-410A, by the compliance deadline.

EPA agrees with many of the comments approving of the proposed list of prohibited substances for use in remote condensing ACIMs. Regarding the comments received requesting a 2,500 GWP limit, at this time, EPA does not consider setting a GWP limit for this type of equipment to be appropriate at this time but may choose to do so through future rulemakings. By identifying HFCs and HFC blends as prohibited from use, the Agency is able to encourage a transition away from specific higher-GWP refrigerants while allowing flexibility for the industry as it continues developing products that use refrigerants well below 2,500 GWP. As stated in section VI.B of this preamble, this approach—restricting specific substances instead of setting a GWP limit for a given subsector—gives EPA time to identify an appropriate GWP limit for this subsector while still restricting those substances that have the highest adverse environmental impact. Given the additional technical challenges for equipment installed remotely and restrictions on use of flammable refrigerants in industry safety standards, the restricted

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list is less prohibitive than that for self-contained units. EPA also disagrees with the commenter that described a 150 GWP limit as appropriate for this type of ACIM. Very few non-flammable substitutes are available below 150 GWP, flammability concerns are even greater for remote condensing units than for those that are self-contained, and the information provided did not support a conclusion that those nonflammable options (*e.g.*, R-744) are viable in all remote condensing ACIMs. For these reasons, EPA is finalizing the restrictions for remote condensing ACIM as proposed.

Comment: One commenter supported EPA's proposed January 1, 2025, compliance date for ACIM, citing California's HFC regulation implementation as proof that 2025 is achievable. All other comments received requested an extension from the proposed date, including general requests for EPA to work with OEMs to ensure the achievability of the timeline and additional time to develop new refrigerants, update building codes, and harmonize with various standards, and for specific compliance dates ranging from 2027 to 2029. Commenters who requested 2029 referenced the EU F-Gas Regulation's conversion timeline as one reason for the appropriateness of a much later compliance date.

Various issues were cited as reason for the requests to extend the date of compliance from that proposed. Many manufacturers stated that they will need to completely redesign many of their ACIM models, which will take considerable time. Commenters described this subsector as highly complex and diverse, with many varying demands. End-users range from hospitals to restaurants, hotels, supermarkets, offices, and schools, requiring many different types of ice, necessitating unique equipment design for each model. New equipment development efforts, according to a few commenters, will be held up by design challenges unique to ACIM and vending machines, such as

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strict limitations on flammable refrigerant charges at points of egress, which require manufacturers to design for very small charge sizes. Additionally, the availability of components, both in terms of supply chain and design of models using new substitutes, was mentioned by several commenters as a major challenge for this subsector to transition. Commenters highlighted that after new models are designed, they will still need to be tested and certified by NRTLs for safety, efficiency, and sanitation.

Commenters discussed how several identified substitutes have not yet been SNAP-approved or updated to allow for larger charge sizes in equipment, following the update to UL 60335-2-89. These commenters stated that additional time would provide an opportunity for finalization of SNAP listings, including new A2L refrigerants and increased charge sizes for R-290, providing additional substitutes for manufacturers to choose from. A few commenters requested a later compliance date of January 1, 2029, for facilities not yet updated to safely use flammable refrigerants to make necessary conversions. One such commenter noted that an accelerated timeline to more flammable options would create safety risks for manufacturers and the public resulting from potential oversights and would not provide sufficient time to train technicians to properly handle A3 refrigerants. Commenters requested time for the new DOE efficiency standards for ACIMs to be published, likely in 2027, before EPA requires compliance with restrictions. This standard was described as greatly influential on the design requirements of products, and if EPA sets a compliance deadline ahead of its publication, commenters worried that they would need to redesign their new products.

Response: EPA agrees with commenters that additional time for compliance is warranted for ACIMs to meet the restrictions finalized in this rulemaking. ACIMs fall within the scope of safety standard UL 60335-2-89. In October 2021, the 2nd edition of

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this standard was published, updating safety requirements so that flammable and lower flammability refrigerants could be deployed more widely in commercial refrigeration equipment. EPA recognizes the time it can take for an updated UL standard to be widely incorporated and for the updates to be applied across industry. Many other relevant changes affecting the availability of substitutes and facilitating transition to the use of those substitutes generally occur after the UL standard is updated, including evaluation of substitutes under the SNAP program, adoption of new editions of safety standards into building codes, equipment testing and certification, safety updates to manufacturing facilities, and training of technicians. All of these are considerations for EPA's assessment of availability of substitutes under subsection (i)(4)(B). Further discussion on how updates to UL 60335-2-89 affect the availability of substitutes for equipment within the safety standard's scope can be found in section VI.F.1.a.

Typically, following updates to safety standards for commercial refrigeration equipment, EPA evaluates substitutes through the SNAP program's comparative risk framework, where the Agency considers safety by assessing exposure assessments, toxicity data, and flammability, as well as other regulatory criteria. EPA is currently evaluating many of the refrigerants impacted by the updates to UL 60335-2-89 and has proposed to list several refrigerants as acceptable, subject to use conditions, under SNAP for use in ACIMs (88 FR 33722, May 24, 2023). Although those evaluations under SNAP are ongoing, the Agency anticipates that given the number of substitutes currently proposed as acceptable for use, users in the ACIM subsector will likely have an expanded set of available substitutes from which to choose in the coming years. EPA has considered its ongoing ACIM evaluations under SNAP, the adjusted compliance timeframes reflecting these evaluations, and their potential impact on the availability of

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substitutes for use in this subsector, as well as the existing acceptable substitutes that are not prohibited, in finalizing the restrictions for ACIMs. Further discussion on the intersection of SNAP listing decisions and AIM Act subsection (i)(4) criteria can be found in section VI.E.

As noted by many commenters, building codes can limit refrigerants available for use based on their flammability, the charge size of the equipment, and other relevant safety factors, and take time to adopt changes to safety standards. These code updates are generally made in each specific jurisdiction, and the timeframe for adoption of new editions of safety standards can vary greatly. In certain jurisdictions, users may be unable to utilize certain flammable substitutes identified by EPA for use in ACIMs, even if they are SNAP-approved, until building codes incorporate the updates in the 2nd edition of UL 60335-2-89. However, EPA may still consider a substitute to be available before every building code in every jurisdiction across the United States permits its use. See section VI.E.2.d for discussion on EPA's consideration of building codes and the availability of substitutes under subsection (i)(4).

Further, EPA agrees with commenters that updates to UL standards and new listings under SNAP must also be incorporated into equipment design, testing, and certifications. Even after manufacturers develop equipment using substitutes, NRTLs must certify that the new equipment meets UL safety standards. NRTL equipment certification requires substantial testing, site visits, and labor input before new equipment can be used. Although ACIM is a smaller subsector, all commercial refrigeration equipment expanding use of flammable refrigerants will need to be tested, and NRTLs could struggle to complete certification of new equipment by the proposed January 1,

2025, compliance date for this subsector. However, the industry seems to anticipate this upcoming need and is opening or expanding testing labs to handle this demand.[131]

EPA also anticipates that greater use of flammable refrigerant options like R-290 and A2Ls that EPA's SNAP program has proposed as acceptable for use in ACIM may require more specialized training. Trainings on flammable refrigerants have been available for many years, and there are now trained technicians within the commercial refrigeration industry in general whose knowledge and skills will assist the transition to lower-GWP refrigerants in other related subsectors.

EPA agrees with the commenters that manufacturing facilities not currently using flammable refrigerants will need to incorporate safety updates before using flammable refrigerants on site. The Agency acknowledges that these upgrades to manufacturing facilities could require financial and time investments; however, the use of A2L and A3 refrigerant has steadily increased over the last ten years, meaning many manufacturers may have already made such upgrades, or intend to do so in the coming years. In the cases where these updates have yet to be made, EPA understands that they could delay when industry is able to factory-charge new substitutes into their appliances, which is one factor we considered in establishing 2026 and 2027 compliance dates for this subsector.

For self-contained batch type ACIMs with harvest rates less than or equal to 1,000 lb of ice per day, and for self-contained continuous type ACIM with harvest rates less than or equal to 1,200 lb of ice per day, EPA is finalizing a January 1, 2026, compliance date. EPA has proposed to update the SNAP use conditions for R-290 use in ACIMs and to list A2L refrigerants that meet the GWP limits for this type of ACIM. Finalizing an

[131] See, *e.g., https://www.danfoss.com/en/about-danfoss/news/dcs/new-extension-of-danfoss-atex-lab-accelerates-the-use-of-sustainable-refrigerants*.

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additional year to comply with the restrictions under subsection (i) provides more time for that ongoing evaluation under SNAP, for designers to develop equipment using up to 500 g of R-290 (a significant increase from the currently allowed 150 g), and for compressor manufacturers and OEMs to begin developing products with A2L refrigerants. This extra time is also provided to allow OEMs to continue research and development of equipment using smaller charge sizes of flammable refrigerants (less than 114 g for R-290) that would comply with building codes at points of egress in public spaces. A large portion of the self-contained equipment market with lower harvest rates has already transitioned to lower-GWP options, especially R-290, meaning that fewer models will need to be redesigned to meet the restrictions. Therefore, in our evaluation of the (i)(4)(B) criteria and for the reasons discussed, EPA finds that January 1, 2026, is an appropriate compliance date for self-contained ACIMs with harvest rates equal to or below 1,000 lb ice per 24 hours (batch type) or 1,200 lb ice per 24 hours (continuous type).

For self-contained ACIMs with harvest rates greater than 1,000 lb of ice per day (batch type) or 1,200 lb of ice per day (continuous type) and for remote condensing ACIMs, EPA is finalizing a January 1, 2027, compliance date. EPA understands that in equipment with larger charge sizes, flammability concerns are greater, creating additional design challenges related to building codes and safety standards. In remote condensing ACIMs, the refrigerant circulates in and out through piping that has been installed in the field that is more prone to leaks than self-contained equipment, also adding to the risk of using flammables. For this reason, considerably fewer products in these categories of ACIMs have transitioned from their respective lists of prohibitive substances, requiring substantial redesigns of equipment before the restrictions are able to be met. Given the

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diversity of ACIM end-users and the complexity of design in terms of varying ice shapes, EPA is providing two additional years from the date proposed for the industry to research, develop, test, and certify new equipment using refrigerants other than those prohibited. Similar to smaller, self-contained ACIMs, extending the compliance date will provide opportunity for additional substitutes to become available for manufacturers, such as those under evaluation in proposed SNAP Rule 26. A later date will likely also grant time for publication of DOE's new efficiency standard for ACIMs, which will inform how OEMs choose to design new equipment.

The Agency disagrees with selecting a compliance date based on other regulations, such as the EU F-Gas Regulation or the proposal to revise that regulation.[132] The AIM Act compels EPA to set deadlines for restrictions based on the availability of substitutes in consideration of the factors described in subsection (i)(4), not based on decisions made by other regulatory bodies. Therefore, EPA is finalizing the compliance dates for ACIMs earlier than January 1, 2029, after evaluating the availability of substitutes and the feasibility of the U.S. industry to transition by an earlier date.

EPA has therefore determined, in consideration of the subsection (i)(4)(B) criteria and the potential for certain SNAP approvals; updates to building codes; equipment design, testing, and certifications; technician trainings; and manufacturing facility upgrades, that providing additional time to comply is reasonable for ACIMs. Considering these factors, noted by many commenters, the Agency is finalizing extended compliance dates for this subsector to provide time for ongoing SNAP evaluation; jurisdictions to consider the latest edition of UL 60335-2-89 and incorporate the updated safety

[132] The Agency's review of the EU F-Gas rule is that self-contained ACIMs have been subject to a 2,500 GWP limit since January 1, 2020, and the proposed rule would subject them to a 150 GWP limit beginning January 1, 2025.

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requirements into their building codes to enable the use of certain substitutes; further development, testing, and certification of equipment using new substitutes; a greater number of specialized trained technicians; and completion of remaining safety updates to facilities.

h. Refrigerated Transport

The refrigerated transport subsector primarily moves perishable goods (*e.g.*, food, flowers) and pharmaceuticals at temperatures between -22 °F (-30 °C) and 61 °F (16 °C) by various modes of transportation, including aircraft, roads and railways, vessels, and intermodal containers. For this action, EPA is establishing restrictions in three distinct subsectors: road, marine, and intermodal containers.

Refrigerated transport—road consists of refrigeration for perishable goods in refrigerated vans, trucks, or trailers and is the most common mode of refrigerated transport in the United States. This mode includes refrigerated trucks and trailers with a separate autonomous refrigeration unit with the condenser typically located at the front of a refrigerated trailer. This subsector also covers domestic trailer refrigeration units that contain an integrated motor (*i.e.*, does not require a separate electrical power system or separate generator set to operate) that are transported as part of a truck, on truck trailers, and on railway flat cars. Other types of containers, such as seagoing ones that are connected to a vessel's electrical system or require a separate generator that is not an integral part of the refrigeration unit to operate, are not included. This subsector also does not include: (i) Refrigerated vans or other vehicles where a single system also supplies passenger comfort cooling (MVAC), (ii) refrigerated containers that are less than 8 feet 4 inches in width, (iii) refrigeration units used on containers that require a separate

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generator to power the refrigeration unit, or (iv) ship holds (refrigerated transport–marine).

Refrigerated transport–marine consists of refrigeration for cooling and storage of perishable goods on refrigerated vessels and various modes of transportation via water, including merchant, naval, fishing, and cruise-shipping. This subsector includes refrigerated ship holds and seagoing containers that are connected to a vessel's electrical system or require a separate generator to operate that is not an integral part of the refrigeration unit. This subsector excludes refrigerated containers that contain their own power source and refrigerators or freezers that are plug-in appliances designed for retail food refrigeration (*e.g.*, stand-alone units used in a galley or store).

Lastly, refrigerated transport–intermodal containers are refrigerated containers with an integrated power source that allow uninterrupted storage during transport on different mobile platforms, including railways, road trucks, and vessels. A common example of intermodal containers are standard-sized refrigerated containers that follow the International Organization for Standardization standard 668, "Series 1 freight containers – Classification, dimensions and ratings."

Other types of refrigerated transport exist (*e.g.*, refrigerated box cars for use in rail, and intermodal refrigerated containers operating at temperatures lower than -50 °C (-58 ºF) for carrying food, medicine, or vaccines at very low temperatures), but EPA is not establishing restrictions on HFC refrigerants in this rule for those other types.

Refrigerated transport equipment manufacturers have used HFC refrigerants, mainly R-404A and HFC-134a, after the phase out of ozone-depleting CFC and HCFC refrigerants such as R-12 and R-22.

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This section provides EPA's final restrictions for each of the three subsectors within the refrigerated transport subsector, followed by significant comments regarding the entire refrigerated transport subsector and EPA's responses to those comments.

What restrictions on the use of HFCs is EPA establishing for refrigerated transport–road?

EPA is prohibiting the use of HFCs in the following blends in new refrigerated transport–road equipment beginning January 1, 2025: R-402A, R-402B, R-404A, R-407B, R-408A, R-410B, R-417A, R-421A, R-421B, R-422A, R-422B, R-422C, R-422D, R-424A, R-428A, R-434A, R-438A, R-507A, R-125/290/134a/600a (55/1/42.5/1.5), RS-44 (2003 formulation) and GHG-X5.

Similar to EPA's approach in addressing the use of HFCs in specific blends in remote condensing ACIM, EPA is not establishing a GWP limit for refrigerated transport–road and instead is restricting the use of HFCs in specific blends. A GWP limit of 2,200, as requested in one of the petitions that EPA granted, is high compared to the GWP limit that the Agency is establishing in other commercial refrigeration applications, and the Agency intends to propose a GWP limit at a later time. As stated in section VI.B of this preamble, this approach—restricting specific substances instead of setting a GWP limit for a given subsector—gives EPA time to identify a GWP limit while still restricting those substances that have the highest environmental impact (*e.g.*, R-404A, with a GWP of 3,922, is a commonly used refrigerant in this subsector that EPA is restricting). For its considerations of availability of substitutes under subsection (i)(4)(B), EPA identified substitutes that are available in place of the substances that EPA is restricting. These include R-744 (GWP 1), R-450A (GWP 601), R-513A (GWP 630), and R-452A (GWP 2,140). Cryogenic transport refrigeration systems and direct nitrogen expansion are other

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existing technologically achievable options. Cryogenic systems cool cargo by injection of stored liquid R-744 or nitrogen (R-728) into the cargo space or an evaporator. These systems are used in small and large trucks, primarily in Northern Europe. In recent years manufacturers have also developed equipment using R-452A. R-452A has similar properties to R-404A, including cooling capacity, reliability, refrigerant charge, non-flammability, and low compressor discharge temperatures, supporting its use as a lower-GWP and technologically achievable substitute. The two major U.S.-based manufacturers of refrigeration equipment for refrigerated transport–road currently offer equipment using R-452A.[133,134] EPA considers usage in the market as an indication of the commercial demands and technological achievability of a substitute.

What restrictions on the use of HFCs is EPA establishing for refrigerated transport–marine?

EPA is restricting the use of the following HFCs and blends containing HFCs in new refrigerated transport–marine systems beginning January 1, 2025: R-402A, R-402B, R-404A, R-407B, R-408A, R-410B, R-417A, R-421A, R-421B, R-422A, R-422B, R-422C, R-422D, R-424A, R-428A, R-434A, R-438A, R-507A, R-125/290/134a/600a (55/1/42.5/1.5), RS-44 (2003 formulation) and GHG-X5. EPA is not establishing a GWP limit at this time and the list of prohibited HFCs and blends containing HFCs are the same as in refrigerated transport–road. EPA's rationale for restricting specific substances

[133] Thermo King to Reduce Global Warming Potential of Transport Refrigeration by Nearly Fifty Percent, Thermo King, January 2022. Available at: *https://www.thermoking.com/na/en/newsroom/2022/01-jan/thermo-king-to-reduce-global-warming-potential-of-transport-refr.html.*

[134] Carrier Transicold Strengthens Sustainability Initiatives with Lower GWP Refrigerant for North America Truck and Trailer Systems, Carrier Transicold, December 2020. Available at: *https://www.carrier.com/truck-trailer/en/north-america/news/news-article/carrier_transicold_strengthens_sustainability_initiatives_with_lower_gwp_refrigerant_for_north_america_truck_and_trailer_systems.html*.

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in this subsector can be found in section VI.B, with additional information in section VI.F.3.e (under the restrictions on the use of HFCs in ACIM).

Available substitutes that may be used in refrigerated transport–marine in place of the substances that EPA is restricting include R-717, R-744, R-450A, and R-513A. Marine transport refrigeration systems cover a wide range of merchant, naval, fishing, and cruise-shipping applications and often require specialized and custom refrigeration equipment. Historically, this sector used R-22, R-404A, R-507A, R-407C, and R-134a. Today, manufacturers market lower-GWP substitutes for marine applications such as R-717 and R-744, either alone or in cascade systems, particularly for fishing vessels, but these substitutes are not necessarily available in all applications within this subsector. According to the Refrigeration, Air Conditioning and Heat Pumps Technical Options Committee (RTOC), HFC/HFO blends with lower GWPs may also be suitable for some applications and system designs; in addition, the International Maritime Organization limits the GWP of refrigerant in new equipment at 2,000.[135]

What restrictions on the use of HFCs is EPA establishing for refrigerated transport–intermodal containers?

EPA is restricting the use of HFCs and blends containing HFCs that have a GWP of 700 or greater for new refrigerated transport–intermodal containers with refrigerant temperatures entering the evaporator, or exiting fluid temperatures from a chiller, at or above -50 °C (-58 °F), beginning January 1, 2025. For new refrigerated transport–intermodal containers with refrigerant temperatures entering the evaporator, or exiting

[135] Refrigeration, Air Conditioning, and Heat Pumps Technical Options Committee 2018 Assessment Report, Technical and Economic Assessment Panel, UNEP, February 2019. Available at: *https://ozone.unep.org/sites/default/files/2019-04/RTOC-assessment-report-2018_0.pdf.*

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fluid temperatures from a chiller, below -50 °C (-58 °F), there are no restrictions in this final rule.

For its considerations of availability of substitutes under subsection (i)(4)(B), EPA identified substitutes that are available in place of the substances that EPA is restricting. These include R-744 and R-450A. R-513A, R-513B, and R-456A are also potential candidates. According to the RTOC, thousands of intermodal containers operating with R-744 were purchased or leased in 2016 and 2017,[136] and EPA identified one manufacturer that offers an intermodal container using R-744.[137] Several manufacturers also offer intermodal containers using R-513A for new and retrofit applications.[138,139,140]

Comment: Several commenters supported a GWP limit of 700 for HFCs and blends containing HFCs used in new refrigerated transport – intermodal containers. One of these commenters urged EPA to maintain the listed requirement, stating that transport refrigeration systems are a significant source of HFC emissions. Another commenter recommended the following adjustments to the 700 GWP limit for intermodal containers to account for operating needs at different temperature ranges:

a. for operating temperature above -58 °F (-50 °C), GWP limit of 700
b. for operating temperature in the range of -58 °F (-50 °C) to -103°F (-75 °C), GWP limit of 2,000
c. for operating temperature below -103°F (-75 °C), GWP limit is exempted

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[136] Ibid.
[137] Carrier Transicold "NaturaLINE" products. Additional information available at: *https://www.carrier.com/container-refrigeration/en/worldwide/products/Container-Units/naturaline*.
[138] Maersk Container Industry, Star Cool – Refrigerants. Available at: *https://www.mcicontainers.com/products/star-cool/refrigerants*.
[139] Carrier Transicold Offers Lower GWP Refrigerant Option for PrimeLINE® Container Units, Carrier Transicold, February 2018. Available at: *https://www.carrier.com/container-refrigeration/en/worldwide/news/news-article/carrier_transicold_offers_lower_gwp_refrigerant_option_for_primeline_container_units.html*.
[140] Thermo King, Container Fresh and Frozen. Available at: *https://www.thermoking.com/na/en/marine/refrigeration-units/container-fresh-and-frozen.html*.

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The commenter encouraged EPA also to adopt a GWP limit of 2,000 for new refrigerated transport–intermodal containers where the temperature of the chilled fluid leaving the chiller is lower than -50 °C, which is consistent with EPA's treatment of not applying a GWP limit of 700 for chillers for IPR with exiting fluid temperatures lower than -50 °C. This commenter also stated that refrigerants used in low temperature chillers (*i.e.*, below -50 °C) have high GWPs (*e.g.,* HFC-23 with a GWP of 14,800, R-508B with a GWP of 13,396), and this is also true for low temperature intermodal containers. The same commenter stated that they have developed a refrigerant for this temperature range with a GWP of 1,831.

Response: EPA is establishing restrictions on HFCs and HFC blends with a GWP of 700 or higher for use in new refrigerated transport–intermodal containers, as proposed. Manufacturers are already selling intermodal containers using R-744 (GWP 1), R-450A (GWP 601), and R-513A (GWP 630), indicating the availability of these substitutes for use in this subsector, particularly with regard to technological achievability and commercial demand. Concerning the comments about refrigerated transport–intermodal containers with exiting fluid at temperatures below -58 °F (-50 °C), in this final rule, EPA is not establishing GWP restrictions for refrigerated transport–intermodal containers with fluid temperatures below -50 °C (-58 °F). (For chiller type equipment, this is the fluid leaving the system, and for direct expansion equipment, this is the temperature of the refrigerant as it enters the evaporator.) EPA recognizes that most of the refrigerants used for equipment with fluid temperatures below -50 °C (-58 °F) have relatively high GWPs. Upon evaluating the availability of substitutes for refrigerated transport–intermodal containers operating at very low temperatures, EPA is not restricting the use of HFCs and HFC blends with exiting fluid temperatures lower than -50 °C (-58 °F) in this final rule.

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EPA notes that there is a similar lack of availability of refrigerants with temperatures either entering the evaporator or exiting a chiller or low temperature stage in other subsectors, such as IPR and chillers for IPR. The Agency expects that after further research and development, there may be additional refrigerants available for these low temperatures, after additional reviews of refrigerants for safety, health, and environmental impacts under the SNAP program and further development of industry standards that would allow for use of flammable refrigerants. Note that EPA may choose to set restrictions in the future as the availability of lower-GWP substitutes continues to grow.

Comment: One commenter generally supported the proposed refrigerant bans for "transport refrigeration–road" for refrigerated transport: truck, trailer, aircraft, and rail. Another commenter suggested that EPA harmonize the GWP limit of all transport refrigeration including truck and trailer, rail, and construction (although the commenter did not refer to intermodal or marine), with refrigerant bans listed for road systems and a January 1, 2025, transition date**.** Another commenter generally supported the restrictions for refrigerated transport for marine and road applications. This commenter also stated that they preferred that EPA restrict use of refrigerants with 2,200 GWP limit or higher, rather than specific listings of HFCs for these subsectors, stating this would standardize the approach across sectors, align with CARB regulations, and still enable EPA to set a lower GWP limit at a future date. Another commenter stated that a transition toward A2L refrigerants and other lower-GWP alternatives in these subsectors is underway in various States and in other countries and that the proposed rule continues this progress by imposing specific HFC bans with respect to transport refrigeration used in road systems and marine. This commenter encouraged EPA to do more, specifically stating that EPA

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should develop future technological transitions rulemakings that set GWP limits—significantly lower than 2,200—for these transport-refrigeration subsectors as soon as EPA determines that lower-GWP alternatives meeting the criteria set forth in subsection (i)(4) of the AIM Act have become available.

One commenter stated that the proposed list of banned refrigerants for refrigerated transport could be reasonable, provided R-452A is listed as approved well before the transition. They commented that ASHRAE class A1 refrigerants must be available for transport refrigeration equipment. This commenter suggested that marine applications could also be regulated for the same list of HFCs that are being regulated under other refrigerated transport subsectors (mentioning truck, trailer, aircraft, and rail) if there were an allowance for the use of R-452A for frozen cargo. They stated that HFC-134a is only used for marine and self-contained equipment and could be added to the list of restricted refrigerants.

Response: In this final rule, EPA is establishing a restriction on specific HFCs and HFC blends as proposed for transport refrigeration–marine and transport refrigeration–road. The specific HFCs and HFC blends restricted for these subsectors are R-404A, R-507, R-507A, R-428A, R-422C, R-434A, R-421B, R-408A, R-422A, R-407B, R-402A, R-422D, R-421A, R-125/290/134a/600a (55/1/42.5/1.5), R-422B, R-424A, R-402B, GHG-X5, R-417A, R-438A, R-410B, IKON A, IKON B, R-134a/HBr (92/8), RS-44 (2003 formulation), THR-02, THR-03, and THR-04. This list consists of all refrigerants with a GWP greater than 2,200 previously listed as acceptable under SNAP. Thus, at this time, the list of specific substances corresponds to the GWP limit 2,200 in CARB's regulations and avoids complications because of differences.

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Concerning the comment requesting that EPA harmonize the GWP limit of all transport refrigeration, including truck and trailer, rail, and construction, with refrigerant bans listed for road systems and a January 1, 2025, transition date, EPA understands the comment to mean that EPA should set restrictions on the same list of refrigerants, all of which have GWPs over 2,200, for all refrigerated transport used on road or rail. For other road or rail uses that EPA excluded from the proposed description of "transport refrigeration–road," such as refrigerated box cars for rail use, refrigerated containers that are less than 8 feet 4 inches in width, or refrigeration units used on containers that require a separate generator to power the refrigeration unit, because these uses fall outside the description of "refrigerated transport–road" in the proposed rule, EPA does not consider them to fall under the refrigerant restrictions in this final rule. However, EPA may establish GWP restrictions or specific refrigerant restrictions for these uses in the future. All of the restricted refrigerants are A1 refrigerants, as are the alternative refrigerants that SNAP has listed as acceptable for refrigerated transport to date. Further, by not restricting R-452A, the list of restricted HFCs allows for use of that refrigerant until lower-GWP refrigerants that can be used safely in mobile applications are available. EPA agrees that in the future, the Agency could set a GWP limit, once EPA identifies that lower-GWP alternatives meeting the criteria set forth in subsection (i)(4) of the AIM Act have become available. EPA is not setting a GWP limit at this time for transport refrigeration–marine and transport refrigeration–road because EPA's assessment is that there continues to be significant development of new refrigerants with lower GWPs than 2,200 for use in these subsectors. Restricting those substances that have the highest environmental impact provides environmental protection while giving industry time to develop new lower-GWP refrigerants.

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Comment: One commenter strongly advised EPA to reconsider the January 1, 2025, compliance date for retail refrigeration units, cold storage warehouse systems, and transport refrigeration due to a lack of available replacement technology sufficient for a wide-scale retail industry transition and extraordinary cost burdens associated with the proposed limits. This commenter expressed concern that a single break in the chain between farmers, manufacturers, and transportation companies would ripple through the entire supply chain and ultimately harm consumers. A different commenter urged EPA to maintain the timeline for refrigerated transport. This commenter stated that a transition toward A2L refrigerants and other lower-GWP alternatives in these subsectors is underway in various States and in other countries.

Response: EPA is establishing a compliance date of January 1, 2025, for refrigerated transport (road, marine, and intermodal containers) in the final rule, as proposed. As mentioned above, lower-GWP alternatives that would allow regulated parties in these three subsectors to meet the final restrictions are already available and are being used for refrigerated transport (*e.g.*, R-744, R-450A, R-513A, R-452A). It is EPA's understanding that the U.S. manufacturers of refrigerated transport equipment are no longer using the higher-GWP blends that are restricted in this rule to manufacture the covered types of equipment. EPA expects that there will be sufficient amounts of alternative refrigerants to meet the commercial demand for refrigerated transport equipment, since this is a relatively small market for refrigerant compared to stationary commercial refrigeration.

i. Household Refrigerators and Freezers

Household refrigerators, freezers, and combination refrigerator/freezers are refrigeration appliances intended primarily for residential use, although they may be used

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outside the home. These products may also be referred to as "residential refrigeration."[141] The designs and refrigeration capacities of equipment vary widely. Household freezers only offer storage space at freezing temperatures, while household refrigerators only offer storage space at non-freezing temperatures. Products with both a refrigerator and freezer in a single unit are most common. For purposes of this rule, other small, refrigerated household appliances such as chilled kitchen drawers, wine coolers, household ice makers, and minifridges also fall within this subsector. Household refrigerators and freezers have all refrigeration components integrated, and for the smallest types, the refrigeration circuit is entirely brazed or welded. These products are charged with refrigerant at the factory and typically require only an electricity supply to begin operation.

CFC-12 was a commonly used refrigerant in household refrigerators and freezers prior to the Montreal Protocol and subsequent CAA restrictions on CFCs. The household refrigeration industry transitioned to HFC-134a and hydrocarbon refrigerants. According to the RTOC 2022 assessment report, R-600a (isobutane) is used in 75 percent of all new household refrigerators and freezers globally with HFC-134a used in the remaining 25 percent.

What restrictions on the use of HFCs is EPA establishing for household refrigerators and freezers?

EPA is restricting the use of HFCs and blends containing HFCs that have a GWP of 150 or greater for new household refrigerators and freezers manufactured or imported

[141] In the proposed rule EPA used the term "residential refrigeration systems." For clarity, EPA is using "household refrigerators and freezers" to better indicate that these are products and not systems under the terminology of this rule. The term "domestic refrigeration" may also be used to indicate refrigeration within a domicile and is not intended to relate to the country of manufacture or use.

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beginning January 1, 2025, as proposed. Sale, distribution, offer for sale or distribution, and export of new household refrigerators and freezers using HFCs and HFC blends with a GWP of 150 or greater is prohibited beginning January 1, 2028.

EPA is establishing the 150 GWP limit and the January 1, 2025, compliance date after considering the AIM Act subsection (i)(4) factors, and in particular, after determining that there are a number of available substitutes with 150 GWP or lower for use in new household refrigerators and freezers. These include R-290 (GWP 3.3), R-600a (GWP 1), R-441A (GWP 3), and HFC-152a (GWP 124). These lower GWP options have been available for a few years now following the publication of UL 60335-2-24 in 2017, which allowed for larger charge size of R-290 and other R-600a from 57 g to 150 g. See the *Availability of Substitutes TSD* for further information on available HFC and HFC-blend substitutes for household refrigerators and freezers.

In particular, EPA has found that R-600a is already a widely available and widely used substitute in this subsector. According to the TEAP and its RTOC, R-600a is the main energy-efficient and cost-competitive substitute that is used globally in household refrigeration as it is "…the ideal refrigerant for domestic refrigeration products, giving roughly 5 percent higher efficiency than HFC-134a while at the same time reducing the noise level of the unit."[142] This report also indicated that globally, household refrigerators are already predominantly using R-600a. For the U.S. market, RTOC reports substantial progress in converting from HFC-134a to R-600a with the market introduction of small refrigerators and freezers that typically do not use electricity to defrost and noted that a

[142] TEAP 2022 Progress Report (May 2022) and 2018 Quadrennial Assessment Report are available at: *https://ozone.unep.org/science/assessment/teap*; the 2018 Quadrennial Assessment Report includes sections for each of the TOCs: Flexible and Rigid Foams TOC, Halons TOC, Methyl Bromide TOC, Medical and Chemicals TOC, and Refrigeration, Air Conditioning and Heat Pumps TOC.

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major U.S. manufacturer introduced auto-defrost refrigerators using R-600a refrigerant to the U.S. market as early as 2010. Given the widespread global and growing domestic use of R-600a as referenced in the 2022 TEAP report, EPA finds that R-600a is available per subsection (i)(4)(B), particularly with respect to technological achievability, commercial demand, safety, and cost.

Across the United States and globally, the transition from HFC-134a is already well underway, indicating that there are sufficient available substitutes to use in place of that refrigerant. Several States have banned the use of HFC-134a refrigerant in household refrigerators and freezers, including California, Colorado, Delaware, Maine, Maryland, Massachusetts, New Jersey, New York, Rhode Island, Virginia, Vermont, and Washington. These restrictions became effective between 2021 and 2023. Globally, the EU has prohibited refrigerants that contain HFCs with a GWP greater than 150 in household refrigerators and freezers since January 1, 2015.[143] These existing regulatory requirements indicate that lower-GWP substitutes are already available, as discussed in section VI.E.

Comment: Only one commenter expressed concerns with EPA's proposed 150 GWP limit for this subsector. The commenter stated it was unnecessary and potentially unrealistic and suggested a 300 GWP limit for household refrigeration.

Response: EPA is finalizing a 150 GWP limit for household refrigerators and freezers as proposed. The Agency disagrees with the commenter's assertion that 150 is unnecessary or unrealistic. The commenter did not provide information disputing the substitutes EPA identified at proposal as available for use in this subsector, per

[143] For additional information, the EU legislation to control F-gases webpage is available at: *https://ec.europa.eu/clima/eu-action/fluorinated-greenhouse-gases/eu-legislation-control-f-gases_en*.

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subsection (i)(4)(B). The Agency does not agree that a 300 GWP limit is reasonable upon consideration of the (i)(4) factors. Many refrigerant options with GWPs lower than 300 in fact lower than 150 are already being used in this subsector in the United States, including R-290 and R-600a. As is often the case, certain subsectors coalesce around the use of a particular option, and according to the TEAP and its RTOC, R-600a is the dominant refrigerant in this subsector.

j. Chillers

A chiller is a type of equipment using refrigerant to typically cool water or a brine solution that is then pumped to fan coil units or other air handlers to cool the air that is supplied to occupied spaces. The heat absorbed by the water or brine can then be used for heating purposes and/or can be transferred directly to the air ("air-cooled"), to a cooling tower or body of water ("water-cooled"), or through evaporative coolers ("evaporative-cooled"). A chiller or group of chillers are similarly used for district cooling where a chiller plant cools water or another fluid that is then pumped to multiple locations being served, such as several office or educational buildings within the same complex. Although typically used for cooling, chillers may also be used to provide heating, for instance by extracting heat from ambient air and transferring it via a working fluid distributed to heaters throughout a building. Chillers may also be used to maintain operating temperatures in various types of buildings; for example, in pharmaceutical, agricultural, and food operations. Chillers have also been used to create ice, such as in an ice-skating arena, and have been employed to maintain equipment reliability, for instance in data centers.

Chillers are also used to cool process streams in industrial applications; in such instances, these are regulated as "chillers for industrial process refrigeration" as discussed

here and not as "industrial process refrigeration" as discussed in section VI.F.1.a. Chillers are also used for comfort cooling of operators or climate control and protecting process equipment in industrial buildings, for example, in industrial processes when ambient temperatures could approach 200 °F (93 °C) and corrosive conditions could exist.

Given the breadth of how chillers are employed, our analysis of the subsection (i)(4) factors leads us to find different GWP limits and/or different compliance dates to be appropriate for different applications of chillers. EPA provided some distinction of such chillers in the proposed rule and is finalizing those and other distinctions based on information from commenters. This rule addresses the multiple types of chillers as they are used in particular subsectors, including chillers used to provide cooling of electronics such as data servers in data centers, ITEFs, and computer room cooling equipment (see section VI.F.1.b), chillers used in cold storage warehouses, *e.g.*, to maintain temperature for fresh or frozen food and pharmaceuticals (see section VI.F.1.e), chillers used to create and maintain ice, for instance in ice-skating rinks or toboggan or luge tracks (see section VI.F.1.f), chillers used to provide comfort cooling or heating (discussed below), and chillers used for industrial process cooling (discussed below). Our review of the (i)(4) factors also provides the basis for distinguishing chillers by the temperature of the fluid exiting the chiller, while maintaining some consistency in GWP limits and/or compliance dates across different chiller applications. EPA notes that the distinctions made in this rule are more specific than in other EPA regulations, such as those under sections 608 and 612 of the CAA.[144]

[144] In describing these regulations promulgated under authorities of title VI of the CAA, EPA is neither reopening nor revisiting them.

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There are several different types of mechanical commercial comfort cooling AC systems known as chillers, which use refrigerants in a vapor compression cycle or by alternative technologies. Vapor compression chillers can be categorized by the type of compressor, including centrifugal and positive displacement chillers. Centrifugal chillers are typically used for commercial comfort AC, although other uses exist. Centrifugal chillers tend to be used in larger occupied buildings such as office buildings, hotels, arenas, convention halls, and airport terminals. Positive displacement chillers utilize positive displacement compressors such as reciprocating, screw, scroll, or rotary types. Positive displacement chillers are applied in similar situations as centrifugal chillers, again primarily for commercial comfort AC, except that positive displacement chillers tend to be used for smaller capacity needs such as in mid- and low-rise buildings.

A chiller may be either a product that is fully completed and charged at a factory or a component that is installed into a field-charged system. Typically, chillers with larger charge capacities are charged in the field. The GWP limits and compliance dates discussed in this section for chillers apply irrespective of whether the chiller is a product or a system. Chillers that are products, as with all other products, have a three-year sell-through. Chillers that are components of systems, as with all other components, are not subject to the restrictions on manufacturing, import, sale, distribution, and export, but new systems using chillers may not be installed after the compliance date.

What restrictions on the use of HFCs is EPA establishing for chillers–comfort cooling?

EPA is restricting the use of HFCs and blends containing HFCs that have a GWP of 700 or greater for chillers – comfort cooling beginning January 1, 2025. This GWP limit applies to new equipment for all compressor types of chillers – comfort cooling, *i.e.*,

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centrifugal and positive displacement (including reciprocating, screw, scroll, and rotary) chillers.

For its consideration of the availability of substitutes under subsection (i)(4)(B), EPA identified several substitutes that are available in place of the substances that EPA is restricting, including some that were recently listed as acceptable, subject to use conditions, under SNAP Rule 25 (88 FR 26382, April 28, 2023). These include HCFO-1224yd(Z) (GWP less than 1), HCFO-1233zd(E) (GWP 4), HFO-1234yf (GWP 1), HFO-1234ze(E) (GWP 1), HFC-32 (GWP 675), R-450A (GWP 601), R-452B (GWP 698), R-454A (GWP 237), R-454B (GWP 465), R-454C (GWP 146), R-513A (GWP 630), R-514A (GWP 3), and R-515B (GWP 287). Chillers for comfort cooling that use lower-GWP substitutes are currently available in both U.S. and international markets. Specifically, in the United States, scroll, other positive displacement, and centrifugal chillers using HCFO-1233zd(E), HFO-1234ze(E), HFC-32, R-454B, R-513A, R-514A, and R-515B are widely available and in use.

What restrictions on the use of HFCs is EPA establishing for chillers–industrial process refrigeration?

EPA is restricting the use of HFCs and blends containing HFCs that have a GWP of 700 or greater for chillers – industrial process refrigeration as proposed and is providing additional time for compliance based on the temperature of the fluid exiting the chiller (*i.e.*, the fluid sent to one or more evaporators or other cooling equipment in the system), because the availability of substitutes for use in equipment in this subsector is constrained based on these conditions. As proposed, EPA is not setting restrictions at this time for chillers where the temperature of the fluid exiting the chiller (*i.e.*, the supply temperature to the facility) is less than -50 °C (-58 °F). For chillers where the temperature

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of the fluid exiting the chiller is equal to or above -50 °C (-58 °F) but less than -30 °C (-22 °F), EPA is restricting the use of HFCs and HFC blends that have a GWP of 700 or greater beginning January 1, 2028 (rather than the proposed compliance date of January 1, 2025). For all other chillers – industrial process refrigeration, EPA is restricting the use of HFCs and HFC blends that have a GWP of 700 or greater beginning January 1, 2026 (rather than the proposed compliance date of January 1, 2025).

For its consideration of the availability of substitutes under subsection (i)(4)(B), EPA identified substitutes that are available in place of the substances that EPA is restricting. These include R-290 (GWP 3.3), R-450A (GWP 601), R-513A (GWP 630), R-600 (GWP 4), R-717 (GWP 1), and R-744 (GWP 1). In the United States, chillers for IPR using R-290, R-513A, R-717, and R-744 are available on the market.

The GWP limit of 700 for chillers – industrial process refrigeration enables the use of more refrigerant options to manage safety (in particular, flammability and toxicity), efficiency, capacity, temperature glide, and other performance factors.

What restrictions on the use of HFCs is EPA establishing for chillers used in other subsectors?

As noted above, ice rinks may use a chiller, circulating the chilled fluid under the floor on which the ice is frozen and maintained at the appropriate temperature. Other technologies are available, such as a refrigeration system that circulates the refrigerant directly through pipes to freeze the ice, then returning the evaporated refrigerant to the compressor. Irrespective of the choice of technology, EPA is finalizing a GWP limit of 700 and a compliance date of January 1, 2025, for ice rinks. These restrictions are the same as chillers for comfort cooling. See section VI.F.1.f for a discussion of ice rinks.

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Chillers can also be used to cool data centers, ITEFs, and computer rooms. Using a chiller for such applications could use the chilled fluid at multiple locations, providing cooling for sections of the facility or spot-cooling for zones where heat gain is significantly higher than other zones. Other types of equipment are available for such uses, including both products that are pre-charged and split systems that are filled with refrigerant on-site. For all such equipment, whether a chiller or not, EPA is finalizing a GWP limit of 700, consistent with several other chiller types. For those specific applications, we are finalizing a compliance date of 2027, later than comfort cooling chillers and IPR chillers with exiting temperatures greater than -30 °C (-22 °F), but one year earlier than IPR chillers with exiting temperatures from -30 °C (-22 °F) to -50 °C (-58 °F), See section VI.F.1.b for a discussion of data centers, ITEFs, and computer room cooling equipment.

Another subsector that may use a chiller is cold storage warehouses. A chiller could be applied to circulate chiller fluid throughout a warehouse, perhaps to keep one section at freezing temperatures (*e.g.*, for frozen food or ice cream) and another at above-freezing temperatures (*e.g.*, for dairy or meats). Like data centers, ITEF, and computer room cooling equipment, other equipment could be applied. For instance, an array of rooftop units could be used, limiting the charge of each individual unit and perhaps providing more flexibility to employ low-GWP substitutes while complying with local building codes. All such equipment applied in cold storage warehouses, including chillers, have either a 300 or 150 GWP limit and a January 1, 2026, compliance date.

Comment: Many commenters expressed support for EPA's proposal without any suggested changes to the GWP limits or suggestions to set GWP limits by different product capabilities and classifications.

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A few commenters suggested stricter limits at 300 or 150 and noted that there are many viable alternatives for IPR chillers below the proposed limit. One commenter suggested that the GWP limits for IPR systems and chillers for IPR be based on operating temperature ranges, like those in the current CARB and EU F-Gas Regulations. Another commenter opposed the proposed GWP limits for chillers,[145] stating the current proposal will perpetuate HFCs for a longer period than is necessary and increases the likelihood that new construction will 'lock in' HFC use in a manner that is inconsistent with the Kigali Amendment to the Montreal Protocol phasedown and that is inconsistent with Federal, State, and local climate goals. The commenter proposed a new chiller GWP limit of 10 in 2027. One commenter requested clarification of 700 GWP limit as opposed to 750 and noted that currently no SNAP-approved alternative exists between 700 and 750.

Response: EPA is finalizing a compliance date for chillers for comfort cooling consistent with the January 1, 2025, dates proposed. For chillers used in IPR, EPA is finalizing a compliance date of January 1, 2026, or later for reasons explained below. For chillers where the fluid exiting the chiller is greater than or equal to -50 °C (-58 °F) and below -30 °C (-22 °F), EPA is finalizing January 1, 2028, as the compliance date. Consistent with the proposed rule, EPA is not establishing restrictions at this time for chillers—industrial process refrigeration where the temperature of the fluid exiting the chiller is less than -50 °C (-58 °F). After review of the comments received, EPA is finalizing a 700 GWP limit for all types of comfort cooling chillers and industrial process chillers covered in this rule. As explained above, we are also finalizing a 700 GWP limit in two other subsectors where chillers may be employed, namely ice-skating rinks and

[145] The commenter did not indicate whether the comment was with respect to comfort cooling or industrial process refrigeration chillers. Based on the context of the comment, which discussed chillers with other comfort cooling technologies EPA views this as a comment on chillers—comfort cooling.

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data centers, ITEFs, and computer room cooling equipment. Based on our review of the subsection (i)(4) factors, EPA finds that the availability of substitutes varies for chillers used in IPR based on the temperature of the fluid leaving the chiller. Therefore, EPA finds it appropriate to establish a later compliance date for lower-temperature chillers, with additional time provided for the reasons explained below.

The Agency disagrees with commenters asserting that EPA should adopt a GWP limit of 300 or 150 for IPR chillers. Nor does EPA agree that GWP limits as low as 10 are appropriate for comfort cooling chillers. Some of the lower GWP refrigerants such as HCFO-1233zd(E), HFO-1234ze(E), HCFO-1224yd(Z), R-717, and R-744 (with respective GWPs of 4, 1, 1, 1, and 1, respectively) are not technologically achievable for use in all chiller applications—either for comfort cooling or IPR—and the use of other substitutes remains necessary to ensure a smooth transition to lower-GWP alternatives in this subsector. Further, in our evaluation of availability under (i)(4)(B), EPA sees higher-pressure substitutes such as HFC-32 (GWP 675) and R-454B (GWP 465) in comfort cooling chillers, and possibly in the future IPR chillers, as both technologically achievable and in commercial demand, with manufacturing already adopting or planning to adopt such solutions.

As one commenter noted, while there are other refrigerants under research, development, and review, EPA's SNAP program has not listed acceptable refrigerants for the relevant subsectors with GWPs between 700 and 750. The Agency's assessment is that a 700 GWP limit is appropriate for chillers after considering the (i)(4) factors. EPA is prohibiting the use of regulated substances that have a GWP of 700 or greater, in part, because there are multiple lower-GWP substitutes available for use in chillers with a GWP less than 700. For example, HFC-32, R-452B, and R-454B have GWPs of 675,

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698, and 465, respectively, and are acceptable for use under the SNAP program for comfort cooling chillers.

With respect to the compliance date for chillers—IPR, we note that in addition to the refrigerants already available as discussed above, EPA continues to evaluate substitutes under the SNAP program, and has authority to do so under subsection (i)(5) of the AIM Act as well, on an ongoing basis. In SNAP Rule 26 EPA has proposed to list as acceptable, subject to use conditions, several additional refrigerants for use in chillers for IPR: HFO-1234yf, HFO-1234ze(E), HFC-32, R-454B, R-454C, R-455A, R-457A, and R-516A (with GWPs of 1, 1, 675, 465, 146, 146, 137, and 140 respectively) (88 FR 33722, May 24, 2023). Further discussion on the intersection of SNAP listing decisions and AIM Act subsection (i)(4) can be found in section VI.E.

The Agency anticipates that this continuing evaluation of additional substitutes, including for use in chillers for IPR, may help facilitate the availability of even more options for compliance by January 1, 2026, through January 1, 2028, depending on the IPR chiller's characteristics.

The Agency recognizes the time it can take for an updated UL standard to be widely incorporated and for the updates to be applied across industry. Many other relevant changes impacting the availability of substitutes and facilitating transition to the use of those substitutes generally occur after the UL standard is updated, including evaluation of substitutes under the SNAP program, adoption of new editions of industry safety standards into building codes, equipment testing and certification, safety updates to manufacturing facilities, and training of technicians. All of these are considerations for EPA's assessment of availability of substitutes under subsection (i)(4)(B), and EPA has accounted for the additional time needed for these updates to occur by extending

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compliance dates for IPR chillers to 2026 and 2028, depending on the temperature of the fluid leaving the chiller. The Agency is allowing for a later compliance date of January 1, 2028, for equipment with exiting fluid temperatures lower than or equal to -30 °C (-22 °F) and higher than or equal to -50 °C (-58 °F) because fewer refrigerants are available with a sufficiently low boiling point to be technologically achievable, and thus, more time may be needed to identify, test, and implement appropriate substitutes than for equipment with higher temperature ranges.

With respect to the compliance date for chillers—comfort cooling, after review of the comments widely expressing support for the proposed compliance date, EPA is finalizing a compliance date of January 1, 2025. In addition to other substitutes discussed above, EPA finalized as acceptable more refrigerant options for use in comfort cooling chillers through SNAP Rule 25: HFO-1234yf, R-452B, R-454A, R-454B, R-454C and HFC-32 (with GWPs of 1, 698, 237, 465, 146, and 675, respectively) (88 FR 26382, April 28, 2023). The Agency agrees with the many commenters that this timeline is sufficient considering that substitutes that meet the Agency's restrictions are already widely available and in use in this subsector.

Comment: Many commenters requested clarification for chillers and IPR systems with very low temperatures that may or may not be exempt from GWP limits under EPA's proposed rule including those for laboratory equipment and IPR chillers. One commenter requested clarification on refrigerated laboratory equipment that operates at -62°C (-80°F) or lower temperatures and whether industrial process refrigeration chillers that operate at less than -50°C (-58°F) are exempt. Another commenter suggested that EPA exempt specialty applications for systems designed for exiting fluid temperatures of -50°C (-58°F) or create a formal variance application process, similar to California and

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Washington State regulations. One commenter proposed an exemption for all IPR applications with a refrigerant evaporating temperature below -45 °C (-49 °F). A couple of commenters requested clarification that the exclusion in the proposed rule for equipment where the temperature of the fluid exiting the chiller is less than -50°C (-58°F) and how that applies in cases where the temperature may also rise above -50°C (-58°F) while in use. The commenters also requested an exemption in the chillers – IPR subsector to encompass all applications in semiconductor manufacturing because chillers used in semiconductor manufacturing are required to reach very low temperatures, but also operate across a wide range of temperatures that can span from below -50 °C (-58 °F) to as high as 5 °C (41 °F).

Response: In this final rule, EPA is not setting restrictions for HFCs or HFC blend refrigerants used in IPR equipment or chillers for IPR with exiting fluid temperatures of -50 °C (-58 °F) or lower although the Agency may in the future propose to restrict HFCs used in such equipment. Concerning one commenter's request for either an exception or a longer period to comply for refrigerated laboratory equipment, to the extent that equipment used in the laboratory falls within the chillers – IPR subsector and has exiting fluid temperatures below -50 °C (-58 °F), it also would have no restrictions on HFCs or HFC blend refrigerants under this rule. Similarly, refrigerated laboratory equipment within the chillers – IPR subsector with exiting fluid at temperatures -50 °C (-58 °F) and above but below -30 °C (-22 °F) would have a compliance date of January 1, 2028, and if exiting fluid temperatures are equal to or greater than -30 °C (-22 °F), the compliance date would be January 1, 2026, for new equipment to transition to alternative refrigerants. EPA did not propose and is not finalizing a process to allow individual users to request a variance. Further a variance process would be burdensome and would decrease certainty

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that necessary transitions away from HFCs would occur. In response to the request for clarification about equipment where the temperature of the fluid exiting the chiller is less than -50 °C (-58 °F) in some cases but also may rise above that temperature while in use, EPA responds that if the fluid exiting the chiller reaches -50 °C or below during the normal operations of the chiller then the equipment is not covered under this rule.

k. Residential and Light Commercial Air Conditioning and Heat Pumps

The residential and light commercial air conditioning and heat pump subsector includes equipment for cooling air in individual rooms, single-family homes, and small commercial buildings. Heat pumps are equipment types that heat, or have the option to cool and heat, air for such locations. This subsector differs from commercial comfort air conditioning, which uses chillers that cool water that is then used to cool air throughout a large commercial building, such as an office building or hotel. The residential and light commercial air conditioning and heat pump subsector includes both self-contained and split systems. Self-contained products include some rooftop AC units (*e.g.*, those where the conditioned air is ducted to supply multiple spaces) and many types of ACs designed for use in a single room, including packaged terminal air conditioners (PTACs), packaged terminal heat pumps (PTHPs), some rooftop AC units, window AC units, portable room AC units, and wall mounted self-contained ACs. Split systems include ducted and non-ducted mini-splits (which might also be designed for use in a single room), multi-splits and variable refrigerant flow (VRF) systems, and ducted unitary splits. Split systems typically are charged with refrigerant at the location of assembly and installation ("field-assembled"). Water-source and ground-source heat pumps often are packaged systems similar to the self-contained equipment described in this section but could be assembled with the condenser separated from the other components, similar to split systems.

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Examples of equipment for residential and light commercial AC and heat pumps include the following:

- Central air conditioners, also known as unitary AC or unitary split systems. These systems include an outdoor unit with a condenser and a compressor, refrigerant lines, an indoor unit with an evaporator, and ducts to carry cooled air throughout a building. Central heat pumps are similar but offer the choice to either heat or cool the indoor space.
- Multi-split air conditioners and heat pumps. These systems include one or more outdoor unit(s) with a condenser and a compressor and multiple indoor units, each of which is connected to the outdoor unit by refrigerant lines. Non-ducted multi-splits provide cooled or heated air directly from the indoor unit rather than providing the air through ducts.
- Mini-split air conditioners and heat pumps. These systems include an outdoor unit with a condenser and a compressor and a single indoor unit that is connected to the outdoor unit by refrigerant lines. Non-ducted mini-splits provide cooled or heated air directly from the indoor unit rather than being carried through ducts.
- Rooftop AC units. These are products that combine the compressor, condenser, evaporator, and a fan for ventilation in a single package and may contain additional components for filtration and dehumidification. Most units also include dampers to control air intake. Rooftop AC units cool or heat outside air that is then delivered to the space directly through the ceiling or through a duct network. Rooftop AC units are common in small commercial buildings such as a single store in a mall with no indoor passageways between stores. They can also be set

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up in an array to provide cooling or heating throughout a larger commercial establishment such as a department store or supermarket.

- Window air conditioners. These are self-contained products that fit in a window with the condenser extending outside the window.
- PTACs and PTHPs. These are self-contained products that consist of a separate, un-encased combination of heating and cooling assemblies mounted through a wall. PTACs and PTHPs are intended for use in a single room and do not use ducts to carry cooled air or have external refrigerant lines. Typical applications include motel or dormitory air conditioners.
- Portable room air conditioners. These are self-contained products designed to be moved easily from room to room, usually having wheels. They may contain an exhaust hose that can be placed through a window or door to eject heat outside.
- Water-source heat pumps and ground-source heat pumps. These systems are similar to unitary split systems except that heat is ejected (when in cooling mode) from the condenser through a second circuit rather than directly with outside air. The second circuit transfers the heat to the ground, groundwater, or another body of water such as a lake using water, or a brine if temperatures would risk freezing. Some systems can perform heating in a similar matter with the refrigerant circuit running in reverse; regardless, the term “heat pump” is most often used.
- Variable refrigerant flow/variable refrigerant volume systems. These are engineered DX multi-split systems incorporating the following: a split system air conditioner or heat pump incorporating a single refrigerant circuit that is a common piping network to two or more indoor evaporators, each capable of independent control, or compressor units. VRF systems contain a single module

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outdoor unit or combined module outdoor units with at least one variable capacity compressor that has three or more steps of capacity, with air or water as the heat source. In response to comment below, we clarify that air-source VRF systems have capacities of 65,000 BTU/h (19 kW) or more, while water-source VRF systems can be of any capacity.

- Dehumidifiers that are integrated with the space air-conditioning system. This includes dehumidification via a separate bypass in the duct through which air is dehumidified, a dehumidifying heat pipe across the indoor coil, or other types of energy recovery devices that move sensible and/or latent heat between air streams (*e.g.*, between incoming air and air vented to the outside). In addition, this subsector includes non-residential dehumidifiers, which are used for commercial and other purposes and are typically of a higher capacity than residential dehumidifiers.

This subsector in its entirely is subject to the restrictions on the use of HFCs under this rule.

Common HFCs and blends containing HFCs used in self-contained AC and heat pump equipment are R-410A and HFC-134a. Common HFCs and blends containing HFCs used in mini-splits, multi-splits, unitary splits, and VRF systems are R-410A and to a lesser extent, R-407C, with GWPs of 2,088 and 1,774, respectively. Residential split systems are commonly shipped with a refrigerant charge that is then "balanced" by the technician once the equipment is installed in its place of use. Larger commercial sized units often are not pre-charged with refrigerant but may contain a nitrogen "holding charge" for shipping.

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EPA granted petitions submitted by EIA, AHRI, CARB, and AHAM which requested restrictions on the use of HFCs in the residential and light commercial air conditioning and heat pump subsector. EIA's petition refers to "residential and non-residential"; AHRI refers to "residential and light commercial"; and CARB, in its recently finalized regulation, refers to the specific end-uses of "room/wall/window air-conditioning equipment, PTACs, PTHPs, portable air-conditioning equipment," and "other air-conditioning (new) equipment, residential and nonresidential."[146] AHAM specifically requested restrictions on the use of HFCs for room ACs with and without electric heat and a capacity of 25,000 BTU/hr or less and for portable ACs.[147] For the purposes of this action, EPA considers all of these petitioned uses within the subsector "residential and light commercial air conditioning and heat pumps."

What restrictions on the use of HFCs is EPA establishing for residential and light commercial air conditioning and heat pumps?

EPA is restricting the use of HFCs and blends containing HFCs, that have a GWP of 700 or greater for all equipment types in the residential and light commercial air-conditioning and heat pump subsector, as proposed. EPA is prohibiting the manufacture and import of self-contained products beginning January 1, 2025, as proposed, with restrictions on the sale, distribution, offer for sale or distribution, and export of products beginning January 1, 2028. For systems in this subsector that are field-assembled, EPA is prohibiting the installation of new systems as of January 1, 2025, except for VRF systems, which have a compliance date of January 1, 2026.

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[146] California Code of Regulations, Prohibitions on Use of Certain Hydrofluorocarbons in Stationary Refrigeration, Stationary Air-conditioning, and Other End-uses. Available at: *https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2020/hfc2020/frorevised.pdf.*

[147] The petitions can be found in the docket to this rule and further discussion can be found in the proposed rule and in the *Federal Register* notice (86 FR 57141, October 14, 2021) granting the petitions.

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In our proposal to set the GWP limit for this subsector at 700, EPA identified multiple lower-GWP substitutes currently available for use in residential and light commercial air-conditioning and heat pump applications. For example, R-452B, HFC-32, and R-454B have GWPs of 698, 675, and 465, respectively, and are available under EPA's (i)(4)(B) analysis, including being listed under SNAP as acceptable, subject to use conditions. After consideration of the comments, which were largely supportive of the level of restriction, EPA is finalizing the GWP limit at 700 for this subsector.

The transition in this subsector to lower-GWP substitutes is underway. As discussed in section VI.E.2.c, updates to the safety standard covering these refrigerants were published on November 1, 2019, and many of the subsequent regulatory steps and industry adaptations incorporating those updates have already occurred. SNAP lists five lower-GWP refrigerants for use in residential and light commercial AC and heat pumps in Rule 23 (86 FR 24444, May 6, 2021). The International Building Code and the Residential Building Code were also revised in 2021 to incorporate updates to the safety standards, by allowing for the use of lower-GWP refrigerants exhibiting lower flammability (*i.e.*, 2L flammability classification). EPA anticipates that States will adopt the 2021 model building codes or revise their regulations allowing for use of several SNAP-listed lower-GWP refrigerants that exhibit lower flammability by 2025. Several OEMs have also indicated that they intend to switch to using A2L refrigerants (*e.g.*, R-454B, HFC-32) once relevant codes have been updated to allow their use.[148,149]

[148] Turpin, J, R-454B Emerges as a Replacement for R-410A, ACHR News, August 2020. Available at: *https://www.achrnews.com/articles/143548-r-454b-emerges-as-a-replacement-for-r-410a*.
[149] Turpin, J, Manufacturers Eye R-32 to Replace R-410A, ACHR News, August 2020. Available at: *https://www.achrnews.com/articles/143422-manufacturers-eye-r-32-to-replace-r-410a*.

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EPA proposed and is finalizing a compliance date of January 1, 2026, for VRF systems. These systems are larger and more complicated than most of the other types of equipment in this subsector. This additional time is needed for designing, testing, and implementing the use of substitutes in these systems.

Comment: EPA received many comments on the proposed GWP limit for the residential and light commercial air conditioning and heat pump subsector.

Many commenters expressed support for EPA's proposed GWP limit of 700 for HFCs and blends containing HFCs used in this subsector. Several commenters requested that EPA provide more detail on the basis for proposing a 700 GWP limit, rather than the 750 GWP limit that petitioners requested. One commenter in favor of a 750 GWP limit stated that proposing a lower GWP limit than contained in the petitions does not promote stability and fairness and it was not appropriate or necessary for EPA to do so. Some commenters described concerns with the 700 GWP limit because of the desire to harmonize Federal, State, and global standards, while other commenters noted that although the GWP limit is not entirely similar to those established by CARB, they anticipate the differences will not create undue burden for the industry. Other commenters agreed with EPA's reasoning in the proposed rule that there is a lack of refrigerants with a GWP between 700 and 750. Another commenter, whose petition also included a limit of 750 for this subsector agreed that 700 was more appropriate because the only additional refrigerant between 700 and 750 GWP would be R-466A, which they characterized as a step backwards due to its ozone depletion potential.

Many commenters also expressed support for the January 1, 2025, compliance date for this subsector. Many commenters were also supportive of the January 1, 2026, compliance date for VRF systems; however, a few commenters disagreed with the

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additional year proposed for VRF systems due to the larger charge sizes and potentially higher refrigerant leak rates from VRF systems, and the potential for more releases to the atmosphere of higher-GWP refrigerants. Another commenter suggested a GWP limit of 150 for VRF systems rather than the proposed 700 due to the potentially higher leakage rates and volumes from VRF systems. Another commenter suggested that EPA consider establishing lower GWP limits with delayed compliance dates for VRF systems (*i.e.*, 10 or 150 GWP in 2027) to support product innovation and achieve greater GHG emissions reduction. Several commenters asked EPA to clarify whether VRF-type products under 65,000 BTU/hr would be subject to the compliance dates for air-conditioning and heat pump products (January 1, 2025) or VRF products (January 1, 2026). One commenter stated that their smaller capacity, single-phase VRF products could be interpreted as falling into both residential AC and VRF category descriptions, and they suggested EPA align with the category definitions in AHRI 1230 and AHRI 210/240 standards to clarify this issue.

Response: EPA is finalizing a compliance date of January 1, 2025, for the residential and light commercial air conditioning and heat pumps subsector as proposed. The Agency agrees with the large number of commenters that this timeline is sufficient considering several of these alternatives have already been SNAP-approved. EPA is also finalizing a January 1, 2026, compliance date for residential and light commercial air conditioning- VRF systems as proposed and agrees with the many commenters that additional time beyond 2026 is not required for these systems.

In response to the comment regarding smaller capacity products, EPA has reviewed the AHRI standards referenced and has clarified above that for the purposes of this rule, for an air-source air conditioner to be considered a VRF system, it must have a

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capacity greater than or equal to 65,000 BTU/h (19 kW), among the other characteristics described, whereas there is no minimum capacity for water-source VRF systems. We find that such a clarification conforms with the referenced AHRI Standard 1230.

EPA is finalizing a 700 GWP limit for this subsector as proposed. We acknowledge that many commenters requested a limit of 750 for this subsector and other commenters requested a lower GWP limit. Consistent with our consideration of the (i)(4) factors in the proposed rule, the Agency identified multiple currently available substitutes with a GWP below 700 and did not receive comments disputing EPA's assessment of availability under subsection (i)(4)(B) or that EPA overlooked important considerations.

The AIM Act does not require that EPA adopt as its final restriction the requests made in petitions granted under subsection (i). Instead, granting a petition under subsection (i)(3)(C) means that the Administrator must then undertake a rulemaking with respect to the restriction that is the subject of the petition, and must do so by the statutory timeframe established in the AIM Act (two years after the date on which the Administrator grants the petition). The Act states that in carrying out this rulemaking establishing any restriction, the Agency is to factor in, to the extent practicable, the considerations laid out in subsection (i)(4). Thus, granting a petition under subsection (i)(3)(C) does not commit the Agency to any substantive outcome, nor would such an interpretation be reasonable. There would be little purpose in Congress directing the Agency to undergo a notice-and-comment rulemaking if the Agency were bound to promulgate the restriction as requested in the petition. We therefore do not agree with commenters who alleged that proposing and finalizing a restriction that is more stringent than what was requested in a petition undermines "stability and fairness," nor do we agree that to do so, the Agency must demonstrate that it is "appropriate and necessary."

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In addition, when approving petitions, EPA stated explicitly that a petition grant does not mean that the Agency will propose or finalize requirements identical to the petitions.

As discussed in section VI.E of this preamble, EPA takes notice of the regulations and restrictions related to HFC use and technology transitions in its assessment of whether substitutes are available to use in a sector or subsector. Restrictions in other jurisdictions can be an indicator of the status of a sector or subsector's transition to lower-GWP substitutes, and can provide affirmation of the Agency's assessments that substitutes are available. However, nothing in the AIM Act suggests that EPA must or even should establish its restrictions with the goal of consistency with State or international regulations. Our proposed 700 GWP limit for this subsector took into consideration that there are a number of widely available substitutes for use in this subsector with GWPs lower than 700, and we also note the programmatic advantage of establishing restrictions at set cut-points (*i.e.*, 150, 300, 700) to facilitate compliance and enforcement of the Technology Transitions program (*see* section VI.E).

Finally, in the Agency's assessment, there is little practical difference between a 750 GWP or 700 GWP limit for this subsector. Available substitutes that the Agency identified for use in this subsector had GWPs lower than 700, and there are no substitutes for this subsector listed under the SNAP program with a GWP between 700 and 750. A number of industry commenters also confirmed the lack of refrigerants with GWPs between 700 and 750. For example, R-452B, HFC-32, and R-454B have GWPs of 698, 675, and 465, respectively, and are acceptable for use in this subsector under the SNAP program, and some equipment within this subsector is now offered with these refrigerants. As a commenter noted, there is one refrigerant with a GWP between 700 and 750 that may be under consideration by some industry stakeholders; however, as noted by

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a separate commenter, the ozone-depleting potential of this refrigerant (R-466A) is higher than for other identified alternatives. In a separate action, EPA requested advance comments on potential approaches to SNAP listing decisions for certain very short-lived substances (87 FR 45508, July 28, 2022).

The Agency therefore disagrees with commenters asserting that EPA should adopt a GWP limit of 750 for this subsector or as low as 10 or 150 for VRF systems.

EPA is also finalizing a 700 GWP limit for VRF systems as proposed. With consideration to the subsection (i)(4) factors, EPA does not agree with a GWP limit of 10 or 150. Currently there are no SNAP listed refrigerants with GWP less than 10 for VRF systems, apart from ammonia absorption. EPA views the availability of this option to be many years off, and therefore is setting restrictions at a higher GWP limit and a compliance date that allows for transitions to initiate sooner. Likewise, EPA views the two other refrigerants with GWPs below 150—R-454C and R-457A—as not being available under the (i)(4) factors, including technological achievability, in the timeframes considered in this rule.

l. Residential Dehumidifiers

Residential dehumidifiers are self-contained products primarily used to remove water vapor from ambient air or directly from indoor air for comfort or material preservation purposes in the context of the home. This product circulates air from a room, passes it through a cooling coil, and collects condensed water for disposal. While AC equipment often combines cooling and dehumidification, residential dehumidifiers only serve the latter purpose. This subsector therefore does not include dehumidifiers for residential or light commercial use that are integrated with the space air-conditioning equipment, for instance via a separate bypass in the duct through which air is

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dehumidified, a dehumidifying heat pipe across the indoor coil, or other types of energy recovery devices that move sensible and/or latent heat between air streams (*e.g.*, between incoming air and air vented to the outside). In addition, this subsector does not include non-residential dehumidifiers, which are used for commercial and other purposes and are typically of a higher capacity than residential dehumidifiers. Such equipment falls within the residential and light commercial AC or heat pump subsector. Similar to other residential and light commercial AC equipment, the majority of residential dehumidifiers historically used HCFC-22 and moved to R-410A.

What restrictions on the use of HFCs is EPA establishing for residential dehumidifiers?

EPA received only two comments on this subsector, both in support of EPA's proposed GWP limit of 700 for dehumidifiers. Therefore, EPA is restricting the manufacture and import of HFCs and blends containing HFCs that have a GWP of 700 or greater for residential dehumidifiers as proposed. EPA identified multiple available substitutes for use in this subsector at proposal that have GWPs of 700 or lower. In assessing availability, we note that many substitutes with GWPs of 700 or lower are listed as acceptable under the SNAP program. For example, R-513A with a GWP of 630 is listed as acceptable (82 FR 33809, July 21, 2017). EPA has also recently listed as acceptable, subject to use conditions, R-452B, HFC-32, and R-454B, with respective GWPs of approximately 698, 675, and 465 (88 FR 26382, April 28, 2023). EPA is also finalizing a compliance date of January 1, 2025, as proposed.

m. Motor Vehicle Air Conditioners

Motor Vehicle Air Conditioners (MVACs) cool the passenger compartment of light-duty (LD) vehicles, heavy-duty (HD) vehicles (*e.g.*, large pickup trucks, delivery trucks, and semi-trucks), nonroad (also called off-road) vehicles, buses, and passenger

rail vehicles. MVACs used to cool passenger compartments in LD, HD, and nonroad vehicles are typically charged during vehicle manufacture and the main components are connected by flexible refrigerant lines. In addition, the MVAC subsector includes heat pumps, which may cool or redirect heat into vehicle cabins and control temperatures. Heat pumps are expected to become more common, especially as more electric vehicles are introduced into the market. The vehicle types subject to this action are passenger cars and light-duty trucks,[150] referred to jointly in this action as LD vehicles, limited types of HD vehicles (*i.e.*, medium-duty passenger vehicles (MDPVs),[151] HD pickup trucks, and complete HD vans), and certain nonroad vehicles. These nonroad vehicles include:

- Agricultural tractors greater than 40 horsepower (HP) (including two-wheel drive, mechanical front-wheel drive, four-wheel drive, and track tractors) that are used for various agricultural applications such as farm work, planting, landscaping, and loading;[152,153]
- Self-propelled agricultural machinery (including combines, grain and corn harvesters, sprayers, windrowers, and floaters) that are primarily used for harvesting, fertilizer, and herbicide operations;
- Compact equipment (including mini excavators, turf mowers, skid-steer loaders, and tractors less than 40 HP) that are primarily used for agricultural operations and residential, commercial, and agricultural landscaping;
- Construction, forestry, and mining equipment (including excavators, bulldozers, wheel loaders, feller bunchers, log skidders, road graders, articulated trucks, sub-

[150] Defined at 40 CFR 86.1803-01.
[151] Ibid.
[152] Wagner, 2021. May 24, 2021, email from John Wagner of the Association of Equipment Manufacturers to EPA. Available in the docket.
[153] AEM, 2021. Appendix A: Machine Forms as Classified by AEM Membership. Available in the docket.

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surface machines, horizontal directional drill, trenchers, and tracked crawlers) that are primarily used to excavate surface and subsurface materials during construction, landscaping, and road maintenance and building; and

- Commercial utility vehicles that are primarily used for ranching, farming, hunting/fishing, construction, landscaping, property maintenance, railroad maintenance, forestry, and mining.

For further information on classifications of vehicle types, see the proposed rule (87 FR 76789-91, December 15, 2022).

EPA proposed to restrict the use of HFCs and blends containing HFCs that have a GWP of 150 or greater starting in MY 2025 for MVACs in newly manufactured LD vehicles as well in MDPVs and limited types of HD vehicles in Class 2b-3 (*i.e.*, newly manufactured MDPVs, HD pickup trucks, and complete HD vans), including vehicles manufactured exclusively for export.[154] EPA also proposed to restrict the use of HFCs and blends containing HFCs that have a GWP of 150 or greater starting in MY 2026 for certain nonroad vehicles (*i.e.*, agricultural tractors greater than 40 HP; self-propelled agricultural machinery; compact equipment; construction, forestry, and mining equipment; and commercial utility vehicles), including vehicles manufactured exclusively for export.

What restrictions on the use of HFCs is EPA establishing for MVAC?

EPA is restricting the use of HFCs and blends containing HFCs that have a GWP of 150 or greater for MVACs in newly manufactured LD vehicles, limited types of MD and HD vehicles in Class 2b-3, and certain nonroad vehicles, as proposed. The use

[154] "Model year" is defined at 40 CFR 85.2302 and "means the manufacturer's annual production period (as determined under 40 CFR 85.2304) which includes January 1 of such calendar year, provided, that if the manufacturer has no annual production period, the term "model year" shall mean the calendar year."

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restriction for LD vehicles starts in MY 2025, as of one year after publication of this final rule, and includes vehicles manufactured for export as proposed. EPA is delaying the compliance date for MDPVs and for the HD vehicles subject to this rule to MY 2028, not MY 2025 as proposed. The final rule also delays the compliance date for the listed nonroad vehicles to January 1, 2028, rather than MY 2026 as proposed. As discussed in section VI.C.2.c, EPA is allowing for a three-year sell-through of manufactured products. Thus, the dates by which newly manufactured vehicles containing regulated substances with a GWP of 150 or greater (*e.g.*, HFC-134a) may no longer be sold, distributed, or exported are the following: upon introduction of MY 2028 for LD vehicles; upon introduction of MY 2031 for newly manufactured MDPVs, HD pickup trucks, and complete HD vans which have AC equipment that will not be modified by upfitters; and January 1, 2031, for the listed nonroad vehicles.

For LD vehicles, EPA is restricting the use of HFCs and blends containing HFCs starting MY 2025, as of one year after publication of the final rule. The Agency analyzed the subsection (i)(4) factors and, in particular, the availability of substitutes under (i)(4)(B) and identified three substitutes, R-744, HFO-1234yf, and HFC-152a, with GWPs below the limit of 150. EPA is aware of only limited use of R-744 globally, and no commercial use of HFC-152a in any LD or HD vehicle to date.

In terms of commercial demands and technological achievability, HFO-1234yf has gained significant market share in LD vehicles in the United States since its introduction in MY 2013. According to the *2022 EPA Automotive Trends Report*, approximately 95 percent of MY 2021 LD vehicles sold used HFO-1234yf and most

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manufacturers have implemented HFO-1234yf across their entire vehicle brands.[155] HFO-1234yf is also predominantly being used in new LD vehicles in Europe and Japan.[156] The GWP limit of 150 for LD vehicles harmonizes with the EU's Mobile AC Directive 2006/40/EC,[157] which is aimed at reducing emissions of HFC-134a from LD MVACs, and also sets a GWP limit of 150 for refrigerants used in MVAC installed in any LD vehicle sold in the European market after 2017, regardless of its model year. Today's final rule restricts the use of HFCs and blends containing HFCs that have a GWP of 150 or greater for LD vehicles, including vehicles manufactured exclusively for export, starting in MY 2025 and becoming effective no earlier than one year after publication of the final rule.

For MDPVs, HD pickup trucks, and complete HD vans which have AC equipment that will not be modified by upfitters, EPA is restricting the use of HFCs and blends containing HFCs starting MY 2028, because at least three technologically achievable substitutes, R-744, HFO-1234yf, and HFC-152a, meet the GWP limit of 150. HFO-1234yf was listed as acceptable, subject to use conditions, in 2016 under SNAP for new MDPVs, HD pickup trucks, and complete HD vans and is in use or under various stages of development for these vehicle types. After review of the comments and further consideration of the subsection (i)(4) factors, EPA is extending the compliance date to MY 2028 for these vehicle types.

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[155] The 2022 EPA Automotive Trends Report: Greenhouse Gas Emissions, Fuel Economy, and Technology since 1975 (EPA-420-R-22-029, December 2022). Available at: *https://www.epa.gov/automotive-trends*.
[156] Volume 1: Progress Report, Technology and Economic Assessment Panel, UNEP, September 2021. Available at: *https://ozone.unep.org/system/files/documents/TEAP-2021-Progress-report.pdf*.
[157] European Commission, 2006. Directive 2006/40/EC of the European Parliament and of the Council of 17 May 2006 relating to emissions from air-conditioning systems in motor vehicles and amending. Available at: *https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32006L0040*.

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After review of the comments and further consideration of the (i)(4) factors, EPA is also extending the compliance date for MVACs for the proposed list of nonroad vehicles (*i.e.*, agricultural tractors greater than 40 HP; self-propelled agricultural machinery; compact equipment; construction, forestry, and mining equipment; and commercial utility vehicles) to January 1, 2028. Nonroad vehicles are vocational vehicles and are not produced by model year.

In general, commenters supported the proposed 150 GWP limit for new MVACs and did not suggest alternatives, and one commenter stated that this GWP limit is critically important to continue the transition to low-GWP refrigerants in these subsectors. EPA is retaining the 150 GWP limit in this final rule. EPA also received comments objecting to the compliance dates for the restrictions in the MVAC subsectors and exports of vehicles that contain HFC-134a. We summarize those comments and address them in this section.

Comment: EPA received many comments on the compliance date for the GWP of refrigerants used in MVACs. Environmental nongovernmental organizations and State attorneys general supported the proposed compliance dates. A State environmental agency urged EPA to take advantage of every opportunity to phase out HFCs as soon as possible. Representatives of manufacturers of LD vehicles objected to the proposed MY 2025 compliance date, stating that this could give as little as three months after finalization of this rule to redesign vehicles and retrofit assembly plants. These commenters instead suggested MY 2027, to allow at least two full years after finalization of this rule. One of these commenters asserted that additional lead-time of two years would provide a similar environmental benefit, but at a more reasonable cost and timeframe. Another commenter representing automotive manufacturers stated that using a

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calendar year basis restricting refrigerant in an industry that "efficiently operates using the model years" would add expense and complexity to track refrigerant and system components while managing the running change of these parts.

Response: EPA is finalizing a MY-based compliance deadline for LD vehicles because we agree that structuring the restriction in this way provides clarity for the regulated industry and aligns with their typical practices. In this final rule, the Agency is establishing a compliance date for new LD vehicles of MY 2025, but no earlier than [**INSERT DATE ONE YEAR AFTER DATE OF PUBLICATION IN FEDERAL REGISTER**]. This ensures that manufacturers of LD vehicles will have at least one full year after finalization of this rule to change their MVAC designs and facilities, while meeting the AIM Act requirement that no rule under subsection (i) may take effect before the date that is one year after the date of final promulgation. We do not agree with commenters who advocated for a compliance date of MY 2027, based on their view that regulated entities might be expected to comply with the new subsector restrictions within three months of this action being finalized. Vehicle manufacturers choose the start of a MY and any manufacturer that has not completed their transition could decide to make their MY 2025 start date coincide with the effective date of this rule, thereby avoiding any potential expense and/or complexity of a transition in the middle of a MY. Moreover, after reviewing the comments and considering the (i)(4) factors, we do not agree that a delay of two years to MY 2027 is reasonable or appropriate for MVAC in LD vehicles. The agency has identified three available substitutes for use in MVAC in LD vehicles and recognized that this transition is already well underway, and commenters largely agreed with the Agency's assessment. This confirms industry reports of the transition status for this subsector: the 2022 EPA Automotive Trends Report stated that approximately 95

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percent of MY 2021 LD vehicles sold used HFO-1234yf (a substitute compliant with the 150 GWP limit) and most manufacturers have implemented HFO-1234yf across their entire vehicle brands.[158] This is a subsector that has already largely transitioned to use of lower-GWP substitutes meeting the new restriction; therefore, providing a compliance date of MY 2025, or at most one year after the date of final publication, is appropriate.

Comment: Several commenters requested that EPA not restrict exports of vehicles with MVACs using HFC-134a in the final rule. Some commenters said that the proposed timeline does not provide adequate lead-time to implement the required infrastructure updates and additional training needed at dealerships in all export countries. Commenters stated that because there are markets that do not yet support the lower GWP refrigerants, it is premature to be overly restrictive with an export prohibition that could hinder U.S. domestic manufacturing goals. One commenter stated that some countries have not yet decided to phase down HFCs, such as those in the Gulf Cooperation Council, and thus, there is no guarantee that these countries will have vehicle markets prepared to support different refrigerants within EPA's proposed timeframe. Another commenter stated that because of the uncertainty associated with the availability of HFO-1234yf in international markets, equipment manufacturers may need to export machines pre-charged with HFC-134a as well as bulk shipments of HFC-134a to properly service equipment abroad. This commenter asked EPA to ensure that the heavy-duty, nonroad equipment industry maintain an uninterrupted supply of HFC-134a for export purposes to ensure continuity.

Response: HFO-1234yf is widely used in MVACs on a global basis including those countries with large export markets. The transition of this sector began in the EU

[158] 2022 EPA Automotive Trends Report. EPA, 2023. Available at: *https://www.epa.gov/automotive-trends/download-automotive-trends-report#Summary*.

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and the United States prior to the agreement of the Kigali Amendment to the Montreal Protocol in 2016. Commenters seem to imply a direct linkage between ratifying the Amendment and transition of an HFC use. While currently 150 countries have ratified the Kigali Amendment, EPA does not agree with that assessment. While the Agency agrees that this rule will support the U.S. domestic HFC phasedown under the AIM Act, this rule is under separate authority provided by Congress. In other countries, actions to restrict use of HFCs were underway ahead of the Kigali Amendment and without a domestic phasedown, notably the EU Mobile Air Conditioning Directive. With regard to the use of HFO-1234yf, there has been an increased use of HFO-1234yf on a global basis over the last decade as the replacement for higher-GWP MVAC refrigerants. Therefore, infrastructure for servicing vehicles is increasingly available globally as well.

EPA also notes that the final rule provides three years, rather than the proposed one year, before compliance dates for sale, distribution, offer for sale or distribution, and export are effective. As a result, LD vehicles manufactured in the United States using HFC-134a prior to the compliance date may still be exported prior to the introduction of MY 2028. Similarly, the nonroad vehicles covered in this rule would have a compliance date of January 1, 2028, for manufacturing new equipment, and would be able to export that equipment until January 1, 2031. See section VI.C.2.d for further discussion on exports.

Comment: Representatives of manufacturers of MDPVs, HD pickup trucks, and complete HD vans requested a MY 2028 or MY 2029 compliance date to allow time to design and validate AC equipment using new refrigerants. These commenters stated that their members had not yet converted any of their HD vehicles to HFO-1234yf, and that HD vehicles must be designed for higher capacity engine cooling systems, requiring

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changes from the design for LD vehicles. One of these commenters stated that it was more complex and increases the cost and time to transition to HFO-1234yf if only some HD pickups in class 2b and 3 and complete HD vans have an earlier conversion date, while other classes of HD vehicles in the same assembly plant continue to be manufactured with HFC-134a. This commenter suggested that delaying the timing for conversion until after EPA reviews HFO-1234yf for use with all remaining HD vehicles would allow manufacturers to convert all production in an assembly plant. This commenter also stated that some HD pickups are sold without beds so that upfitters add on to the AC equipment and some complete HD vans are sold with "AC Prep" packages allowing upfitters to complete or modify the AC equipment. This commenter suggested that the restriction apply only to HD pickups and complete HD vans which have AC equipment that will not be modified by upfitters, since the risk assessments on HFO-1234yf have not covered such vehicles. A representative of manufacturers of HD vehicles stated that HFO-1234yf is the logical next-generation refrigerant for MD and HD commercial vehicles and that EPA must first approve its use in all MD and HD on-road vehicles before the transition can happen.

Response: EPA recognizes the constraints posed by the proposed MY 2026 compliance date for MDPVs, HD pickup trucks, and HD complete vans which have AC equipment that will not be modified by upfitters, and we are finalizing a delay of this compliance date to MY 2028 to address many of the concerns raised by commenters. Unlike LD vehicles, which already widely use lower-GWP refrigerants, MDPVs, HD pickup trucks, and HD complete vans do not. Manufacturers will need to change MVAC designs, prepare facilities for safe use of flammable or high-pressure refrigerants such as HFO-1234yf or R-744 (*e.g.*, explosion-proofing refrigerant handling equipment), and

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train personnel in proper technical and safety procedures. Commenters for these uses did not advocate for a less stringent GWP limit for these uses within this subsector, suggesting that efforts to transition are already underway. Rather, commenters focused on needing additional time to effectuate the transition. EPA is therefore extending the compliance date to MY 2028 for these uses, providing two to three years after the final rule publication to accommodate factors impacting availability of substitutes.

The MY 2028 compliance date will also accommodate those facilities that manufacture different products or parts within one facility, and where EPA's restriction only covers some of the products or parts. The Agency agrees with the likely cost-effectiveness of converting an entire facility rather than staggering the transition. In addition, a MY 2028 compliance date is still before the 2029 stepdown in HFC consumption and can relieve the potential for shortages by reducing demand for HFCs.

Finally, EPA is not establishing restrictions on HD vehicles that are modified by "upfitters" with AC equipment after manufacture, such as ambulances, shuttle buses, and motorhomes. We agree with commenters that substitutes that would allow them to meet the new restriction have not yet been identified for use in these vehicles.

Comment: Representatives of manufacturers of nonroad vehicles and HD trucks commented that much of the nonroad equipment industry does not use MY designations on their products. These commenters also asserted that it would take at least five years to design and validate new AC systems, convert production facilities, and develop and provide maintenance and service information for new AC systems. One such commenter noted that most of that work (for class 4 through 8 HD trucks) can only begin once EPA has provided certainty about applicable use conditions in a final SNAP rulemaking for HFO-1234yf.

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Response: EPA agrees that a calendar year compliance date is more appropriate for nonroad vehicles since using MY dates is not a common practice in that industry. EPA also agrees that additional time is needed to redesign and convert AC equipment and production facilities, but that time should be limited. The Association of Equipment Manufacturers developed a risk assessment for each of the six categories of nonroad vehicles with a structure similar to previous SAE Cooperative Research Programme risk assessments for the use of HFO-1234yf in LD vehicles. The risk assessments found that HFO-1234yf can be used safely. EPA issued regulations to allow for the safe use of HFO-1234yf in six categories of nonroad vehicles in a final rule issued in May 2022 (87 FR 26276, May 4, 2022). Commenters did not object to the level of the GWP restriction, but requested additional time for compliance, indicating that industry expects that substitutes widely used in this subsector can be adapted for use in nonroad vehicles. EPA understands that the necessary work to transition to a refrigerant with a GWP below 150 is already well underway. Based on a review of the comments and information received during the comment period, particularly comments concerning the transition of manufacturing facilities, it is EPA's assessment that extending the compliance date by approximately two and one-half years is consistent with a review of the subsection (i)(4) factors. This also would allow roughly five years from the date of the proposed rule in December 2022, until the compliance date of January 1, 2028, consistent with the commenter's request. EPA is therefore finalizing a compliance date of January 1, 2028, for the six types of nonroad vehicles.

Comment: Many commenters, including representatives of automobile manufacturers, automobile dealers, and chemical producers requested that HFC-134a be

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allowed to maintain and service vehicles and equipment already manufactured with HFC-134a prior to the compliance date.

Response: Vehicles with MVACs that are manufactured to use HFC-134a before the compliance date (*i.e.*, MY 2025 for LD vehicles; MY 2028 for MDPVs, HD pickup trucks, and complete HD vans which have AC systems that will not be modified by upfitters; and January 1, 2028, for the six types of nonroad vehicles covered in this rulemaking) may continue to use HFC-134a after the applicable compliance date, including use for service, maintenance, and repair.

2. Foams

Foams are plastics (such as phenolic, polyisocyanurate, polyolefin, polyurethane, or polystyrene) that are manufactured using blowing agents to create bubbles or cells in the material's structure. The range of uses for plastic foams includes building materials, appliance insulation, cushioning, furniture, packaging materials, containers, flotation devices, filler, sound proofing, and shoe soles. Some foams are rigid with closed cells that still contain the foam blowing agent, which can contribute to the foam's ability to insulate. Other foams are open-celled, with the foam blowing agent escaping at the time the foam is blown, as for flexible foams.

A variety of foam blowing agents have been used for these applications. In the early 1990s CFCs and HCFCs were typically used. In implementing CAA title VI requirements to protect the stratospheric ozone layer, EPA issued regulations that banned the sale or distribution of foam products blown with CFCs and HCFCs except for HCFCs used for foam insulation products.

Blowing agents that are a liquid at room temperature (such as CFC-11, CFC-113, cyclopentane, HCFC-141b, HFC-245fa, HFC-365mfc, and methyl formate) are more

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commonly used in polyisocyanurate, polyurethane, and phenolic foams. Blowing agents that are gases at room temperature (such as CFC-12, CO_2, HCFC-22, HCFC-142b, HFC-134a, and HFC-152a) are more commonly used in polyolefin and polystyrene foams.

What restrictions on the use of HFCs is EPA establishing for foams?

EPA is restricting the use of HFCs and blends containing HFCs with a GWP of 150 or greater beginning January 1, 2025, for all foam subsectors included in the proposed rule. These subsectors, with examples, are:

1. Flexible polyurethane, which includes open-cell foam in furniture, bedding, chair cushions, and shoe soles;
2. Integral skin polyurethane, which includes open-cell foam used in car steering wheels, dashboards, upholstery, and shoe soles;
3. Phenolic insulation board and bunstock, which includes insulation for roofing and walls;
4. Polyolefin (*e.g.*, polyethylene, polypropylene), which includes foam sheets and tubes;
5. Polystyrene – extruded boardstock and billet, which includes closed cell insulation for roofing, walls, floors, and pipes;
6. Polystyrene – extruded sheet, which includes closed cell foam for packaging and buoyancy or flotation;
7. Rigid polyurethane – appliance foam, which includes insulation foam in household refrigerators, freezers, and hot water heaters;
8. Rigid polyurethane – slabstock and other, which includes insulation for panels and pipes, taxidermy foam, and other miscellaneous uses;

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9. Rigid polyurethane – commercial refrigeration, which includes insulation for vending machines, coolers, commercial refrigeration equipment, pipes, shipping containers for perishable goods, and refrigerated transport vehicles;[159]
10. Rigid polyurethane – sandwich panels, which includes insulation panels for walls and metal doors;
11. Rigid polyurethane and polyisocyanurate laminated boardstock, which includes laminated board insulation for roofing and walls;
12. Rigid polyurethane – marine flotation foam, which includes buoyancy or flotation foams;[160] and
13. Rigid polyurethane spray foam that is applied *in situ*, which includes insulation for building envelopes, roofing, walls, doors, and other construction uses, as well as foam for building breakers for pipelines. Polyurethane spray foam is broken down further into high-pressure two-component, low-pressure two-component, and one-component foam sealants. These three applications vary in the types of systems used to apply them (one-component or two-component, high-pressure or low-pressure), who uses such systems (contractors using personal protective equipment, or consumers), and how much is applied (large-scale applications within walls or on roofs of a residence or filling in cracks, leaks, and gaps in a residence). For further information on spray foam applications, *see* SNAP Rule 21 (81 FR 86778 at 86846-86847, December 1, 2016).

[159] As described in section VI.C.1 and in this section, EPA is exempting certain applications as long as they have a current qualification for application-specific allowances under subsection (e)(4)(B) of the Act, including structural composite preformed polyurethane foam for trailer use.

[160] As described in section VI.C.1 and in this section, EPA is exempting certain applications as long as they have a current qualification for application-specific allowances under subsection (e)(4)(B) of the Act, including structural composite preformed polyurethane foam for marine use.

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These restrictions apply to the manufacture and import of new foam products, including fully formulated polyols and foam insulation, the blowing of foam to manufacture new products containing foams, such as appliances, furniture, or vehicles, and the import of such foam products and products containing foams beginning January 1, 2025. Foam products and products containing foam with blowing agents that are HFCs or HFC blends with a GWP of 150 or greater (*e.g.*, HFC-134a) may no longer be sold, distributed, offered for sale or distribution, or exported beginning January 1, 2028.

The use restrictions (including labeling and reporting) finalized in this rule do not apply to any product that qualifies for application-specific HFC allowances under subsection (e)(4)(B) of the AIM Act. Specifically, this final action does not restrict the HFCs used in the manufacture of structural composite preformed polyurethane foam for marine use and trailer use or foams used in mission-critical military end uses as they have a current qualification for application-specific allowances.

This rule also excludes spray and pour foams used in space vehicles, as defined in 40 CFR 84.3 from the use restrictions. Such equipment faces unparalleled and highly demanding operating conditions and requires long lead-times for its operation to be certified. This approach is consistent with EPA's CAA regulations where space vehicles were either exempted or given additional time to transition to substitute foam blowing agents. EPA proposed to exclude spray foams used in this application but has learned that pour foams requiring the use of HFCs are also used in space vehicles. EPA is exempting the use of both foam types in space vehicles from the restrictions in this final rule.

HFCs have been widely used as blowing agents in rigid polyurethane insulation foam (*e.g.*, appliance, commercial refrigeration, sandwich panels, and spray foams) and polystyrene – extruded boardstock and billet in the United States since the phaseout of

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ODS blowing agents such as HCFC-141b and HCFC-142b, particularly where insulation value and flammability have been important considerations. Available substitutes have increased in the last decade and the uses for substitute blowing agents have also expanded.

There is interest in using newer foam blowing agents with lower GWP, often to improve energy efficiency of the foam products. SNAP has listed HCFO-1233zd(E) (GWP 4), HFO-1234ze(E) (GWP 1), HFO-1336mzz(E) (GWP 26), and HFO-1336mzz(Z) (GWP 2) as acceptable for some uses. These newer substitutes, which are either nonflammable or lower flammability, may prove appropriate for subsectors where higher-flammability blowing agents raise safety concerns. In addition, some nonfluorinated lower-GWP blowing agents are now being used more broadly, such as carbon dioxide (GWP 1), light saturated hydrocarbons with three to six carbons (GWPs from 1 to 4), and methyl formate (GWP 13). The process and timing for retooling facilities to use new blowing agents or that incorporate the foam product into another product will vary depending on the substitute selected. Manufacturing facilities such as household refrigerator manufacturers have already been transitioning to lower-GWP substitutes for foam-blowing. Production volumes for some of these newer substitutes are expanding rapidly to keep pace with growing commercial demands.

For some types of foam that have historically used gaseous blowing agents, HFC-152a or blends containing HFC-152a may be an available alternative. The GWP of HFC-152a is 124, compared to 794 for HFC-365mfc, 1,030 for HFC-245fa, 1,430 for HFC-134a, and 4,470 for HFC-143a. Some manufacturers of polystyrene – extruded boardstock and billet transitioning from HFC-134a have recently starting using blends of HFC-152a and non-HFCs such as CO_2, HFO-1234ze(E), and/or HFO-1336mzz(Z).

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Hydrocarbons are lower-GWP and cost-effective substitutes that have been available for years for large parts of the foam sector, particularly in polystyrene – extruded sheet, rigid polyurethane – slabstock, rigid polyurethane and polyisocyanurate laminated boardstock, phenolic insulation board and bunstock, and polyolefin. Hydrocarbons are used in most of the other foam subsectors, but less extensively. In EPA's consideration of the safety of available substitutes, flammability of foam blowing agents, including hydrocarbons, can be a concern, particularly for rigid polyurethane – two-component spray foam applications. Water is used broadly as a blowing agent in flexible polyurethane foam. Other non-fluorinated compounds such as methyl formate and methylal are also used as blowing agents, alone or in combination with other compounds, particularly in polyurethane foams.

There is little or no use of HFCs in the flexible polyurethane; integral skin polyurethane; polyolefin; polystyrene – extruded sheet; and rigid polyurethane and polyisocyanurate laminated boardstock subsectors. Water and hydrocarbons are commonly used available substitutes used as blowing agents for flexible polyurethane, polyolefin, polystyrene – extruded sheet, and rigid polyurethane and polyisocyanurate laminated boardstock. CO_2, and more recently, HFOs, are available substitutes used as blowing agents for integral skin polyurethane. Based upon comments and information received during the public comment period, EPA now understands that there is limited use of HFCs—in particular, HFC-152a—as foam-blowing agents in polystyrene – extruded sheet used as sheathing to insulate buildings.

Comment: Several commenters from the foam blowing industry raised concerns about the proposed GWP limit of zero for flexible polyurethane; integral skin polyurethane; polyolefin; polystyrene – extruded sheet; and rigid polyurethane and

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polyisocyanurate laminated boardstock. These comments requested that EPA clarify whether the GWP applies only to HFCs in a blend of blowing agents, or if it applies to the entire blowing agent. Some of the commenters suggested that if the GWP applies to the entire blowing agent that the GWP should be higher than zero for these five foam subsectors. One commenter suggested a GWP limit of less than 20 instead of zero, because non-HFC blowing agents such as hydrocarbons or HFOs have non-zero GWPs. Other commenters suggested GWPs of 50 or for blowing agent blends, either for all foam subsectors or at least for the subsectors for the commenters' products, to maintain a "level playing field" with other types of insulation. Two manufacturers of polystyrene – extruded sheet used as sheathing to provide insulation in buildings requested a GWP limit of 150 for all foam subsectors, or at least for polystyrene – extruded sheet to allow for continued use of HFC-152a because of its contributions to insulation value, its technical achievability compared to other alternatives, and its reductions in volatile organic compounds (VOCs). One trade group commented that HFCs should be prohibited for all foam-blowing subsectors.

Response: EPA is establishing a GWP limit of 150 in all foam subsectors. Based on additional information received from commenters, EPA's earlier understanding contained in the proposed rule that little or no HFCs are being used as foam blowing agents in polystyrene – extruded sheet was incorrect. This foam subsector also includes insulation for buildings, similar to polystyrene – boardstock and billet, rigid polyurethane: spray foam, and rigid polyurethane and polyisocyanurate laminated boardstock. EPA agrees it is reasonable to use the same GWP limit for all foam subsectors used as insulation. Foam insulation blown with HFC-152a is more energy efficient, and thus, improves affordability for residential and small business consumers

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compared to foams blown with smaller molecules such as water, hydrocarbons, or CO_2. HFC-152a is in sufficient supply, is technologically achievable as a blowing agent on its own or blended with other blowing agents, and is currently being used in particular in polystyrene foams. HFC-152a, with its GWP of 124, is lower GWP than other HFCs that had been used in foam blowing. Further, to provide greater consistency and a "level playing field" between and within foams subsectors, to avoid confusion over use of a GWP limit of zero, and to set a GWP limit at one of the regular intervals being used across all the sectors and subsectors (*see* section VI.E.5 of the preamble), EPA is establishing a GWP limit of 150 for blowing agents in all foams subsectors that were included in the proposed rule.

Comment: Concerning the compliance date for the different foam subsectors, most commenters either supported January 1, 2025, as proposed or did not comment on it. Two companies that manufacture foam used in military and aerospace applications requested that EPA allow until 2030 for such applications because of the unique and highly demanding operating conditions that require extensive technical resources and time to evaluate.

Response: EPA is finalizing the proposed compliance date of January 1, 2025, for most subsectors that use HFCs and HFC blends as foam blowing agents. EPA is finalizing January 1, 2026, for military and aerospace foam blowing applications in recognition of the additional time that may be required to evaluate substitutes. EPA agrees with commenters that the operating conditions for military and aerospace applications are highly demanding. EPA also recognizes that the process of qualifying new materials to specification in military and aerospace applications is time consuming. Some uses raised by commenters are not subject to EPA's final restrictions. Mission-

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critical military uses identified by the Department of Defense, consistent with the requirements for receipt of application-specific allowances under subsection (e)(4)(B)(iv), are exempt. EPA is also exempting spray and pour foam used in space vehicles. Given these exemptions, but recognizing that applications may require more time for qualifying new materials to specification, EPA is finalizing a later compliance date of January 1, 2026, for foam-blowing uses in space and military applications that are not already exempted.

3. Aerosols

Aerosols use liquefied or compressed gas to propel active ingredients in liquid, paste, or powder form in precise spray patterns with controlled droplet sizes and amounts. In some cases, the propellant is also itself the active ingredient. The propellant, typically a gas at atmospheric pressure but a pressurized liquid in the product canister, is emitted during use. Some aerosols also contain a solvent in addition to the propellant. In some cleaning applications, the propellant disperses the solvent; in other applications, the solvent product and propellant solution are evenly mixed to improve shelf-life and product performance, such as by preventing dripping and ensuring uniform film thickness for spray paints. Consumer aerosols include products for personal and household use, such as hairspray, household cleaning products, and keyboard dusters. Technical aerosols are specialized products used solely in commercial and industrial applications, such as cleaning products for removal of grease from electrical equipment and sprays containing corrosion preventive compounds.

Available aerosol propellants with GWPs lower than the final restriction include HFC-152a (GWP 124), HFO-1234ze(E) (GWP 1), dimethyl ether (GWP 1), saturated light hydrocarbons (GWP 1 to 4), and CO_2 (GWP 1). Available aerosol solvents with

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GWPs lower than the final restriction include HCFO-1233yd(Z) (GWP 1), HFO-1336mzz(Z) (GWP 2), methoxytridecafluoroheptene isomers (MPHE) (GWP 2.5), HCFO-1233zd(E) (GWP 4), and petroleum hydrocarbons.

EPA is exempting certain uses with a current qualification for application-specific allowances under subsection (e)(4)(B) of the AIM Act, including certain aerosol applications. Subsection (e)(4)(B)(iv) lists six applications, three of which typically use aerosols: (1) Propellant in metered-dose inhalers, (2) defense sprays, and (3) mission-critical military end uses. The requirements of this rule do not apply to these uses of HFCs in these applications, since they have a current qualification for application-specific allowances under 40 CFR 84.13.

What restrictions on the use of HFCs is EPA establishing for aerosols?

EPA is restricting the use of HFCs and blends containing HFCs in aerosols that have a GWP of 150 or greater beginning January 1, 2025, as proposed. In response to comments seeking additional time to transition, EPA is extending the compliance date to January 1, 2028, for the following technical aerosol uses: cleaning products for removal of grease, flux, and other soils from electrical equipment or electronics; refrigerant flushes; products for sensitivity testing of smoke detectors; lubricants and freeze sprays for electrical equipment or electronics; sprays for aircraft maintenance; sprays containing corrosion preventive compounds used in the maintenance of aircraft, electrical equipment or electronics, or military equipment; pesticides for use near electrical wires or in aircraft, in total release insecticide foggers, or in certified organic use pesticides for which EPA has specifically disallowed all other lower-GWP propellants; mold release agents and mold cleaners; lubricants and cleaners for spinnerets for synthetic fabrics; duster sprays specifically for removal of dust from photographic negatives, semiconductor chips,

specimens under electron microscopes, and energized electrical equipment; adhesives and sealants in large canisters; document preservation sprays; wound care sprays; topical coolant sprays for pain relief; and products for removing bandage adhesives from skin.

EPA is also extending the compliance date for use of the aerosol solvents HFC-43-10mee and HFC-245fa to January 1, 2028.

Commenters indicated some applications may still need the use of HFC-134a as a propellant and the use of the solvents HFC-43-10mee and HFC-245fa because of technical limitations, such as a requirement for non-flammability. EPA is aware of possible substitutes with lower GWPs;[161,162] but based on comments, EPA agrees additional time is needed to reformulate, test, and transition listed technical uses.

For the purpose of this rule, the GWP of an aerosol that contains HFCs as both a propellant and a solvent is calculated based solely on the weighted average of the HFCs and does not include other components of the aerosol product. This methodology is different from the SNAP program, where the propellant and solvent are considered as separate entities rather than as a mixture in aerosol products. The decision to use this GWP calculation of the aerosol product under subsection (i) of the AIM Act does not impact other regulations, in particular SNAP listing decisions.

Comment: In general, commenters stated that a GWP limit of 150 is appropriate for most aerosols but was too low for applications where flammability is a concern. HFC-134a (GWP 1,430) is currently used as a propellant in certain applications due to its non-flammable characteristic. Two commenters believed a GWP of 700, similar to what has

[161] See email from HCPA to EPA, dated August 8, 2022.
[162] See Evaluation of Continued Need for HFC-134a in Specific Aerosol Propellant Applications memo in the docket.

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been proposed for some refrigeration subsectors, was technologically achievable for niche applications while still maintaining non-flammability.

Response: EPA is finalizing a GWP limit of 150 for aerosols as proposed. EPA recognizes the commenters' concerns regarding flammability of some substitutes, and the impact of flammability on safety and thus availability of that substitute under AIM Act subsection (i)(4)(B). EPA disagrees with commenters that we should raise the GWP limit to 700. EPA is aware of possible substitutes with lower GWPs that are non-flammable. To allow for manufacturers to transition and address flammability risks and other technical challenges, rather than increase the GWP limit across the board, the final rule provides additional compliance time for specific uses of HFC-134a identified by the commenters and excepted under SNAP Rule 20, and for solvents identified by commenters where safety is of concern.

Comment: EPA received a number of comments on the proposed compliance date of January 1, 2025, for certain uses of HFC-134a excepted in Rule 20 and for the aerosol solvents HFC-43-10mee and HFC-245fa. Many commenters requested additional time to address flammability concerns, to complete reformulation and testing, and if necessary, obtain governmental approval from other agencies such as the Food and Drug Administration (FDA) and Federal Aviation Administration (FAA). Many commenters requested a compliance date of January 1, 2030, noting that HFO-1234ze(E) could be an alternative propellant but expressed concern about its availability due to the uncertainty of potential future regulations concerning per- and polyfluoroalkyl substances (PFAS). One manufacturer requested a compliance date of January 1, 2029, for one specific use and stated that an alternative product is currently in development with their goal for final sale of the current HFC-134a product January 1, 2028. Other commenters cited 3 – 7

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years and 5 years needed for transition for medical products. Many other commenters requested exceptions for certain uses of HFCs in aerosols, noting that would allow for more time to formulate an HFC alternative, but did not specify how much more time would be needed.

Response: EPA agrees that it may be difficult for manufacturers to transition all aerosol products using HFCs to alternatives by January 1, 2025. This is particularly true in applications where flammability is a concern or where a specific vapor pressure is needed to achieve the desired result. In this final rule, we are extending the compliance date to January 1, 2028, for products using aerosol solvents HFC-43-10mee and HFC-245fa and also for listed technical aerosols that currently use HFC-134a as a propellant, taking into consideration availability under subsection (i)(4)(B). We are adding an additional three years beyond what was proposed, allowing at least four years after finalization of this rule, for reformulation and specific U.S. Federal government reviews or other third-party approval if needed, including EPA pesticide registration, testing to U.S. military or space agency specifications, and FDA approval.

EPA acknowledges the concerns commenters expressed regarding the potential for future regulation of PFAS and how that may impact the availability of some substitutes. There is currently no single commonly agreed definition of PFAS, and whether HFCs or HFOs are classified as PFAS depends on the definition being used. EPA's PFAS roadmap sets timelines for specific actions and outlines EPA's commitments to new policies to safeguard public health, protect the environment, and hold polluters accountable.[163] EPA elected in this final rule to issue restrictions, including

[163] Available at *https://www.epa.gov/pfas*.

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for this subsector, using a GWP limit approach. Under that approach, regulated entities are not required to use any particular substitute, and the approach inherently permits the use of any substitutes consistent with the restrictions. We have identified a number of available substitutes in this rule and we also anticipate that as the phasedown of HFCs progresses there will be continued innovation of HFC substitutes, and it is reasonable to expect that producers of these substitutes will be cognizant of developing PFAS regulations.

Comment: In the proposed rule, EPA requested comment on whether and why we should include a list of exceptions for propellants in this rulemaking that matches some or all of those included in SNAP Rule 20. All the commenters requested that EPA continue to provide some or all of the HFC-134a propellant exceptions listed in SNAP Rule 20. Some also requested EPA provide exceptions for the aerosol solvents HFC-43-10mee and HFC-245fa.

Response: The structure of the SNAP program and this regulation under subsection (i) of the AIM Act are markedly different in many ways. Therefore, EPA did not propose and is not finalizing a regulation that mirrors the approaches used in SNAP Rule 20. EPA's assessment is that by extending the date of compliance to January 1, 2028, for both propellants and solvents, the formulators will have sufficient time to develop new formulations for the exceptions that were requested by the commenters.

Comment: One commenter raised concerns about the cost of development for a lower-GWP alternative and the recurring cost of goods. In particular, the commenter noted that the current cost of lower-GWP substitutes is much higher than the current costs of HFC-134a and HFC-245fa. The commenter indicated that the economic investment

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required by this rule to develop and test substitutes will result in longer timeframes to recoup costs and achieve a return on investment.

Response: EPA understands that investments are necessary for reformulating products and that these costs can vary based on the specific circumstances. As the HFC phasedown continues, increased scarcity of HFCs will affect their price. In this action, EPA has included this commenter's use as one which may continue to use HFC-134a through January 1, 2028. We anticipate that the longer compliance timeframe will allow for development and testing associated with transitioning to substitutes for the commenter's use, and that in the same timeframe, the relative cost difference of HFC-134a to substitutes may diminish, relative to current costs.

VII. What are the labeling requirements?

EPA seeks to deter, identify, and penalize the manufacture, import, sale, distribution, offer for sale or distribution, export, or installation of products and equipment from using certain HFCs that are prohibited. Consistent with EPA's explanation in the Allocation Framework Rule, based on experience with the ODS phaseout and HFC phasedown thus far in the United States, and global experiences transitioning from ODS and HFCs, EPA anticipates there will be attempts to introduce prohibited equipment into the United States.

Labeling is important for ensuring compliance, discouraging noncompliance, and facilitating enforcement. Labeling allows purchasers to determine what they are buying and whether the product is compliant. Labels provide information to distributors and retailers who are subject to restrictions on the sale or distribution of noncompliant products and certain components. It also provides information to technicians and system owners and operators that allows them to determine whether the specified component is

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prohibited for use in the installation of a new system or is limited to servicing and repair. Labels also allow the Agency to take action to remove noncompliant products from the market and assess compliance of installed systems.

For the labeling requirements, EPA is requiring information on labels for products, specified components, and systems that use regulated substances, regardless of GWP, in the sectors and subsectors covered by this rule. Knowing what HFC, or blend containing an HFC, is used is a necessary step to ensuring that the use of HFCs complies with the restrictions established through this rulemaking. For products, specified components, and systems that use an HFC, or a blend containing an HFC, EPA is requiring that the label include the HFC(s) or blend and the date of manufacture, or at a minimum, the four-digit year. For products in the MVAC subsectors, either the model year or the date of manufacture, at minimum the four-digit year may be used.

For specified components that are intended for use with an HFC, or blend containing an HFC, EPA is requiring that the unfilled equipment be labeled to indicate the HFC(s) or blend(s) containing an HFC intended for use in the specified component. At the time of first charge the system must be labeled to indicate the HFC or blend containing an HFC used in the system and the date of first charge, or at a minimum, the four-digit year. The new label would only need to include the HFC(s) or blend(s) used if it is different from what is listed on the first label or if the first label indicates that the equipment is intended for use with multiple HFCs or blends containing HFCs. New labels must be affixed near but not covering the original label.

Additionally, EPA is requiring that labels for systems in the following subsectors indicate the refrigerant charge capacity: (1) Industrial process refrigeration (without chillers), (2) cold storage warehouses, (3) retail food refrigeration – supermarket systems,

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(4) retail food refrigeration – remote condensing units, and (5) retail food refrigeration – refrigerated food processing and dispensing equipment (remote). The GWP limit varies based on the charge size in these subsectors, thus that information is needed for the purposes of ensuring compliance. The charge size must be added to a label on the system no later than the date of first charge. The label may either be the specific charge size of the system or the charge size as it relates to the threshold of the related subsector. For example, the charge size for a supermarket could be labeled as "Charge 150 lb" or "Charge < 200 lb." EPA is not specifying the wording so as to allow the use of existing labels that already convey the necessary information.

EPA is requiring that labels for self-contained automatic commercial ice machines indicate the harvest rate, either as the specific harvest rate of the equipment, or the harvest rate as it relates to the threshold for the relevant subsector, such as an indication that harvest rate is either greater than 1,000 pounds of ice per day or less than or equal to 1,000 pounds of ice per day for batch-type ACIMs or an indication that the harvest rate is either greater than 1,200 pounds of ice per day or less than or equal to 1,200 pounds of ice per day for continuous-type ACIMs. Labels for industrial process refrigeration chillers and industrial process refrigeration systems without chillers must include an indication of the designed exiting fluid temperature. For all these subsectors EPA is not specifying the specific wording so as to allow the use of existing labels that already convey the necessary information.

For specified components that contain or are dry shipped and intended for use with HFC(s) or blends containing HFC(s) that exceed the applicable GWP limit or HFC restriction, the label must state "For servicing existing equipment only" in addition to the other required labeling elements.

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For the aerosols and foams sectors, where standard blends of HFCs are uncommon, the label must identify all the HFCs used in the product. If they are used as part of an identified blend, the blend may be labeled. If multiple HFCs are used, or an HFC with a GWP greater than the limit is used, such as HFC-134a, either the weights of the HFC(s) relative to the other blowing agents, propellants, solvents, or to the other HFCs must be on the label, or the label must include "GWP <150." For example, the label of a board of extruded polystyrene boardstock could be labeled "GWP<150" or "contains blend of up to 90 percent HFC-152a and the remainder HFO-1234ze(E)."

EPA is requiring that the permanent label be formatted as follows: (1) In English; (2) durable and printed or otherwise labeled on, or affixed to, the external surface of the product; (3) readily visible and legible; (4) able to withstand open weather exposure without a substantial reduction in visibility or legibility; and (5) displayed on a background of contrasting color. Additionally, for equipment being sold electronically through eCommerce platforms, EPA is requiring that labels or a description of the required information be clearly included in information available prior to purchase, either in the text description or photo of the equipment. Websites for products and specified components using a regulated substance would need to have the required information clearly visible in either the photos or the description of the item. If a product or specified component is contained within a box or other overpack that reaches the consumer, the exterior packaging must also contain a label consistent with the formatting requirements described previously. For imported products or specified components, labels must be visible and readily available for inspection.

The labeling requirement takes effect for each subsector at the same time as the manufacture and import prohibition for products or the installation prohibition for

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systems. In the case of components that could be used in multiple subsectors, the earliest compliance date among the possible subsectors is the applicable date. This timing reflects the primary purpose of the labels, which is for assessing compliance of products and systems in sectors and subsectors with active HFC restrictions. For example, consumer aerosols would need to be manufactured or imported with labels starting January 1, 2025, while technical aerosols would be subject to the labeling requirements starting January 1, 2028. Consumer aerosols manufactured or imported prior to January 1, 2025, would be able to be sold until January 1, 2028, without a label that meets the requirements of this rule.

EPA is requiring that as of the applicable manufacture/import compliance date, no person may manufacture or import a product that contains or is intended for use with HFCs that lacks a label consistent with the requirements of this section. Likewise, for systems, EPA is requiring that as of the applicable installation compliance date, no person may install a system in the sectors and subsectors of this rule that contains or is intended for use with HFCs that lacks a label consistent with the requirements of this section. For specified components of systems, EPA is requiring that as of the applicable installation compliance date, no person may manufacture or import a component for a system in the sectors and subsectors of this rule that contains or is intended for use with HFCs that lacks a label consistent with the requirements of this section.

Products, specified components, and systems that are manufactured, imported, or installed after the compliance date in the sectors and subsectors covered by this rule that use HFCs or are intended for use with HFCs and lack the appropriate label are presumed to be using a regulated substance exceeding the GWP limit for that sector or subsector.

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Comment: Many commenters supported certain aspects of the labeling proposal. Several supportive commenters agreed with the Agency that labeling products will be valuable for assessing compliance and allowing for enforcement. Another commenter supported a requirement for each regulated substance that could be used to be listed on the label for dry-shipped components that are intended for use with HFCs. Another commenter supported on-product labeling for all products covered by this rule and it being a violation to not label products regulated by this rule. Another commenter was opposed to any labeling requirements in this rule as they considered them to be 'unnecessary and duplicative.'

Response: EPA acknowledges the support for the labeling provisions provided in the comments and the perspectives raised by the commenters. EPA disagrees with the comments that the labeling requirements of this rule are 'unnecessary and duplicative.' The labels required in the final rule generally align with other existing labeling requirements. EPA has made clear that existing labels that contain the required information can satisfy the labeling requirements. Therefore, many products and equipment already meet the labeling requirements, particularly in the RACHP sector. However, existing labels for foams and aerosols vary and thus uniform labeling for purposes of the HFC transition are necessary. Furthermore, labels allow retailers and distributors to assess whether their products and equipment are subject to the sales restriction. Without labels to identify the regulated substance used and other compliance related information, the Agency, consumers, and entities throughout the sale and distribution chain will not be readily able to assess compliance.

Comment: Multiple commenters stated that EPA should not require GWP on labels since GWPs can be easily researched if the HFC or HFC blend is provided. The

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commenters noted that the GWP values for HFCs are periodically modified by the IPCC, and the value required to be used (AR4, AR5, etc.) can vary based on regulations. The commenters stated that this could result in inconsistent labeling across jurisdictions and confusion. One commenter requested that the Agency not require GWP on the label as the information is not readily accessible or useful to customers and does not provide value to technicians in the RACHP sector. An additional commenter noted that in the foam sector, labeling products with the GWP value could reveal proprietary information, as the precise mixture of blowing agents varies by company and is not public knowledge. Additionally, this commenter shared that labeling products with the precise GWP value would be difficult since the mixtures can vary slightly between batches which could result in small differences in GWP values between products. This commenter recommended that EPA not require the specific GWP on the label and could instead require a statement that the product complies with the GWP limits. Several commenters requested that if the global warming potential is retained on the label, that EPA accept labeling it as 'GWP' given space constraints on labels and the commenters' assessment that the term GWP is widely known. The commenter noted that 'GWP' could also be defined in a product manual to ensure the information is in the relevant language where sold.

Other commenters supported the proposal to label all products with the GWP. These commenters highlighted the particular importance of including the GWP on the label as 'global warming potential,' as they noted that GWP information on a label would be helpful for consumers who may not be familiar with the acronym 'GWP.' One commenter stated that given the considerable quantity of different HFCs and blends that will be on the market, it is essential to include the GWP limit for the product on the label

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to strengthen enforcement and compliance as the GWP limit is easier to enforce compared to referencing an extensive blend list.

Another commenter requested that EPA use the term 'Exchange Value' as opposed to 'GWP' or 'global warming potential.' This commenter noted that in their opinion, using 'Exchange Value' would be more precise as the GWP limits under the AIM Act are not the most up-to-date and also there are other recognized GWPs that could lead to confusion.

Response: EPA is not finalizing a requirement for labels to specify the GWP. EPA finds the concerns raised about the inconsistent GWP values resulting from updates from the IPCC and different requirements by jurisdiction to be particularly compelling. The varying GWPs could cause confusion and result in unintentional noncompliance. The Agency maintains that listing the GWP could provide some benefit, such as informing consumers about the environmental impact of the products they are purchasing, as well as allowing for easier assessment of compliance. However, the information needed to assess compliance is still required on the label. Additionally, for the next several years, EPA plans to maintain a public website that lists HFCs, commonly used blends containing HFCs, and their respective GWPs that will provide a quick look-up tool for assessing compliance or comparing the environmental impact of products.

Comment: Numerous commenters requested that EPA eliminate the labeling requirement if the required information is required by other authorities and current labels contain the same information. They noted that this would provide the necessary information while reducing burden for manufacturers. One commenter noted that many products in the RACHP sector already label what HFC is used. Other commenters specifically requested that the Agency allow information already included in the Vehicle

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Manufacturing Label, SAE J-639 label, or on a safety data sheet to satisfy the labeling requirement for this rule. Another commenter expressed support for the creation of a standardized label or symbol under this rule to show compliance with the restrictions, create uniformity among the regulated community, and facilitate consumer recognition.

Response: EPA is clarifying that existing labels that meet the requirements of this rule and include the required information are sufficient. EPA agrees it is not necessary to have additional labels that provide the same information. EPA recognizes that most, if not all, of the information required by this rule is already provided on equipment through existing labels, such as UL labels or nameplates. It is not the intention of the Agency for the labeling requirement to result in duplicative information on labels. EPA instead is seeking to ensure that the information necessary to determine compliance with this rule is visible and readily available for the products, specified components, and systems covered by this rule. EPA is not finalizing as part of this rule the creation of a standardized logo, signal word, text, or label format to be in compliance with the labeling requirements finalized through this action. In addition, the Agency takes note of the idea raised by the commenter and may revisit this concept in a future rule.

Comment: EPA also received a significant number of comments related to the proposed requirement to include the date of manufacture on the label. One commenter noted that having the date of manufacture (at minimum the manufacture year) on the product would be helpful for assessing compliance with this rule, as well as other regulations. Others commented that EPA should allow for an already existing date code on the labels to satisfy the date of manufacture requirement, while other commenters requested that EPA allow for the serial number or a traceable batch code to fulfill the

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requirement. Other commenters requested that EPA allow the date listed on the nameplate to satisfy the requirement, at least for stand-alone refrigeration equipment.

Response: EPA understands that some companies have methods in place to indicate the date of manufacture of their product. For the purposes of this rulemaking, the Agency seeks to minimize duplication of the information required on the labels wherever possible. However, given the complex distribution chains for some of the equipment for which labels are required, it is also important for other entities throughout the distribution chain to be able to assess compliance of equipment they intend to purchase, sell, or otherwise distribute. If the product does not clearly indicate the date of manufacture, it may not be possible for entities beyond the OEM to assess its compliance. For this reason, EPA is retaining the requirement that each product have the date of manufacture (at minimum the four-digit year) on a label on the item, included in the associated packaging material, or available via a QR code.

Comment: EPA received several comments related to requiring the charge size on the label. One commenter stated that the label should not have to indicate whether the charge size is above or below a threshold as they believe that to be unnecessary. Another commenter noted that the indication of the charge size threshold specific to this rule (such as the 200 lb cutoff for supermarkets) may be useful for enforcement of this rule, but a universal indication of charge size would be useful for general enforcement for this regulation as well as others that may exist for instance at the State level. This commenter noted that knowing the exact charge size could be useful for estimating the total extent of a violation. The commenter shared that certain U.S. States already regulate some of these products based on a different size threshold, therefore requiring an indication of intended charge size would make these labels useful for States as well.

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Response: EPA is finalizing the option for regulated entities to label their equipment with the charge size either as the specific charge size of the system or the charge size related to the threshold of the related subsector. For example, the charge size for a supermarket could be labeled as 'Charge 150 lb' or 'Charge < 200 lb' For certain aspects of this rule, the GWP limit varies based on that charge size threshold in that subsector, thus information about the charge size is needed for the purposes of ensuring compliance. Retaining both options will provide flexibility in meeting this requirement while retaining the information necessary for the Agency and others throughout the distribution chain to assess compliance.

Comment: Several commenters responded to EPA's request for comment on alternative methods for satisfying the labeling requirements. Some asked that EPA retain QR codes as an option as this would allow the greatest flexibility for manufacturers and could be useful as it would allow for changes to the label to comply with future regulations. Others requested that EPA not mandate the use of QR codes as they are costly to maintain and not widely used in the foam sector. Other commenters stated that a QR code alone would not be sufficient for providing information to the consumer and that accompanying text explaining the purpose of the QR code would be required. Finally, one commenter supported there being multiple ways to satisfy the labeling requirement, such as QR codes, package labeling, and eCommerce descriptions. That commenter also requested that EPA mandate that QR code labels be accompanied by printed product information that can be produced at any time if requested.

Response: EPA is finalizing the ability for manufacturers to meet the labeling requirement by including the required information in packaging materials (*e.g.*, tag, pamphlet, or box containing the product or specified component) or through an on-

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product QR code instead of a traditional label. This associated packaging must be present with the product or specified component at the point of sale and import to fulfill the labeling requirement. To satisfy the labeling requirement, the QR code must direct to the required information and meet all the requirements of the on-product label. The label with the QR code must include adjacent text to indicate the purpose of the QR code, such as 'contains HFC information' or 'scan for HFC info.' A QR code may be useful for products where there is limited space for on-product labels or the accompanying packaging and allows for additional flexibility in meeting the labeling requirements while still retaining the necessary information for assessing compliance. A nonfunctional or unreadable QR code does not fulfill the labeling requirement and would be treated as a missing label. For products and specified components being sold through eCommerce, the QR code would not be sufficient on its own and the description on the eCommerce site would also have to contain the required information.

Comment: EPA received several comments related to the idea for an administrative process to address products that have been found to be mislabeled or lacking a proper label. One commenter supported the website highlighting noncompliance that was considered at proposal. They noted that such a system would increase compliance through transparency and inform the public of entities that may be introducing illegal products into the marketplace. This commenter recommends these entities be restricted from using regulated substances as defined in the proposed rule for a set period of time, with increasing lengths for repeated offenses, under the assumption that repeated noncompliance is an attempt to avoid regulations and should result in permanent use restrictions for the entity. Another commenter suggested an option which

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would be a list of compliant products. This list would aide purchasers and users in self-compliance efforts and positively promote enforcement actions.

Response: EPA values approaches that inform the public. Therefore, the Agency is finalizing use of an administrative process to address equipment that has been found to be mislabeled or lacking a proper label and that such a process will include an electronic means of sharing information regarding noncompliance with the public. As EPA noted in the proposed rule, this administrative process does not supplant or replace any enforcement action that may be available for violations of EPA's regulations or the AIM Act. Instead, such consequences are in addition to any applicable enforcement action. EPA's intent in establishing labeling provisions is to support the enforcement of prohibitions on the use of certain HFCs and blends containing HFCs that exceed the GWP limits or are otherwise prohibited. Not providing a label or mislabeling equipment hampers EPA's ability to enforce those prohibitions. As an administrative process for quickly correcting mislabeled or unlabeled equipment, EPA is finalizing the option of creating an electronic list that would provide a list of entities that manufacture, import, sell, distribute, or offer for sale or distribution, or export products or specified components that have been found to be mislabeled or lacking a proper label.

Transparency is a significant means of ensuring compliance, as discussed in detail in the Allocation Framework Rule (*see* 86 FR 55191, October 5, 2021). EPA intends to employ similar processes for notification and response finalized in 40 CFR part 84, subpart A. This includes notifying the entity of the Agency's finding that a product or specified component is mislabeled or lacking a label, and of our intent to list them as not meeting the subsection (i) labeling provisions. The Agency will provide 30 days from the initial notification for the entity to respond, after which the entity would be publicly listed

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on EPA's website. To be eligible for removal from the website, the entity must submit a demonstration that the labeling issue has been resolved along with a description of measures that the entity has put in place to reduce the likelihood of future labeling problems. Publicizing noncompliance could be an effective method to deter violations and provide valuable information to consumers.

EPA requested comment on whether there should be a standardized process to correct missing or inaccurate labels on products, and if so, what that process should be.

Comment: EPA received several related comments, one commenter did not support a standardized process for fixing labels, as they believed that this could discourage necessary adjustments to labels from taking place. Another commenter requested that EPA set up a standard process for requesting new labels and certifying that they are accurate.

Response: The Agency is not finalizing a standardized process for correcting missing, inaccurate, or otherwise noncompliant labels in this rule. EPA may revisit this decision in the future but at this time does not believe that a standardized process for correcting labels is necessary to assess compliance and allow for enforcement actions under this rule.

The labeling provisions are intended to support compliance with the prohibitions on the use of high-GWP HFCs in certain sectors and subsectors. Requiring a manufacturer or importer to affirmatively and publicly specify the HFC being used through a label reinforces their compliance with the limits established through this rulemaking. Accurate labeling information also supports compliance with the limits by allowing distributers, as well as competitors and the general public, to assess whether a product uses a compliant HFC. The labeling and packaging requirements may also ease

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inspection by EPA and CBP and facilitate efforts to prevent the import or manufacture of noncompliant products. Clearly and visibly identifying the HFC, or blend containing an HFC, used provides one mechanism for inspectors to quickly identify noncompliant products and/or identify products for further inspection.

As a secondary consideration, the information on the labels and packaging materials can provide consumers with information about whether a product uses an HFC or blend containing an HFC. This information may alter consumer purchasing choices and could increase market pressure for the transition away from products that use HFCs.

VIII. What are the reporting and recordkeeping requirements?

EPA is establishing recordkeeping and reporting requirements for any entity that domestically manufactures or imports products or specified components that use or are intended to use regulated substances or blends containing a regulated substance in the sectors and subsectors covered in this rulemaking. As with labeling, this requirement applies regardless of the GWP of the HFC or HFC blend used or intended to be used.

EPA is not finalizing the proposed reporting and recordkeeping requirements for the installation of field-charged systems in this rulemaking. The Agency may seek to establish reporting and/or recordkeeping for installed systems in a future rulemaking under the AIM Act. The proposed rule included both reporting and recordkeeping requirements for importers and domestic manufacturers of products, which as defined in the proposal was inclusive of field-charged systems. The proposed rule also included an exemption for field technicians or installers of systems from such requirements.

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A subset of the entities subject to these reporting requirements currently report under subpart QQ of the GHGRP.[164] The GHGRP covers the mandatory reporting of greenhouse gas emissions and supplies from certain facilities and suppliers. To meet the needs of this final rule without unnecessarily increasing the administrative burden to those entities that would be subject to both subpart QQ of 40 CFR part 98 and this rulemaking, to the extent possible, EPA is aligning with the data elements and reporting schedule collected by the GHGRP subpart QQ. However, both subparts apply, and the reporter is expected to meet the requirements codified under both subparts.[165]

While many of the reporting elements overlap with those of the GHGRP, the scope of the reporting universes is different in a few important ways. First, this rule applies to both domestic manufacturers and importers, whereas the GHGRP applies to importers and exporters. Second, this rule requires reporting from all manufacturers and importers of products and specified components regardless of the volume of HFCs within those products. In contrast, the GHGRP excludes entities that import and export less than 25,000 $MTCO_2e$ per year[166] (and are not otherwise required to report under 40 CFR part 98). Third, this rule requires reporting from manufacturers and importers of aerosol and aerosol solvent products containing HFCs which do not report under the GHGRP. Requiring all entities to report is important for understanding how HFCs are being used or are intended for use in products and specified components and provides important information for verifying compliance and allowing for better oversight.

[164] 40 CFR part 98, subpart QQ, "Importers and Exporters of Fluorinated Greenhouse Gases Contained in Pre-Charged Equipment or Closed-Cell Foams."
[165] EPA is not making any changes to 40 CFR part 98 in this rulemaking.
[166] Calculated as specified in 40 CFR 98.2.

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EPA is requiring covered entities to register and report electronically.[167] EPA intends to limit to the extent practicable duplicative burden between the AIM Act and the GHGRP and plans to use a mechanism to synchronize these systems similar to the Agency's efforts under the HFC Allocation program. Entities already subject to reporting under 40 CFR part 98, subpart QQ may need to comply with the reporting requirements of this rule but should not need to duplicate their efforts. Where there is overlap in requested data, EPA intends to internally direct data to the appropriate Agency data systems to reduce duplicative burden as much as possible for reporters that fall under this rule and under GHGRP subpart QQ.

Comment: The Agency received several comments with concerns about the proposed approach to require manufacturers and importers to report for field-charged systems. Some commenters indicated that these requirements would result in duplicative reporting, with EPA receiving reports for both components of systems and the completed system. Additionally, some commenters indicated that data would be inaccurate, as the manufacturers and importers would often have no way of knowing the total volume of refrigerant charged in the field. Instead, one commenter indicated that the reporting would be more accurate if it occurred after the system is installed and charged as opposed to having manufacturers or importers estimate an expected charge of a system, which could be changed by numerous factors during installation.

Response: EPA agrees with the commenters that it is impractical for manufacturers and importers to report on intended uses that they may not know about. Reports for systems are most useful and effective for ensuring compliance, allowing for

[167] E-GGRT is EPA's electronic Greenhouse Gas Reporting Tool for certain sources and suppliers of GHGs in the United States to report GHG emissions (*https://ghgreporting.epa.gov/ghg/login.do*).

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enforcement, and understanding HFC use when they are fully accurate and reflect how HFCs are being used. As a result, in this rule, the Agency is focusing the reporting on the information that can be known by the domestic manufacturer and importer of products and specified components and is not finalizing a requirement for reporting for systems prior to or upon their installation.

Comment: Several commenters expressed support for electronic reporting and for the Technology Transitions program utilizing the existing e-GGRT platform, which is used by reporters subject to the GHGRP requirements codified under part 98, as regulated entities have familiarity, access, and confidence in the system.

Response: EPA determined it could meet its goals under subsection (i) of the AIM Act while using an existing platform that was already familiar to many of the reporters. The Agency maintains that if in the future, it cannot meet the needs of subsection (i) with existing reporting mechanisms, EPA may require use of a different data system.

Comment: Several commenters requested that EPA not create any new recordkeeping and reporting requirements outside of what is already covered in subpart QQ of the GHGRP, and by other EPA requirements, such as the requirements overseen by the Office of Transportation and Air Quality.

Response: EPA is mindful of the various reporting requirements across the Agency and has taken an approach to minimize duplicative reporting where possible, but notes that the scope and purpose of this rulemaking is separate from those regulations promulgated under different statutory authorities for different programmatic goals. The reporting and recordkeeping provisions specific to this rule are necessary to implement and enforce subsection (i) of the AIM Act, which directs EPA to restrict the use of HFCs in the sector or subsector in which they are used. The broader scope of reporting in this

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rule allows EPA to assess the threshold question of identifying which sectors or subsectors use HFCs, which HFCs, and in what quantities, in order to inform its decision-making under subsection (i) to act on petitions and promulgate rules to facilitate the transition of sectors and subsectors away from those HFCs.

A. What reporting is EPA requiring?

Covered entities in the refrigeration, air-conditioning, and heat pump sector must provide annual reports to EPA that include: (1) The subsector of the product or specified component based on the categorization in this rulemaking; (2) for each type of equipment with a unique combination of charge size and regulated substance or blend containing a regulated substance, the identity of the HFC or HFC blend used, charge size (including holding charge or no charge, if applicable), and number of each product type domestically manufactured, imported, or exported; and (3) for each item in (2) in this list, the total mass in metric tons of each HFC, or blend containing an HFC, used in the product type, and the mass of the regulated substance, or blend containing a regulated substance, per unit of equipment type. Additionally, for products within the refrigeration, air-conditioning, and heat pump sector that include closed-cell foams that contain HFCs, the reporter must also provide; (1) the identity of the HFC or HFC blend contained in the foam, (2) the mass of the HFC or HFC blend contained in the foam in each product, and (3) the number of products manufactured, imported, or exported with each unique combination of mass and identity of HFC or HFC blend within the closed-cell foams.

Covered entities in the aerosols sector must provide annual reports to EPA that include: (1) The subsector of the product based on the categorization in this rulemaking; (2) for each type of product with a unique regulated substance or combination of regulated substances, the identity of the HFC(s) used, and if multiple HFCs are used,

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their percentages, and number of each product type domestically manufactured, imported, or exported; and (3) for each item in (2) in this list, the total mass in metric tons of each HFC, or blend containing an HFC, used in the product type, and the mass of the regulated substance, or blend containing a regulated substance, per unit of product type.

Covered entities in the foam sector must provide annual reports to EPA that include: (1) The subsector of the product based on the categorization in this rulemaking; (2) for each type of product with a unique regulated substance, or blend containing a regulated substance, the identity of the HFC or HFC blend used, and the total volume of each manufactured foam product type; and the number of foam products (*e.g.*, polyols) type domestically manufactured, imported, or exported; and (3) for each item in (2) in this list, the total mass in metric tons of each HFC, or blend containing an HFC, used in the product type, and the mass of the regulated substance, or blend containing a regulated substance, per unit of product type.

For the requirement to report the total mass in metric tons of each HFC, or blend containing an HFC, used in the relevant products and specified components in the RACHP and aerosols sectors, but excluding those in the foam blowing sector, reporters shall use the following equation:

$$I = \sum_{t} S_t \times N_t \times 0.001$$

where:

I = Total mass of the regulated substance or blend containing a regulated substance (metric tons) in all products the reporter imports and/or domestically manufacturers annually.

t = Equipment/product type using a regulated substance or blend containing a regulated substance.

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S_t = Mass of the regulated substance or blend containing a regulated substance per unit of equipment type t (charge per piece of equipment, kg).

N_t = Number of units of equipment type t imported or domestically manufactured annually (pieces of equipment).

0.001 = Factor converting kg to metric tons.

For the RACHP sector, and for those foams that are an integrated part of a product (*e.g.*, the foam in a household refrigerator or freezer), S_t shall be the mass of the regulated substance, or blend containing a regulated substance, in the foam used as part of the product, and all other factors in the equation above shall remain the same.

For containers or foam blowing products (*e.g.*, polyols) which contain foam blowing agent, and are intended for use to blow foam, S_t shall be the mass of the regulated substance, or blend containing a regulated substance, in the container or foam blowing product, and all other factors in the equation above shall remain the same.

For those foams that are considered the product itself (*e.g.*, extruded polystyrene boardstock), S_t shall be the density of the regulated substance, or blend containing a regulated substance, in foam (amount per cubic foot of foam, kg of regulated substance per cubic foot), N_t shall be the total volume of foam imported or domestically manufactured annually (cubic feet of foam), and all other factors in the equation above shall remain the same.

This equation is used in 40 CFR part 98, subpart QQ for imports and exports of pre-charged equipment and closed-cell foams that contain a fluorinated GHG, as defined under 40 CFR part 98, and is already in use and familiar to those currently subject to reporting under subpart QQ.

EPA is also requiring that all entities subject to the reporting requirements in this rule provide necessary identifying information to EPA that includes: (1) The name of the

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importer or manufacturer, and the physical street address including city, State, and zip code; (2) the year covered under the report; (3) the date of submittal; (4) a signed and dated certification statement provided by the designated representative of the owner or operator; and (5) NAICS code(s) that apply.

As proposed, EPA is requiring that reports be signed and attested. Entities subject to the proposed reporting requirements must provide a statement of certification that the data they provide are accurate. Reporters must also certify that their products use only allowed HFCs, do not exceed any applicable GWP limit, and are properly labeled.

For equipment that is shipped without an HFC but is intended to use an HFC (*e.g.*, dry-shipped specified components of a field-charged system), EPA is requiring that the manufacturer or importer report on 1) the sector and subsector of the equipment based on the categorization in this rulemaking, if known; 2) the number of units, by unique combination of intended charge size and HFC; 3) the HFC or HFC blend intended to be used in the sector and subsector; and 4) the expected quantity of HFC or HFC blend that the equipment would contain when fully charged.

Requiring reporting from entities that are manufacturing or importing equipment that is intended for but does not contain HFCs or HFC blends will provide EPA with the full universe of relevant uses of HFCs or HFC blends in the covered sectors and subsectors including the quantity and type of HFCs used. It will allow the Agency to identify the entities that manufacture and import this equipment and support EPA's efforts to assess compliance. EPA seeks to ensure a level playing field for the regulated community and views reporting as a central mechanism for ensuring compliant companies are not placed at a competitive disadvantage. Importers and manufacturers

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who fail to report required information or provide inaccurate information would be considered in violation.

In addition to the required reporting elements being finalized, EPA had proposed that reporters provide (1) the GWP of the HFC or HFC blend used or intended for use in the products and (2) the date of manufacture or import. EPA is not finalizing requirements for either of these proposed reporting elements. First, EPA has the ability to calculate GWPs for provided HFCs and HFC blends. Removing this requirement will prevent unintentional reporting errors due to inaccurate GWP calculations, particularly as the AIM Act directs EPA to use values that are equivalent to AR4 values, whereas other entities may calculate GWPs differently. Second, EPA is removing the requirement to report the exact date of manufacture or import as a necessary data element.

Comment: Several commenters raised concerns about the Agency's proposal to include date of manufacture or import in the reports. The commenters described this requirement as being unjustifiably burdensome and indicated that it would provide little to no value for assessing compliance.

Response: EPA is mindful of the time and resources that reporters dedicate to fulfilling reporting requirements. Based on a review of the comments, EPA reconsidered and determined that the specific dates of import or manufacture will not be necessary. For other regulatory programs, knowing the specific day of import has utility in assessing compliance (*e.g.*, for imports of bulk HFCs in accordance with the HFC Allocation program), but knowing the specific day that a product was manufactured or imported would not provide significant additional value to the Agency's understanding of the market transition from using high-GWP HFCs. EPA is therefore removing these two data elements, GWP and date of import or manufacture from finalized reporting requirements.

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Because EPA is finalizing annual reporting, these reports would necessarily capture imports and production from a specific calendar year.

Comment: Numerous commenters requested that the Agency limit reporting to aggregated use of HFCs in equipment. These commenters raised concern about the detail requested in the reports and indicated that reporting more detailed information than a summary of the aggregated use of each chemical by subsector would be highly burdensome and costly for the reporters. EPA interprets "bulk use of HFCs" to mean reporting aggregated data, not the reporters' purchases of bulk HFCs as defined in subpart A of this part.[168] Reporting "bulk use of HFCs" would not be sufficient for ensuring compliance and allowing for enforcement of subsection (i). The Agency must have enough information in the reports to assess if the products and equipment are being reported in the correct subsector and that they meet all the specifications related to the restrictions. For instance, for certain products the GWP limit changes based on factors such as charge size. If reporters do not provide information related to the charge size of the products, it will not be possible for the Agency to assess market demand and other relevant aspects for the Technology Transitions program. Additionally, the specific level of data requested is in alignment with data already submitted under GHGRP and has been required for over a decade. As a result, the Agency disagrees with the commenters' assertion that the level of detail requested will be highly burdensome.

[168] Under 40 CFR 84.3, EPA has defined bulk as it relates to HFCs as "a regulated substance of any amount that is in a container for the transportation or storage of that substance such as cylinders, drums, ISO tanks, and small cans. A regulated substance that must first be transferred from a container to another container, vessel, or piece of equipment in order to realize its intended use is a bulk substance. A regulated substance contained in a manufactured product such as an appliance, an aerosol can, or a foam is not a bulk substance.

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Comment: Several commenters noted that the public release of certain data elements, such as information related to production and sales volumes and GWPs of proprietary blends for foams, could result in financial damage to companies. Commenters requested that EPA use a confidential platform, such as e-GGRT, for reporting and ensure that the data collected are properly secured and Confidential Business Information (CBI) is treated as such.

Additional commenters noted that aggregated data could be released publicly by the Agency. One commenter noted that Section 114 of the Clean Air Act provides that 'emission data' shall be publicly available and cannot be withheld from the public as confidential information. The commenter also noted that EPA has long-standing regulations that define 'emission data' expansively to include 'a description of the device, installation, or operation constituting the source' of those emissions.

Response: The Agency understands the need to properly manage and secure CBI and is mindful of the concerns around specific data elements being released and will ensure that appropriate protections are in place for such data collected under this rulemaking. The Agency also agrees that there is substantial value in sharing reported data with the public. EPA plans to publicly share aggregated data collected under this rule through reports, or other public-facing material. EPA intends to protect CBI by aggregating data in public reports as well as implementing data reporting and management platforms appropriate for handling CBI.

1. What is the frequency and timing of reporting?

EPA is requiring annual reporting from domestic manufacturers and importers subject to the reporting requirements. EPA had proposed quarterly reporting to allow the Agency to review data throughout the year to identify trends and noncompliance on an

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ongoing basis. Quarterly reporting is also consistent with other reporting under the Allocation Framework Rule. EPA is requiring that reports be submitted to the Agency within 90 days of the end of the reporting period, rather than 45 days as proposed.

Comment: EPA received significant comment in opposition to the proposed reporting frequency. Most commenters requested that the Agency instead finalize annual reporting. These commenters indicated that quarterly reporting would be overly burdensome and costly for reporters and requested annual reporting as a more feasible frequency. The commenters stated that quarterly reporting would be cumbersome for the Agency, and they did not believe it would provide greater clarity on the total impact of the HFC phasedown than annual reports and would not be necessary to ensure compliance with this rule. Commenters also noted that annual reporting is sufficient under other reporting programs across the Agency, such as the GHGRP. Additionally, some commenters raised concerns about the costs associated with quarterly reporting disproportionately harming small businesses. Some commenters were supportive of quarterly reporting as they believed it would allow EPA to spot trends faster than annual reporting and noted that it is consistent with other reporting requirements under the AIM Act.

Response: After taking into consideration the information submitted in the comments on the proposed reporting frequency, EPA has decided that annual reporting will be sufficient for the Agency's purposes and will be less burdensome to regulated entities. While EPA agrees that quarterly reporting could allow for more detailed trends analyses and is consistent with other AIM Act reporting such as for imports of bulk HFCs, EPA agrees with commenters that annual reports will provide the information necessary for the Agency to meet the goals of the Technology Transitions program and

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should assist with compliance of this rule. The Agency will be able to react to reports in a meaningful way with information collected on an annual basis. If as implementation on subsection (i) continues, the Agency determines that more frequent reporting is necessary, EPA would propose a change in reporting frequency. At this time, the Agency views annual reporting to be a reasonable timeframe that would meet the Agency's information need and would be less burdensome than quarterly reporting. Therefore, the Agency is finalizing annual reporting.

Comment: Several commenters raised concerns about their ability to submit reports within 45 days. These commenters stated that 45 days was not sufficient time to compile and report the necessary data. The commenters also noted that this is significantly shorter than the 90-day requirement in subpart QQ of the GHGRP and requested that EPA allow reporters 90 days to submit their reports. Commenters mentioned that the longer timeline has been proven to be sufficient in the GHGRP and that aligning these timelines would be beneficial for those that report under both programs. One commenter explicitly supported the 45-day reporting requirement.

Response: EPA is mindful of the need for reporters to have sufficient time to compile and submit accurate and timely data. The Agency is also seeking to reduce burden by aligning with other existing requirements. EPA proposed 45 days to match the timing of reports for the production and import of bulk HFCs under the Allocation Framework Rules. However, EPA finds it more appropriate to align with the reporting schedule of the GHGRP given the greater overlap of reporters between this rule and that program.

EPA requested comment on whether to require reporters to provide notification to the Agency prior to an import. EPA is not finalizing such a requirement.

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Comment: Some commenters indicted that pre-notification for imported products could result in delayed shipments, could strain supply chains, and negatively impact price stability and product availability. These commenters believe that a pre-notification system would not increase compliance or enhance enforcement efforts.

Response: While EPA considers pre-notification to be an important tool that EPA uses in a range of situations, the Agency agrees that for the purposes of implementing the Technology Transitions program under subsection (i) it is not necessary for EPA to require pre-notification at this time. EPA understands the concerns raised with regard to the timely import of compliant products; however, EPA has effectively used pre-notification processes with other programs and does not consider pre-notification to create barriers to timely imports. Pre-notification can be useful for ensuring compliance at the point of import.

2. When do reporters need to begin reporting?

The Agency received a request for clarity regarding the compliance date for the reporting and recordkeeping requirements. A commenter asked when EPA would consider the start date for reporting to be. The proposed rule did not clearly specify when the recordkeeping and reporting requirements would begin to apply.

EPA is requiring that the reporting period for all sectors and subsectors start on January 1, 2025. This means that the first reports must be submitted to the Agency by March 31, 2026. Starting the reporting period on the same day for all sectors and subsectors will allow the Agency to monitor the full scope of the transition resulting from this rule. For subsectors with initial restrictions starting on January 1, 2025, the start date to the reporting period is needed to ensure compliance with the active restrictions. Reporting data provided from subsectors with restrictions starting after January 1, 2025,

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will provide valuable data to help EPA assess the use of HFCs in subsectors prior to the compliance restrictions. This information will be helpful to the Agency in its efforts to better understand the landscape of HFC use across the country, and it will also allow for proactive efforts by the Agency to ensure that subsectors are adequately preparing for the transition to lower GWP HFCs.

B. What recordkeeping is EPA requiring?

EPA is requiring that entities that import or domestically manufacture products or specified components that use or are intended to use a regulated substance in the sectors and subsectors covered by this rule maintain records that form the basis of the reporting requirements. These entities must retain records for a minimum of three years and make them available to EPA upon request. The importer or domestic manufacturer must also retain records of the company or retailer to whom the product or specified component was sold, distributed, or in any way conveyed to. Information regarding where products and specified components have been distributed, sold, or conveyed to after import or manufacture may be necessary for tracking noncompliant equipment when it is identified and removing it from the market.

In addition, EPA is requiring that importers retain the following records substantiating each of their imports: (1) A copy of the bill of lading for the import, (2) the invoice for the import, (3) the CBP entry documentation if applicable, (4) ports of arrival and entry through which the products passed, and (5) country of origin and if different the country of shipment to the United States. These provisions are consistent with the recordkeeping required for the subset of importers subject to subpart QQ of the GHGRP and will allow EPA to enforce the restrictions by tracking the movement and sources of noncompliant products when they are identified.

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Comment: Numerous commenters supported the proposed recordkeeping requirements. These commenters indicated that retaining records for a period of three years is manageable for industry and requested that no additional data other than the items proposed be required for the purposes of recordkeeping. One commenter supported a recordkeeping period of five years instead of three years, as five years would align with the retention period of the HFC Framework rule.

Response: The Agency agrees that there may be benefits to aligning with the five-year retention period under the HFC Framework. However, EPA notes that a requirement to retain records for three years is common practice across other programs at EPA and we consider it will be sufficient for ensuring compliance and allowing for enforcement actions under this rule. Covered entities may choose to retain records longer and may have other reasons why doing so is beneficial. However, EPA is only requiring records be retained for three years.

Comment: Several commenters requested the Agency clarify the requirement that the importer or domestic manufacturer must retain records of the company or retailer to whom the product was sold, distributed, or in any way conveyed to. These commenters noted that manufacturers and importers often do not know the end purchaser of a product and requested that EPA clarify that manufacturers and importers are not required to keep records of all sales throughout the distribution chain.

Response: EPA is clarifying that this requirement only applies to the initial sale, distribution, or conveyance from the domestic manufacturer or importer to another entity. The Agency understands the complexity of distribution channels and does not intend for the manufacturer or importer to be required to retain records beyond the first conveyance.

IX. What are the costs and benefits of this action?

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EPA estimated the costs and benefits of restricting HFCs consistent with this final rule. This analysis, presented in the RIA addendum contained in the docket, is intended to provide the public with information on the relevant costs and benefits of this action and to comply with executive orders. To the extent that EPA has relied upon costs and benefits estimates for purposes of analyzing factors under subsection (i)(4), as discussed in sections VI.E and VI.F of this preamble, EPA has summarized those estimates in the Costs and Environmental Impacts TSD.

The RIA addendum also includes estimates of the social cost of HFCs in order to quantify climate benefits, chiefly for the purpose of providing useful information to the public and to comply with Executive Order 12866. Although EPA estimated the social costs of HFCs for purposes of that assessment, this action does not rely on these costs as a record basis for the Agency action, and EPA would reach the conclusions of this final rule in the absence of the social costs of HFCs.

A. Assessment of costs and additional benefits utilizing transition options

The RIA addendum follows a methodology that is consistent with the costs and benefits analysis of the Allocation Framework RIA, released in 2021, and the Addendum to that RIA accompanying the 2024 Allocation Rule. In the Allocation Framework RIA and that Addendum, EPA calculates costs and benefits using a marginal abatement cost (MAC) curve to evaluate the availability and cost of abatement required to meet the AIM Act phasedown caps for production and consumption. Similarly, for this rulemaking, EPA quantified the costs associated with the transitions necessary for compliance, but based on the sector- and subsector-specific restrictions finalized in this rule as opposed to an overall production and consumption cap. Both approaches, as discussed in the RIA and this RIA addendum, respectively, also quantify the monetized climate benefits

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associated with the reduction in emissions over time as a result of decreased consumption of regulated substances.[169]

Because the phasedown in HFC consumption and production has already been codified under the Allocation Framework Rule, with further changes under the 2024 Allocation Rule, the full extent of consumption and emissions reductions as well as associated costs (or cost savings) estimated for this rule are not considered additional. Therefore, in calculating the impacts from this rule, we calculate the "incremental" costs and environmental impacts (either increased or decreased) relative to those previously estimated for the Allocation Framework Rule as updated by the 2024 Allocation Rule RIA Addendum.

EPA estimates that this rule will have incremental benefits relative to those assessed for the Allocation Rules, although—as discussed in the RIA addendum and the Costs and Environmental Impacts TSD—the extent of these benefits varies depending on the mix and timing of industry transitions made in order to achieve compliance in the affected sectors and subsectors. In its analysis of the Allocation Rules, EPA estimated that regulated entities would adopt specific technology transition options to achieve compliance with the statutory allowance cap step-downs. Industry is already making many of these transitions, and we expect that achieving the allowance cap step-downs will require many of the same subsector-specific technology transitions that are required by this rule. However, this rule may in some cases require regulated entities to further accelerate transitions in specific subsectors, relative to what EPA previously assumed in its analysis of the Allocation Rules. Conversely, entities in a discrete set of subsectors not

[169] For the sake of comparison, results from both sets of analyses are included in the RIA addendum contained in the docket.

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covered by this rule could conceivably forgo or delay adopting abatement options that were assumed to be undertaken to comply with the Allocation Rules.

Given this uncertainty, EPA analyzed two scenarios to represent the range of potential incremental impacts resulting from this rule: a "base case" and "high additionality case." Based on this approach, EPA estimates average annual incremental HFC emissions and consumption reductions from 2025–2050 of approximately 3 to 34 $MMTCO_2e$ and 28 to 43 $MMTCO_2e$, respectively. The annual incremental consumption and emissions avoided are shown in Table 5 for select years as well as on a cumulative basis.

Table 5–Incremental Consumption and Emission Reductions, Relative to Allocation Rule Reference Case 2025–2050 ($MMTCO_2e$)

Year	Consumption Reductions		Emission Reductions	
	Base Case	High Additionality Case	Base Case	High Additionality Case
2025	-5	30	-54	7
2030	23	50	-15	33
2035	38	49	3	44
2040	22	30	25	38
2045	37	45	28	37
2050	39	47	32	40
Cumulative total	**720**	**1,113**	**83**	**876**

To calculate the climate benefits associated with consumption abatement, the consumption changes are expressed in terms of emission reductions. Emissions avoided in each year can be less than the consumption avoided in the same year because of the delay between when an HFC is produced or imported and when it is emitted to the atmosphere.

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As noted above, the base case scenario of incremental benefits shows overall emission reductions over the full-time horizon for implementation. However, the incremental emission reductions under the transition pathway evaluated for this rule are in some cases assumed to be more gradual than those EPA previously estimated to occur with implementation of the Allocation Rules. This is primarily because (1) the base case does not include certain actions to reduce consumption (and, consequently, reduce emissions) previously assumed in the Allocation Framework Rule reference case, including increased leak reduction and enhanced recovery of HFCs, and (2) the assumed timing of emission reductions achieved or forgone differs depending on assumed equipment lifetime and the subsector and technology being modeled. Overall, the abatement options analyzed for compliance with this rule result in more consumption reductions on a cumulative basis; however, some of the emission reductions come at a later time than the emission reductions from the Allocation Framework Rule reference case. As a result, when compared to the analysis of the Allocation Rules, the base case scenario results in slightly higher emissions in earlier model years while yielding greater emission reductions in later years and overall.

Although the base case scenario is a reasonable projection of the potential impacts of this rule, there is reason to believe that it is a conservative one, and that the incremental emission reduction benefits associated with this rule could be substantially greater than reflected in the base case scenario. Previous regulatory programs to reduce chemical use in the affected industries show that regulated entities do not limit their response to the required compliance level; rather, regulated entities may take additional actions that transform industry practices for various reasons, including the anticipation of future restrictions, strengthening their competitive position, and supporting overall

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environmental goals. The industries affected by this rule have historically reached compliance with chemical phaseouts ahead of schedule. For instance, with a 1996 phaseout of CFCs, nearly all home refrigerators and motor vehicle air conditioners had transitioned from CFC-12 to HFC-134a by 1994. Likewise, with a 2010 phaseout of HCFC-22 for new equipment, air conditioners using R-410A were available more than 10 years earlier than required. For this reason, in the high additionality case we assumed certain abatement options not covered by this rule—but which were assumed in the prior accounting of benefits for the Allocation Rules—are also included to illustrate the potential for incremental benefits. In both scenarios, on a cumulative basis this rule is expected to yield incremental emission reductions, ranging from 83 to 876 $MMTCO_2e$ through 2050 (respectively, about 2 percent and 20 percent of the total emissions over that same time period in the Allocation Rules analyses). In the RIA addendum, we estimate the present value of these incremental benefits to be between $3.01 billion and $50.4 billion in 2020 dollars.

Table 6 presents a summary of the annual incremental costs and net benefits of this rule for selected years in the time period 2025–2050, with the climate benefits discounted at 3 percent.

Table 6–Summary of Annual Incremental Climate Benefits, Costs, and Net Benefits of the Technology Transitions Rule Base Case and High Additionality Case Scenarios for the 2025–2050 Timeframe (millions of 2020$, discounted to 2022)[a,b,c,d,e]

	Base Case			*High Additionality Case*		
Year	Incremental Climate Benefits (3%)	Annual Costs (negative values are savings)	Net Benefits (3% Benefits, 3% or 7% Costs)[e]	Incremental Climate Benefits (3%)	Annual Costs (negative values are savings)	Net Benefits (3% Benefits, 3% or 7% Costs)[e]
2025	-$3,730	$73	-$3,803	$486	$532	-$46
2029	-$1,253	$208	-$1,461	$2,451	$498	$1,953
2034	-$73	-$28	-$45	$3,636	$98	$3,538
2036	-$613	-$424	-$190	$3,121	-$381	$3,501
2040	$2,448	-$677	$3,125	$3,831	-$618	$4,449

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2045	$3,080	-$587		$3,667		$4,164	-$523		$4,687	
2050	$3,869	-$619		$4,488		$4,938	-$549		$5,488	
Discount rate	**3%**	**3%**	**7%**	**3%**	**7%**	**3%**	**3%**	**7%**	**3%**	**7%**
PV	$3,013	($4,549)	($2,073)	$7,561	$5,086	$50,406	($1,601)	$1	$52,007	$50,405
EAV	$184	($278)	($215)	$462	$399	$3,081	($98)	$0	$3,179	$3,081

[a] Benefits include only those related to climate. Climate benefits are based on changes in HFC emissions and are calculated using four different estimates of the SC-HFCs (model average at 2.5 percent, 3 percent, and 5 percent discount rates; 95th percentile at 3 percent discount rate). For purposes of this table, we show the effects associated with the model average at a 3 percent discount rate, but the Agency does not have a single central SC-HFC point estimate. We emphasize the importance and value of considering the benefits calculated using all four SC-HFC estimates. As discussed in Chapter 5 of the RIA addendum a consideration of climate effects calculated using discount rates below 3 percent, including 2 percent and lower, is also warranted when discounting intergenerational impacts.
[b] Rows may not appear to add correctly due to rounding.
[c] The annualized present value of costs and benefits are calculated as if they occur over a 26-year period from 2025 to 2050.
[d] The costs presented in this table are annual estimates.
[e] The PV for the 7% net benefits column is found by taking the difference between the PV of climate benefits at 3% and the PV of costs discounted at 7%. Due to the intergenerational nature of climate impacts the social rate of return to capital, estimated to be 7 percent in OMB's Circular A-4, is not appropriate for use in calculating PV of climate benefits.

Climate benefits presented in Tables 5 and 6 are based on changes (increases or reductions) in HFC emissions compared to the Allocation Framework Rule reference case (*i.e.*, after consideration of benefits previously accounted for in Allocation Framework Rule RIA and 2024 Allocation Rule RIA Addendum) and are calculated using four different global estimates of the social cost of HFCs (SC-HFCs): the model average at 2.5 percent, 3 percent, and 5 percent discount rates and the 95th percentile at a 3 percent discount rate. For the presentational purposes of Table 6, we show the incremental benefits associated with the average SC-HFCs at a 3 percent discount rate, but the Agency does not have a single central SC-HFCs point estimate.

EPA estimates the climate benefits for this rule using a measure of the social cost of each HFC (collectively referred to as SC-HFCs) that is affected by this rule. The SC-HFCs is the monetary value of the net harm to society associated with a marginal increase in HFC emissions in a given year, or the benefit of avoiding that increase. In

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principle, SC-HFCs includes the value of all climate change impacts, including (but not limited to) changes in net agricultural productivity, human health effects, property damage from increased flood risk and natural disasters, disruption of energy systems, risk of conflict, environmental migration, and the value of ecosystem services. As with the estimates of the social cost of other GHGs, the SC-HFC estimates are found to increase over time within the models—*i.e.*, the societal harm from one metric ton emitted in 2030 is higher than the harm caused by one metric ton emitted in 2025—because future emissions produce larger incremental damages as physical and economic systems become more stressed in response to greater climatic change, and because gross domestic product (GDP) is growing over time and many damage categories are modeled as proportional to GDP. The SC-HFCs, therefore, reflects the societal value of reducing emissions of the gas in question by one metric ton. The SC-HFCs is the theoretically appropriate value to use in conducting benefit-cost analyses of policies that affect HFC emissions.

The gas-specific SC-HFC estimates used in this analysis were developed using methodologies that are consistent with the methodology underlying estimates of the social cost of other GHGs (carbon dioxide ($SC\text{-}CO_2$), methane ($SC\text{-}CH_4$), and nitrous oxide ($SC\text{-}N_2O$)), collectively referred to as SC-GHG, presented in the *Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990* published in February 2021 by the Interagency Working Group on the Social Cost of Greenhouse Gases (IWG) (IWG 2021). As a member of the IWG involved in the development of the February 2021 SC-GHG TSD, EPA agrees that the TSD represents the most appropriate methodology for estimating the social cost of greenhouse gases until revised estimates have been developed reflecting the latest, peer-reviewed science. Therefore, EPA views the SC-HFC estimates used in analysis to be

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appropriate for use in benefit-cost analysis until improved estimates of the social cost of other GHGs are developed.

As discussed in the February 2021 TSD, the IWG emphasized the importance and value of considering the benefits calculated using all four estimates (model average at 2.5, 3, and 5 percent discount rates, and 95th percentile at a 3 percent discount rate). In addition, the TSD explained that a consideration of climate benefits calculated using discount rates below 3 percent, including 2 percent and lower, is also warranted when discounting intergenerational impacts. As a member of the IWG involved in the development of the February 2021 TSD, EPA agrees with this assessment for the purpose of estimating climate benefits from HFC reductions as well, and will continue to follow developments in the literature pertaining to this issue.

Table 7 presents the sum of incremental climate benefits across all HFCs reduced for the Technology Transitions Rule for 2025, 2029, 2034, 2036, 2040, 2045, and 2050 in the base case scenario.

Table 7—Incremental Climate Benefits for the Final Rule for select years from 2025–2050 (Base Case Scenario)[a,b] (Billions of 2020$)

Year	Incremental climate benefits by discount rate and statistic			
	5% (average)	3% (average)	2.5% (average)	3% (95th percentile)
2025	-1.6	-3.7	-5.0	-9.9
2029	-0.5	-1.3	-1.7	-3.3
2034	0.0	-0.1	-0.1	-0.2
2036	-0.5	-0.6	-0.7	-1.7
2040	1.0	2.4	3.2	6.5
2045	1.4	3.1	4.0	8.2
2050	1.8	3.9	5.0	10.2

[a] Benefits include only those related to climate. See Table 6-3 in the RIA addendum for the full time series of climate benefits using the SC-HFC.

[b] Climate benefits are based on changes in HFC emissions and are calculated using four different estimates of the SC-HFCs (model average at 2.5 percent, 3 percent, and 5 percent discount rates; and 95th percentile at 3 percent discount rate). The IWG emphasized, and EPA agrees with, the importance and value of considering the benefits calculated using all four estimates. As discussed in the Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order

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13990 (IWG 2021), a consideration of climate benefits calculated using discount rates below 3 percent, including 2 percent and lower, are also warranted when discounting intergenerational impacts.

EPA estimates that the present value of cumulative net incremental benefits evaluated from 2025 through 2050 ranges from $7.6 billion to $52.0 billion at a 3 percent discount rate, or $5.1 billion to $50.4 billion at a 7 percent discount rate. These comprise cumulative incremental climate benefits due to reducing HFC emissions (with a present value ranging from $3.01 billion to $50.4 billion) as well as cumulative incremental compliance savings (with a present value ranging from $1.6 billion to $4.5 billion at a 3 percent discount rate or -$1 million to $2.1 billion at a 7 percent discount rate).

The estimation of incremental benefits due to reductions in HFC emissions resulting from the restrictions involved three steps. First, the difference between the consumption of HFCs realized under this rule and the consumption that would have been expected based on the analysis in the Allocation Framework RIA as adjusted by the Addendum for the 2024 Allocation Rule was calculated for each year of the restrictions in metric tons of carbon dioxide equivalent ($MTCO_2e$). Although the Allocation Framework Rule only required allowances for domestic bulk consumption (*i.e.*, in that rule, EPA defines consumption, with respect to a regulated substance, to mean bulk production plus bulk imports minus bulk exports), the consumption reduction estimates in the Allocation Framework RIA included reductions in imported products containing HFCs. Second, using EPA's Vintaging Model, the changes in consumption were used to estimate changes in HFC emissions, which generally lag consumption by some time as HFCs incorporated into equipment and products are eventually released to the environment. Finally, the climate benefits were calculated by multiplying the HFC emission reductions for each year by the appropriate social cost of HFC to arrive at the monetary value of HFC emission reductions.

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The incremental climate benefits of this rule derive mostly from preventing the emissions of HFCs with high GWPs, thus reducing the damage from climate change that would have been induced by those emissions. The emission reductions attributed to this rule are only those beyond the reductions previously estimated for the Allocation Framework Rule as updated by the 2024 Allocation Rule, due to more rapid and/or comprehensive transitions to HFC substitutes in certain sectors or subsectors than would otherwise occur in the Allocation Framework Rule reference case. The reduction in emissions follows from a reduction in the production and consumption of HFCs measured in millions of $MTCO_2e$, or $MMTCO_2e$, that would occur as a result of the restrictions in this rule. It is assumed that all HFCs produced or consumed would be emitted eventually, either in their initial use (*e.g.*, as propellants), during the lifetime of HFC-containing products (*e.g.*, off-gassing from closed-cell foams or leaks from refrigeration systems), or during servicing—including the reuse of HFC recovered and possibly reclaimed—or disposal of HFC-containing products. However, because the emissions lag the consumption in time, all the consumption reductions are not realized as emission reductions during the time period analyzed; hence, the cumulative emission reductions calculated are lower than the cumulative consumption reductions.

EPA recognizes the shortcomings and limitations associated with the current interim IWG estimates and underlying methodology. Since the SC-HFC estimates are based on the same methodology underlying the SC-GHG estimates presented in the IWG February 2021 TSD, they share limitations that are common to those SC-GHG estimates. The limitations were outlined in the February 2021 TSD and include that the current scientific and economic understanding of discounting approaches suggests discount rates appropriate for intergenerational analysis in the context of climate change are likely to be

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less than 3 percent, near 2 percent or lower. Additionally, the Integrated Assessment Models (IAMs) used to produce these estimates do not include all of the important physical, ecological, and economic impacts of climate change recognized in the climate change literature, and the science underlying their "damage functions"—*i.e.*, the core parts of the IAMs that map global mean temperature changes and other physical impacts of climate change into economic (both market and nonmarket) damages—lags behind the most recent research.

The modeling limitations do not all work in the same direction in terms of their influence on the SC-HFC estimates. However, as discussed in the February 2021 TSD, the IWG has recommended that, taken together, the limitations suggest that the SC-GHG estimates likely underestimate the damages from GHG emissions. Therefore, as a member of the IWG involved in the development of the February 2021 TSD, EPA agrees that the interim SC-GHG estimates represent the most appropriate estimate of the SC-GHG until revised estimates have been developed reflecting the latest, peer reviewed science.

B. Scoping analysis of imports of products

In the Technology Transitions Rule RIA addendum, EPA examined the scope of HFCs supplied in and emitted from equipment and products that are imported to the United States containing HFCs. We explained that the Allocation Framework Rule program does not require the expenditure of allowances when importing products with HFCs to the United States We also indicated in the Allocation Framework Rule that subsection (i) of the AIM Act provided authority that would be appropriate to address such imports. In this rule, under subsection (i) of the AIM Act, restrictions apply equally

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to imported and domestically manufactured products that contain regulated substances or blends containing a regulated substance.

In the RIA addendum, we reiterate that while the Allocation Framework Rule did not restrict imports of products containing HFCs, the analysis performed for that rule as well as the 2024 Allocation Rule assumed a whole-market approach. In other words, transitions that were selected by the models to meet HFC consumption reductions were assumed to apply equally to imported products and domestically manufactured products. We were not at the time able to distinguish the two because the models used (*i.e.*, the Vintaging Model and the Marginal Abatement Cost model) are agnostic as to the location of product manufacture. The models are used to project demand for and emissions from products containing HFCs in the United States or HFC emitting processes carried out in the United States.

To understand the historical and potential future scope of imports in products, and the effects that the restrictions could have, EPA evaluated additional information to analyze eight scenarios as explained in Annex D to the RIA addendum. The scenarios derived from two approaches to estimate what HFCs or substitutes are contained in the imported products, two scenarios for how future imports would grow, and two methods of evaluating the substitutes that would be used in imported products to comply with the restrictions. From these calculations of reductions in the supply of HFCs inside products, we applied a simplified emission model to estimate the time-dependent emission reductions, which due to the multi-year use of some products lag the initial supply. We used these emission reduction estimates, by HFC over time, and the same SC-HFCs factors from the Allocation Framework RIA, to derive climate benefits. The climate benefits were not used for decisional purposes and are provided for informational and

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illustrative purposes only. As described in the RIA addendum, these estimates are provided as a scoping analysis and are considered in whole just a subset of the climate benefits achieved from other actions taken under the AIM Act.

As detailed in Annex D to the RIA addendum, annual reductions in the supply of HFCs in imported products ranged from 30.0 to 50.4 $MMTCO_2e$ in 2029, from 31.0 to 59.0 $MMTCO_2e$ in 2034, and from 31.0 to 62.5 $MMTCO_2e$ in 2036, depending on the scenario. The cumulative reductions for the years 2025 through 2050 ranged from 828 to 1,720 $MMTCO_2e$, equal to about 12 to 25 percent of the projected reductions in the Allocation Rules analysis and about 10 to 23 percent of the combined projected reductions due to the Allocation Rules plus the incremental reductions due to this Technology Transitions Rule.

The emission reductions lag the reductions in supply as previously explained in this section but increase significantly as products and systems reach the end of their lifecycle and HFCs are emitted. The cumulative emission reductions for the years 2025 through 2050 ranged from 317 to 598 $MMTCO_2e$, equal to about 7 to 13 percent of the projected reductions in the Allocation Rules analysis and about 6 to 13 percent of the combined projected reductions in the Allocation Rules analysis plus the incremental reductions due to this Technology Transition Rule.

Climate benefits of the emission reductions are shown in Table 8. As noted in this section, these benefits are not considered additional to the Allocation Framework Rule or to this rule and are shown to inform the reader of the scope of the benefits from restricting imported products using HFCs.

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Table 8—Climate Benefits from Restricting Imports of Regulated Products for 2025–2050 (Billions of 2020$, discounted to 2022)

Year	Net climate benefits at 3% (average) discount rate
	Range of Eight Scenarios
2025	0
2029	0 to 0.2
2034	0 to 0.3
2036	0.1 to 0.5
2040	2.2 to 3.0
2045	3.0 to 4.5
2050	4.0 to 7.3

X. How is EPA evaluating environmental justice?

EPA provides the following discussion of its assessment of environmental justice impacts in relationship to this rulemaking. This analysis is intended to provide the public with information on the potential environmental justice impacts of this action. This analysis was not used for purposes of EPA's consideration of the statutory factors under AIM Act subsection (i)(4) or any determinations EPA has made in this action.

Executive Order 12898 (59 FR 7629, February 16, 1994) and Executive Order 14008 (86 FR 7619, January 27, 2021) establish Federal executive policy on environmental justice. Executive Order 14096, signed April 21, 2023, builds on the prior Executive Orders to further advance environmental justice (88 FR 25251).

Executive Order 12898's main provision directs Federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on people of color and low-income populations in the United States. EPA defines[170]

[170] EPA recognizes that EO 14096 (88 FR 25251, April 21, 2023) provides a new terminology and a new definition for environmental justice, as follows: "the just treatment and meaningful involvement of all people, regardless of income, race, color, national origin, Tribal affiliation, or disability, in agency

environmental justice as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.[171] Meaningful involvement means that: (1) Potentially affected populations have an appropriate opportunity to participate in decisions about a proposed activity that will affect their environment and/or health; (2) the public's contribution can influence the regulatory Agency's decision; (3) the concerns of all participants involved will be considered in the decision-making process; and (4) the rule-writers and decision-makers seek out and facilitate the involvement of those potentially affected.[172] The term "disproportionate impacts" refers to differences in impacts or risks that are extensive enough that they may merit Agency action. In general, the determination of whether there is a disproportionate impact that may merit Agency action is ultimately a policy judgment which, while informed by analysis, is the responsibility of the decision-maker. The terms "difference" or "differential" indicate an analytically discernible distinction in impacts or risks across population groups. It is the role of the analyst to assess and present differences in anticipated impacts across population groups of concern for both the

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decision-making and other Federal activities that affect human health and the environment so that people: (i) Are fully protected from disproportionate and adverse human health and environmental effects (including risks) and hazards, including those related to climate change, the cumulative impacts of environmental and other burdens, and the legacy of racism or other structural or systemic barriers; and (ii) have equitable access to a healthy, sustainable, and resilient environment in which to live, play, work, learn, grow, worship, and engage in cultural and subsistence practices." For additional information, see *https://www.federalregister.gov/documents/2023/04/26/2023-08955/revitalizing-our-nations-commitment-to-environmental-justice-for-all*.

[171] See, e.g., Environmental Protection Agency. "Environmental Justice." Available at: *https://www.epa.gov/environmentaljustice*.

[172] The criteria for meaningful involvement are contained in EPA's May 2015 document "*Guidance on Considering Environmental Justice During the Development of an Action*." Environmental Protection Agency, 17 Feb. 2017. Available at: *https://www.epa.gov/environmentaljustice/guidance-considering-environmental-justice-during-development-action*.

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baseline and proposed regulatory options, using the best available information (both quantitative and qualitative) to inform the decision-maker and the public.[173]

Executive Order 14096 calls on agencies to make achieving environmental justice part of their missions and further declares a policy to "advance environmental justice and help create a more just and sustainable future for all."[174] The January 2021 Presidential Memorandum on Modernizing Regulatory Review calls for procedures to "take into account the distributional consequences of regulations, including as part of a quantitative or qualitative analysis of the costs and benefits of regulations, to ensure that regulatory initiatives appropriately benefit, and do not inappropriately burden disadvantaged, vulnerable, or marginalized communities."[175] EPA also released its June 2016 "Technical Guidance for Assessing Environmental Justice in Regulatory Analysis" to provide recommendations that encourage analysts to conduct the highest quality analysis feasible, recognizing that data limitations, time and resource constraints, and analytic challenges will vary by media and circumstance.[176]

The Allocation Framework Rule, among other things, established the framework for the phasedown of HFCs in the United States, which will achieve significant benefits by reducing the production and consumption of HFCs on a GWP-weighted basis. In that rulemaking, EPA described the environmental justice analysis conducted in support of

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[173] The definitions and criteria for "disproportionate impacts," "difference," and "differential" are contained in EPA's June 2016 document "Technical Guidance for Assessing Environmental Justice in Regulatory Analysis." Available at: *https://www.epa.gov/environmentaljustice/technical-guidance-assessing-environmental-justice-regulatory-analysis.*

[174] 88 FR 25251 (Apr. 26, 2023).

[175] Presidential Memorandum on Modernizing Regulatory Review, January 20, 2021. Available at: *https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/20/modernizing-regulatory-review*.

[176] Technical Guidance for Assessing Environmental Justice in Regulatory Analysis, June 2016. Available at: *https://www.epa.gov/sites/default/files/2016-06/documents/ejtg_5_6_16_v5.1.pdf.*

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this rule and summarized the public health and welfare effects of GHG emissions (including HFCs), including information that certain parts of the population may be especially vulnerable to climate change risks based on their characteristics or circumstances, including the poor, the elderly, the very young, those already in poor health, the disabled, those living alone, and/or indigenous populations dependent on one or limited resources due to factors including but not limited to geography, access, and mobility. Potential impacts of climate change raise environmental justice issues. Low-income communities, for example, can be especially vulnerable to climate change impacts because they tend to have more limited capacity to bear the costs of adaptation and are more dependent on climate-sensitive resources such as local water and food supplies. In corollary, some communities of color, specifically populations defined jointly by both ethnic/racial characteristics and geographic location, may be uniquely vulnerable to climate change health impacts in the United States.

Many of the environmental justice implications of this rule are similar to those addressed at length in the RIA[177] developed for the Allocation Rules. The analysis of potential environmental justice concerns for the Allocation Rules focused mainly on characterizing baseline emissions of air toxics that are also associated with chemical feedstock use for HFC production. As detailed in the RIA for the Allocation Rules, the phasedown of high-GWP HFCs in the United States will reduce GHG emissions, thereby reducing damages associated with climate change that would have been associated with those emissions. EPA expects that this rule will also reduce GHG emissions, which will benefit populations that may be especially vulnerable to damages associated with climate

[177] The RIA for the Allocation Framework Rule is available in the docket for that rulemaking at: *https://www.regulations.gov/document/EPA-HQ-OAR-2021-0044-0227.*

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change. We also expect that the restriction on use of certain HFCs will increase the production of HFC substitutes. However, there continues to be significant uncertainty about how the transition to lower-GWP substitutes and market trends independent of this rulemaking could affect production of predominant HFC substitutes, such as hydrocarbons, ammonia (R-717), and HFOs at individual facilities and how those changes in production could affect associated air pollutant emissions, particularly in communities that are disproportionately burdened by air pollution. Some predominant HFC substitutes, such as HFOs, use the same chemicals used in the manufacture of HFCs as feedstocks in their production or release the same chemicals as byproducts, potentially raising concerns about local exposure. Due to the limitations of the current data, we cannot make conclusions about the impact this rule may have on individuals or specific communities near facilities producing HFC substitutes. For the purpose of environmental justice, however, it is important to understand the characteristics of the communities surrounding these facilities to better ensure that future actions, as more information becomes available, can improve outcomes.

EPA's 2016 Technical Guidance does not prescribe or recommend a specific approach or methodology for conducting an environmental justice analysis, though a key consideration is consistency with the assumptions underlying other parts of the regulatory analysis when evaluating the baseline and regulatory options. Therefore, for this rule, EPA followed the format used for the Allocation Framework RIA to analyze the demographic characteristics and baseline exposure of the communities near facilities producing HFC substitutes. The complete analysis is described in the RIA addendum developed for this rule, which is available in the docket. EPA relied on public data from

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the Toxics Release Inventory (TRI),[178] GHGRP, Chemical Data Reporting (CDR) Program,[179] EJScreen (an environmental justice mapping and screening tool developed by EPA), Enforcement and Compliance History Online, Census data, and information provided by industry stakeholders to identify the facilities. In addition, updated Air Toxics Screening Assessment (AirToxScreen, formerly National Air Toxics Assessment (NATA)) data from 2019 for census tracts within and outside of a 1-, 3-, 5-, and 10-mile distance were used to approximate the cumulative baseline cancer and respiratory risk due to air toxics exposure for communities near the production facilities.

With the restriction on use of certain HFCs, EPA anticipates that the production of HFC substitutes will increase. Accordingly, for the environmental justice analysis for this rule, EPA identified 14 facilities producing predominant HFC substitutes that may be impacted by this rule and where production changes may impact nearby communities. The relatively small number of facilities that may be affected by this rule enabled EPA to assemble a uniquely granular assessment of the characteristics of the facilities and the communities where they are located. Overall, this rule will reduce GHG emissions, which will benefit populations that may be especially vulnerable to damages associated with climate change. However, the manner in which producers transition from high-GWP HFCs could drive changes in future risk for communities living near facilities that

[178] TRI tracks the management of certain toxic chemicals that may pose a threat to human health and the environment. U.S. facilities in different industry sectors must report annually how much of each chemical is released to the environment and/or managed through recycling, energy recovery, and treatment. Facilities submit a TRI Form R for each TRI-listed chemical it manufactures, processes, or otherwise uses in quantities above the reporting threshold.

[179] The CDR program, under the Toxic Substances Control Act, requires manufacturers (including importers) to provide EPA with information on the production and use of chemicals in commerce. Under the CDR rule, EPA collects information on the types, quantities, and uses of chemical substances produced domestically and imported into the United States. The information is collected every four years from manufacturers of certain chemicals in commerce generally when production volumes are 25,000 pounds or greater for a specific reporting year.

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produce HFC substitutes, to the extent the use of toxic feedstocks, byproducts, or catalysts changes, and those chemicals are released into the environment with adverse local effects.

The environmental justice analysis, which examines racial and economic demographic and health risk information, found heterogeneity in community characteristics around individual facilities. The analysis showed that more individuals identified as African American or Black and as Hispanic with respect to race live in proximity to the identified facilities compared with the national average or the rural area national average. Importantly, the comparison to the rural area national average is more striking because so many of the facilities are rural. While median income is not significantly different for the communities near the facilities (slightly lower than the national average but slightly above or equal to the rural median income), there are more very low-income households in these communities. Additionally, total cancer risk and total respiratory risk is higher than either the rural national average or the overall national average in communities near the facilities. The analysis shows that the risks are higher for those within the 1-mile average radius and decrease at the 3-mile, 5-mile, and 10-mile radii.

EPA notes that the averages may obfuscate potentially large differences in the community characteristics surrounding individual production facilities. Analysis of the demographic characteristics and AirToxScreen data for the 14 identified facilities shows that there are significant differences in the communities near these facilities. The racial, ethnic, and income results are varied but, in almost all cases, total cancer risk and total respiratory risk are higher for the communities in proximity to the sites than to the appropriate (rural or overall) average when compared with the national or State results.

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Additionally, some facilities are in communities that are quite different from the aggregate results discussed in this section above. The aggregate results show that the communities near the facilities tend to have slightly fewer neighboring individuals identified as White and more identified as African American or Black and as Hispanic with respect to race, in several cases. In several cases, however, the communities near specific facilities have higher percentages of White individuals than either the State or national averages. This is true for the HFC substitute-producing facilities in San Dimas, CA; Sibley, LA; El Dorado, AR; Gregory and Manvel, TX; along with those in Iowa, Illinois, and West Virginia.

EPA included a demonstration of a microsimulation approach in the RIA addendum to analyze the proximity of communities to potentially affected facilities. Microsimulation is a technique relying upon advanced statistics and data science to combine disparate survey and geospatial data. It has long been used in economic and social science research and by EPA (in the context of understanding the implications of underground storage tank impacts on groundwater). Recent advances in data science and computational power have increased the availability of microsimulation for applications such as environmental justice analysis. The demonstration analysis included in the RIA addendum contributes to understanding communities that may warrant further environmental justice analysis.

In the proposed rule EPA sought comment on the use of microsimulation approaches and techniques for regulatory impact analysis and other program activities. Among other things, EPA sought information on what microsimulation tools are appropriate for better understanding the burdens faced by communities, and in what circumstances. The demonstration analysis presented in the RIA addendum uses a dataset

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of "synthetic households" based on geospatial data combined through microsimulation techniques with information from the U.S. Decennial Census and the American Communities Survey. EPA requested comment on other surveys or other geospatial datasets should be the focus of EPA efforts to combine with the American Communities Survey and/or Decennial Census data; how microsimulation tools supplement other EPA tools for understanding demographics, multiple burdens facing communities, and assessing the impact of EPA programs; and how microsimulation and other techniques to use current survey information can be used to identify data gaps which might be filled with refinements or improvements to existing survey tools.

EPA noted in the Allocation Framework Rule, and reiterates here, that it is not clear the extent to which these baseline risks are directly related to potential future HFC substitute production, but some feedstocks, catalysts, and byproducts are toxic, particularly with respect to potential carcinogenicity (*e.g.*, carbon tetrachloride). All HFC substitute production facilities are near other industrial facilities that could contribute to the cumulative AirToxScreen cancer and respiratory risk, and, at this time, it is not clear how emissions related to HFC substitute production compare to other chemical production at the same or nearby facilities. Because of the limited information regarding where substitutes will be produced and what other factors might affect production and emissions at those locations, it is unclear to what extent this rule may affect baseline risks from hazardous air toxics for communities living near HFC substitute production facilities.

Additionally, as mentioned previously, emissions from facilities producing fluorinated and non-fluorinated substitutes may also be affected by the phasedown of HFCs. For the 2024 Allocation Rule, EPA updated the environmental justice analysis that

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was previously conducted for the Allocation Framework RIA to help understand how the implementation of the HFC phasedown may affect production and emissions at facilities that produce HFCs. EPA followed the analytical approach used in the Allocation Framework RIA to provide updated data on the total number of TRI facilities near HFC production facilities and the cancer and respiratory risks to surrounding communities. This update included the use of the most recent data available for the AirToxScreen data set from 2019, replacing the 2014 NATA data used in the previous analysis. Additionally, EPA updated the list of HFC production facilities as part of the HFC Allocation analysis to include a ninth facility that reported production of HFCs in 2022. Finally, EPA has updated the list of toxic chemicals potentially used as a feedstock or catalyst or released as a byproduct of HFC production based on information reported to EPA under the Allocation Framework Rule (see 40 CFR 84.31(b)(1)).

Comment: EPA received two comments related to the use of microsimulation in the EJ analysis. The first commenter asserted that it is imperative that the Agency recognize the limitations of any output from microsimulation analyses and ensure such data are utilized within the context of their limitations and that these analyses should be a starting point to inform further dialogue and analysis rather than being used as the sole basis for future regulatory action. The second commenter stated that they appreciate EPA's use of microsimulation models to better model the environmental justice impacts of this rule and encourages EPA to explore longitudinal American Community Survey datasets in any forecasting it attempts. IPUMS may be a helpful resource for tracking this data over time.

Response: EPA continues to explore the use of microsimulation approaches to better understand the characteristics of communities. IPUMS is one of several datasets

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EPA is considering for additional analyses. The Agency recognizes that these analyses have limitations and is not currently contemplating using them as the sole basis for future regulatory action under the AIM Act.

Comment: One commenter stated that EPA should fully evaluate the health and environmental risks of HFC and HFO usage in addition to the impacts on communities near facilities particularly with regard to PFAS and trifluoroacetic acid (TFA) from HFCs and HFOs as an area of concern.

Response: With regard to PFAS, EPA notes that currently, there is no single commonly agreed definition of PFAS, and whether HFCs or HFOs are classified as PFAS depends on the definition being used. EPA's PFAS roadmap, available at *https://www.epa.gov/pfas*, sets timelines for specific actions and outlines EPA's commitments to new policies to safeguard public health, protect the environment, and hold polluters accountable. This rule does not in any way establish a definition of PFAS, nor do the listing decisions depend on a specific definition. As described in section VI.E, substitutes identified as available for use in the subsectors covered in this rulemaking have, for the most part, also been evaluated under the SNAP program. In evaluating alternatives, SNAP uses a comparative risk framework, and considers potential risks to human health and the environment.

With regard to the commenter's concern regarding atmospheric decomposition of certain HFCs and HFOs to TFA, EPA notes that TFA is a perfluorinated acid. Where TFA has been included in a particular definition of PFAS, it is often part of a class of chemicals containing more than 4,730 substances. According to the United Nations Environment Program's Environmental Effects Assessment Panel (EEAP) about 256 PFAS are in commercial use, with widely differing physical, chemical, and biological

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properties.[180] An EEAP 2022 Assessment Report[181] explained that one source of TFA in the environment is the degradation of some HFCs, HCFCs, HFOs, and HCFOs, other potential sources of TFA include geogenic sources; effluents and releases from the manufacture of fluorinated chemicals; combustion, and degradation of fluorinated chemicals in commercial and household waste; and biological and environmental degradation of chemicals such as certain pharmaceuticals and pesticides. The 2022 EEAP Report indicates that while TFA "is unlikely to cause adverse effects in terrestrial and aquatic organisms, [continued] monitoring and assessment are nevertheless advised due to uncertainties in the deposition of TFA and its potential effects on marine organisms." The report notes that "TFA does not bioaccumulate nor is it toxic at the low to moderate exposures currently measured in the environment or those predicted in the distant future." Because the HCFCs and HFCs are long-lived in the atmosphere, they distribute globally and TFA from these substances is more evenly deposited. The HFOs and HCFOs have shorter lifetimes in the atmosphere and deposition of TFA from these substances is likely to be more localized. This will result in greater concentrations near the locations of release. This is unlikely to present a risk to humans or the environment in these locations but changes in concentration in surface water (or soil) would respond rapidly to releases. The 2022 EEAP report states, "[monitoring] of the environment for residues of TFA would provide an early warning if trends in concentration indicate rapid increases." EPA reiterates that the SNAP program, which is one of the sources the Agency considered when determining availability of alternatives, considers ecotoxicity as a criterion when

[180] UNEP. 2022 Assessment Report of the Environmental Effects Assessment Panel. Available at: *https://ozone.unep.org/system/files/documents/EEAP-2022-Assessment-Report-May2023.pdf.*
[181] The EEAP is an advisory body to the Montreal Protocol Parties that evaluates the consequences of stratospheric ozone depletion and additional areas of potential importance to the Montreal Protocol.

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evaluating alternatives under its comparative risk framework, and the Agency has considered the potential impacts of TFA in past actions where SNAP found HFO-1234yf acceptable in certain end uses. The myriad studies EPA referenced all concluded that the additional TFA from HFO-1234yf did not pose a significant additional risk, even if it were assumed to be used as the only refrigerant in all refrigeration and air conditioning equipment (76 FR 17492-17493, March 29, 2011). The Agency intends to continue its approach to evaluating the potential risks from TFA in future.

Comment: One commenter, echoing comments submitted on the Allocation Rule, noted that EPA should monitor indirect pollution impacts (*e.g.*, increased truck traffic and increased diesel exhaust) on communities impacted by the proposed rule.

Response: This rule promulgated under subsection (i) will require manufacturers to restrict the use of HFCs in certain subsectors. Those restrictions on the use of HFCs will, along with the rule implementing the phasedown under subsection (e), likely have the effect of increasing the production of HFC substitutes. We do not disagree that this increase in production may result in changed traffic conditions near facilities producing HFC substitutes, but EPA did not propose to monitor indirect pollution impacts near facilities producing substitutes, nor are we finalizing such monitoring at this time.

Comment: One commenter suggested that EPA should directly engage with the communities' surrounding facilities that produce HFC substitutes. EPA should hold in-person informational workshops in potentially affected communities, provide for relevant translation services to disseminate information about potential impacts, and ensure that community feedback is representative. This commenter also recommends that after this rule is finalized, EPA should provide effective technical assistance and promote compliance in an equitable manner by holding informational workshops and providing

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translation services to members of the regulated community, including small businesses in underserved and Tribal communities.

Response: EPA reached out to EJ organizations when developing the proposed rule. EPA specifically invited EJ groups to public meetings on this rule and shared information using established channels. EPA received comments from environmental organizations, States, and other stakeholders raising EJ concerns. As a part of implementation of this rule, EPA will continue outreach to stakeholders to ensure a smooth implementation of this rule.

Comment: A wide range of commenters said that EPA should, as a part of its EJ analysis, assess or consider the potential for a negative impact on the availability and cost of equipment for underserved communities; low- and medium-income households whose ability to purchase and maintain air conditioning may be negatively impacted; and small businesses, especially retailers in rural and urban food deserts, such that they cannot afford to replace equipment. The commenters note that small food retail stores including "Mom and Pop" shops have slim profit margins and may be forced to continue to operate old leaky equipment with lower energy efficiency performance or purchase refurbished equipment without energy efficiency and refrigerant upgrades because they cannot afford new equipment. One commenter noted that underserved and Tribal communities could be impacted by losing access to nutritious food as the cost of refrigeration in business increases. Some of these commenters requested that EPA review the potential financial costs of this rulemaking on small or locally owned businesses, such as convenience stores, markets, other small local businesses, and the communities they serve. One commenter requested that EPA should disclose whether small businesses potentially impacted are located in underserved communities and consider financial assistance

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options for compliance with this rule. Some of these commenters also noted that underserved communities are already experiencing worse health outcomes and increased mortality from climate-change induced extreme heat events and that EPA should assess whether this regulation would result in an increase in cost for cooling homes, schools, and workplaces.

Response: EPA responds to comments regarding potential costs to food retailers in section IV.F.1.c.iv. EPA disagrees that this rule will result in store closures or the loss of access to food. EPA is not requiring the retrofit or early replacement of equipment that operates using GWPs over the thresholds specific in this rule. Rather, it effectively requires that lower-GWP equipment be phased in once existing equipment reaches the end of its useful life. EPA has outlined provisions in this rule allowing for consumers and small businesses to replace components of existing equipment for the purposes of repair and extending the useful life of equipment without having to upgrade to a lower-GWP system. EPA's intention is to permit ordinary servicing and repair of equipment and not to apply restrictions in a way that would prevent such maintenance. Store owners may replace broken or inefficient HFC components and save money by repairing leaks in their existing systems. Further, EPA has revised this rule to clarify that importers and manufacturers can continue to supply components and parts for existing systems so that these systems can be serviced throughout their useful life.

Regarding the opening of new stores, EPA responds that food retailers, especially smaller format stores like convenience stores and markets, can choose the most appropriate design options for their retail footprint (*e.g.*, centralized DX system, cascade system, remote condensing units, stand-alone displays and cases, or combinations thereof). A company's decision to open a new store specifically in underserved

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communities is based on many socioeconomic factors outside the scope of this rule. The incremental upfront cost of using lower-GWP refrigeration equipment compared to HFC equipment is unlikely to be determinative in that business decision. For most retail food refrigeration equipment, EPA estimates that the transition to lower-GWP alternatives will result in a net cost savings (after accounting for energy efficiency gains and savings on the cost of refrigerant). In the RIA addendum, EPA has provided details on these estimated savings in tables A-4 and A-5. EPA has conducted a small business impact assessment and has not found that a substantial number of small businesses would be significantly impacted.

For transitions in residential air conditioning, EPA estimates that window units that are compliant with this rule will result in moderate cost savings (after accounting for energy savings and refrigerant cost savings) relative to existing equipment, while unitary AC systems that are compliant with this rule will have a moderate cost increase relative to existing systems. .

While financial assistance is beyond the scope of this rule and the authority of subsection (i) of the AIM Act, there are multiple programs, rebates, and incentives available for the design and installation of energy efficient refrigeration and comfort cooling systems using low-GWP refrigerant.[182]

Comment: One commenter noted that retail operations in disadvantaged communities are the most likely to experience supply disruptions and even store closures as a result of the limited availability of equipment and trained personnel and the significant costs associated with bringing existing stores into compliance with the new

[182] See *https://www.energy.gov/articles/biden-harris-administration-announces-250-million-accelerate-electric-heat-pump*. See also *https://www.energy.gov/articles/doe-announces-46-million-boost-energy-efficiency-and-slash-emissions-residential-and*;

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requirements. The same commenter also noted that disadvantaged communities are already struggling with a technician shortage, and it is impossible to open a store that uses refrigeration and air conditioning equipment that cannot be maintained.

Response: To clarify, this rule does not require any retailers to replace existing equipment with new equipment, nor does it place restrictions on the continued servicing, repair, and maintenance of existing equipment. Rather, when retailers are replacing equipment that has reached the end of its useful life, that equipment must meet the new restrictions, where applicable. In setting those restrictions, and assessing which substitutes are available for use in new equipment in impacted subsectors, EPA considered affordability for small business consumers as well as contractor training costs. In addition, EPA understands that RACHP equipment manufacturers, trade associations, trade schools, unions, and other groups are providing training for technicians for equipment that uses newer refrigerants. EPA monitored previous transitions from ODS refrigerants to HFC refrigerants and in many cases to other alternatives. These transitions did not result in large-scale shortages of equipment or technicians. EPA acknowledges as a general matter that over the past several years the global pandemic has affected supply chain and employment for many economic sectors. However, EPA is not aware, nor did the commenters provide specific information that would indicate that this rule would lead to additional shortages in technicians or create a situation where properly trained RACHP technicians would be unable to service newer equipment.

XI. Judicial Review

The AIM Act provides that certain sections of the CAA "shall apply to" the AIM Act and actions "promulgated by the Administrator of [EPA] pursuant to [the AIM Act] as though [the AIM Act] were expressly included in title VI of [the CAA]." 42 U.S.C.

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7675(k)(1)(C). Among the applicable sections of the CAA is section 307, which includes provisions on judicial review. Section 307(b)(1) provides, in part, that petitions for review must only be filed in the United States Court of Appeals for the District of Columbia Circuit: (i) When the agency action consists of "nationally applicable regulations promulgated, or final actions taken, by the Administrator," or (ii) when such action is locally or regionally applicable, but such action is based on such a determination." For locally or regionally applicable final actions, the CAA reserves to the EPA complete discretion whether to invoke the exception in (ii).

The final action herein noticed is "nationally applicable" within the meaning of CAA section 307(b)(1). It defines and interprets terms under the AIM Act, establishes approaches to issuing use restrictions under the AIM Act, and applies nationally applicable regulations for sectors and subsectors using regulated substances as defined by the AIM Act. The rule also establishes regulatory requirements applicable to all entities seeking to submit a petition under subsection (i) of that Act, and nationally applicable regulations for labeling, recordkeeping, and reporting. In the alternative, to the extent a court finds the action to be locally or regionally applicable, the Administrator is exercising the complete discretion afforded to him under the CAA to make and publish a finding that the action is based on a determination of "nationwide scope or effect" within the meaning of CAA section 307(b)(1).[183] In deciding to invoke this exception, the Administrator has taken into account a number of policy considerations, including his judgement regarding the benefit of obtaining the D.C. Circuit's authoritative centralized

[183] In the report on the 1977 Amendments that revised section 307(b)(1) of the CAA, Congress noted that the Administrator's determination that the "nationwide scope or effect" exception applies would be appropriate for any action that has scope or effect beyond a single judicial circuit. See H.R. Rep. No. 95-294 at 323, 324, reprinted in 1977 U.S.C.C.A.N. 1402-03.

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review, rather than allowing development of the issue in other contexts, in order to ensure consistency in the Agency's approach to implementing EPA's national regulations in 40 CFR part 84. The final action treats all affected entities consistently in how the 40 CFR part 84 regulations are applied. The Administrator finds that this is a matter on which national uniformity is desirable to take advantage of the D.C. Circuit's administrative law expertise and facilitate the orderly development of the basic law under the AIM Act and EPA's implementing regulations. The Administrator also finds that consolidated review of the action in the D.C. Circuit will avoid piecemeal litigation in the regional circuits, further judicial economy, and eliminate the risk of inconsistent results for different regulated entities. The Administrator also finds that a nationally consistent approach to the issues addressed in this rule constitutes the best use of agency resources. The Administrator is publishing his finding that the action is based on a determination of nationwide scope or effect in the *Federal Register* as part of this action. For these reasons, this final action is nationally applicable, or alternatively, the Administrator is exercising the complete discretion afforded to him by the CAA and finds that the final action is based on a determination of nationwide scope or effect for purposes of CAA section 307(b)(1) and is hereby publishing that finding in the *Federal Register*. Under section 307(b)(1) of the CAA, petitions for judicial review of this action must be filed in the United States Court of Appeals for the District of Columbia by **[INSERT DATE 60 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER]**.

XII. Severability

This final rule includes definitions and interpretations of terms under the AIM Act, new regulatory requirements regarding submitting a petition under subsection (i) of that Act, and new restrictions for sectors and subsectors using regulated substances as

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defined by the AIM Act, many of which were the subject of petitions granted under subsection (i). The rule also establishes labeling and recordkeeping and reporting requirements to support the enforcement of the new restrictions. Therefore, this final rule is multifaceted and addresses many separate issues for independent reasons, as detailed in each respective section of this preamble. Each interpretation, requirement, and use restriction is supported by separate analysis and discussion. While this rule contains separate parts that we intended to operate independently of one another and to be severable from each other, we took the approach of including all the parts in one rulemaking rather than promulgating multiple rules.

XIII. Statutory and Executive Order Review

Additional information about these statutes and Executive Orders can be found at *https://www.epa.gov/laws-regulations/laws-and-executive-orders.*

A. Executive Order 12866: Regulatory Planning and Review and Executive Order 14094: Modernizing Regulatory Review

This action is a "significant regulatory action" as defined under section 3(f)(1) of Executive Order 12866, as amended by Executive Order 14094. Accordingly, EPA submitted this action to OMB for Executive Order 12866 review. Documentation of any changes made in response to the Executive Order 12866 review is available in the docket for this action (Docket ID No. EPA-HQ-OAR-2021-0643). EPA prepared an analysis of the potential costs and benefits associated with this action. This analysis, "*Regulatory Impact Analysis Addendum: Impact of the Technology Transitions Rule*," is also available in the docket and is briefly summarized in section IX of this preamble.

B. Paperwork Reduction Act (PRA)

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The information collection activities in this rule have been submitted for approval to OMB under the PRA. The Information Collection Request (ICR) document that EPA prepared has been assigned EPA ICR number 2742.02. You can find a copy of the ICR supporting statement in the docket for this rule, and it is briefly summarized here. The information collection requirements are not enforceable until OMB approves them.

Subsection (k)(1)(C) of the AIM Act states that section 114 of the CAA applies to the AIM Act and rules promulgated under it as if the AIM Act were included in title VI of the CAA. Thus, section 114 of the Clean Air Act, which provides authority to the EPA Administrator to require recordkeeping and reporting in carrying out provisions of the CAA, also applies to and supports this rulemaking.

EPA is establishing labeling requirements to products and specified components that use an HFC, or a blend containing an HFC, in the sectors and subsectors covered by this rule. EPA is also establishing recordkeeping and reporting requirements for any entity that domestically manufactures or imports products or specified components to allow the Agency to review data and identify noncompliance with GWP restrictions and monitor the import and manufacture of such equipment.

Respondents/affected entities: Respondents and affected entities are individuals or companies that manufacture, import, sell, distribute, offer for sale or distribution, or export equipment and install systems within the sectors or subsectors addressed by this rule that uses or is intended to use certain HFCs that are defined as a regulated substance under the AIM Act, or blends that contain a regulated substance.

Respondent's obligation to respond: Mandatory (AIM Act and section 114 of the CAA).

Estimated number of respondents: 51,209,764.

Frequency of response: Annually.

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Total estimated burden: 19,715 hours (per year) in the first year; 17,050 hours per year in all following years. Burden is defined at 5 CFR 1320.3(b).

Total estimated cost:[184] $7,170,856 (per year) in the first year, $6,832,015 per year thereafter, includes $5,137,952 annualized capital or operation & maintenance costs.

An agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations in 40 CFR are listed in 40 CFR part 9. When OMB approves this ICR, the Agency will announce that approval in the *Federal Register* and publish a technical amendment to 40 CFR part 9 to display the OMB control number for the approved information collection activities contained in this final rule. EPA addresses comments related to the collection of information in section VIII.

C. Regulatory Flexibility Act (RFA)

I certify that this action will not have a significant economic impact on a substantial number of small entities under the RFA. The small entities subject to the requirements of this action include manufacturers and importers of equipment and products within the affected subsectors (*e.g.*, manufacturers of stand-alone/self-contained air conditioning and refrigeration equipment, manufacturers of aerosol products, and manufacturers of foam products and appliances containing foam) and end-users of equipment within affected subsectors (*e.g.*, supermarkets, warehouse clubs/superstores, convenience stores). EPA estimates that approximately 162 of the 51,047 potentially affected small businesses could incur costs in excess of one percent of annual sales and that approximately 110 small businesses could incur costs in excess of three percent of

[184] Costs are provided in 2022 dollars.

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annual sales. Because there is not a significant percentage of small businesses that may experience a significant impact, it can be presumed that this action will have no SISNOSE. Details of this analysis are presented in *Economic Impact Screening Analysis for Restrictions on the Use of Hydrofluorocarbons under Subsection (i) of the American Innovation and Manufacturing Act,* which is available in Docket ID No. EPA-HQ-OAR-2021-0643.

D. Unfunded Mandates Reform Act (UMRA)

This action contains a Federal mandate under UMRA, 2 U.S.C. 1531–1538, that may result in expenditures of $100 million or more for the private sector in any one year. This action contains no unfunded Federal mandate for State, local, or Tribal governments as described in UMRA, 2 U.S.C. 1531–1538. Accordingly, EPA has prepared a written statement required under section 202 of UMRA. The statement is included in the docket for this action and is briefly summarized here. This rule is estimated to result in average annual cost to the private sector of $99 million for the period 2025 through 2050. This rule is also estimated to result in average annual savings to the private sector of $430 million over the same time period, for a net average annual savings of approximately $330 million. When adjusted for inflation, the $100 million UMRA threshold established in 1995 is equivalent to approximately $184 million in 2022 dollars, the year dollars for the cost estimates in this final rule. While EPA has estimated net savings for affected subsectors in aggregate, the costs of this rule to some portions of the private sector are estimated to exceed the inflation-adjusted UMRA threshold in some years. This action is not subject to the requirements of section 203 of UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments.

E. Executive Order 13132: Federalism

This action does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government.

F. Executive Order 13175: Consultation and Coordination with Indian Tribal Governments

This action does not have Tribal implications as specified in Executive Order 13175. EPA is not aware of Tribal businesses engaged in activities that would be directly affected by this action. Based on the Agency's assessments, EPA also does not believe that potential effects, even if direct, would be substantial. Accordingly, this action will not have substantial direct effects on Tribal governments, on the relationship between the Federal government and Indian Tribes, or on the distribution of power and responsibilities between the Federal government and Indian Tribes, as specified in Executive Order 13175. Thus, Executive Order 13175 does not apply to this action. EPA periodically updates Tribal officials on air regulations through the monthly meetings of the National Tribal Air Association and will share information on this rulemaking through this and other fora.

G. Executive Order 13045: Protection of Children from Environmental Health Risks and Safety Risks

Executive Order 13045 (62 FR 19885, April 23, 1997) directs Federal agencies to include an evaluation of the health and safety effects of the planned regulation on children in Federal health and safety standards and explain why the regulation is preferable to potentially effective and reasonably feasible alternatives. This action is subject to Executive Order 13045 because it is significant under section 3(f)(1) of

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Executive Order 12866, and the environmental health or safety risk addressed by this action has a disproportionate effect on children. Accordingly, we have evaluated the environmental health or safety effects of climate change on children.

GHGs, including HFCs, contribute to climate change. The GHG emission reductions resulting from implementation of this rule will further improve children's health. The assessment literature cited in EPA's 2009 and 2016 Endangerment Findings concluded that certain populations and life stages, including children, the elderly, and the poor, are most vulnerable to climate-related health effects. The assessment literature since 2016 strengthens these conclusions by providing more detailed findings regarding these groups' vulnerabilities and the projected impacts they may experience.

These assessments describe how children's unique physiological and developmental factors contribute to making them particularly vulnerable to climate change. Impacts to children are expected from heat waves, air pollution, infectious and waterborne illnesses, and mental health effects resulting from extreme weather events. In addition, children are among those especially susceptible to most allergic diseases, as well as health effects associated with heat waves, storms, and floods. Additional health concerns may arise in low-income households, especially those with children, if climate change reduces food availability and increases prices, leading to food insecurity within households. More detailed information on the impacts of climate change to human health and welfare is provided in section III.B of this preamble.

H. Executive Order 13211: Actions That Significantly Affect Energy Supply, Distribution, or Use

This action is not a "significant energy action" because it is not likely to have a significant adverse effect on the supply, distribution or use of energy. This action applies

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to certain regulated substances and certain subsectors that use regulated substances, none of which are used to supply or distribute energy.

I. National Technology Transfer and Advancement Act (NTTAA)

This rulemaking does not involve technical standards.

J. Executive Order 12898: Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations and Executive Order 14096: Revitalizing Our Nation's Commitment to Environmental Justice for All

The human health or environmental conditions that exist prior to this action result in or have the potential to result in disproportionate and adverse human health or environmental effects on communities with environmental justice concerns. EPA carefully evaluated available information on HFC substitute production facilities and the characteristics of nearby communities to evaluate these impacts in the context of this rulemaking. Based on this analysis, EPA finds evidence of environmental justice concerns near facilities that produce substitutes for HFCs from cumulative exposure to existing environmental hazards in these communities. However, the Agency recognizes that the phasedown of HFCs and use restrictions in this final rule may cause significant changes in the location and quantity of production of HFCs and their substitutes, and that these changes may in turn affect emissions of hazardous air pollutants at chemical production facilities. Thus, given uncertainties about where and in what quantities HFC substitutes will be produced, EPA cannot determine the extent to which this rule will exacerbate or reduce existing disproportionate adverse effects.

EPA believes that it is not practicable to assess whether this action is likely to result in new disproportionate and adverse effects on communities with environmental

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justice concerns. A summary of the Agency's approach for considering potential environmental justice concerns as a result of this rulemaking can be found in Section X of the preamble, and our environmental justice analysis can be found in the RIA addendum, available in the docket. Based on the analysis, EPA determined that this rule will reduce emissions of potent GHGs, which will reduce the effects of climate change on communities with environmental justice concerns, including public health and welfare effects. As noted in Section X of this preamble, the Agency will continue to evaluate the impacts of this program on communities with environmental justice concerns and consider further action, as appropriate, to protect health in communities affected by HFC substitute production.

K. Congressional Review Act (CRA)

This action is subject to Subtitle E of the Small Business Regulatory Enforcement Fairness Act of 1996, also known as the Congressional Review Act or CRA, and EPA will submit a rule report to each House of the Congress and to the Comptroller General of the United States. This action is a "major rule" as defined by 5 U.S.C. 804(2).

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List of Subjects in 40 CFR Part 84

Environmental protection, Administrative practice and procedure, Air pollution control, Chemicals, Climate change, Emissions, Imports, Reporting and recordkeeping requirements.

Michael S. Regan,

Administrator.

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For the reasons stated in the preamble, EPA amends 40 CFR part 84 as follows:

PART 84-PHASEDOWN OF HYDROFLUOROCARBONS

1. The authority citation for part 84 continues to read as follows:

Authority: Pub. L. 116-260, Division S, Sec. 103.

2. Add subpart B consisting of §§ 84.50 through 84.64 to part 84 to read as follows:

Subpart B—Restrictions on the Use of Hydrofluorocarbons

Sec.
84.50 Purpose.
84.52 Definitions.
84.54 Restrictions on the use of hydrofluorocarbons.
84.56 Exemptions.
84.58 Labeling.
84.60 Reporting and recordkeeping.
84.62 Technology transitions petition requirements.
84.64 Global warming potentials.

§ 84.50 Purpose.

The purpose of the regulations in this subpart is to implement subsection (i) of 42 U.S.C. 7675, with respect to establishing restrictions on the use of a regulated substance in the sector or subsector in which the regulated substance is used, and to provide requirements associated with the submission of petitions seeking such restrictions.

§ 84.52 Definitions.

For the terms not defined in this subpart but that are defined in § 84.3, the definitions in § 84.3 shall apply. For the purposes of this subpart B:

Blend containing a regulated substance means any mixture that contains one or more regulated substances.

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Export means the transport of a product or specified component using a regulated substance from inside the United States or its territories to persons outside the United States or its territories, excluding United States military bases and ships for onboard use.

Exporter means the person who contracts to sell any product or specified component using a regulated substance for export or transfers a product or specified component using a regulated substance to an affiliate in another country.

Importer means any person who imports any product or specified component using or intended for use with a regulated substance into the United States. Importer includes the person primarily liable for the payment of any duties on the merchandise or an authorized agent acting on his or her behalf. The term also includes:

(1) The consignee;

(2) The importer of record;

(3) The actual owner; or

(4) The transferee, if the right to withdraw merchandise from a bonded warehouse has been transferred.

Install means to complete a field-assembled system's circuit, including charging with a full charge, such that the system can function and is ready for use for its intended purpose.

Manufacture means to complete the manufacturing and assembly processes of a product or specified component such that it is ready for initial sale, distribution, or operation.

Product means an item or category of items manufactured from raw or recycled materials which performs a function or task and is functional upon completion of manufacturing. The term includes, but is not limited to: appliances, foams, fully formulated polyols, self-contained fire suppression devices, aerosols, pressurized dispensers, and wipes.

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Retrofit means to upgrade existing equipment where the regulated substance is changed, which—

(i) Includes the conversion of equipment to achieve system compatibility; and

(ii) May include changes in lubricants, gaskets, filters, driers, valves, o-rings, or equipment components for that purpose. Examples of equipment subject to retrofit include air-conditioning and refrigeration appliances, fire suppression systems, and foam blowing equipment.

Sector means a broad category of applications including but not limited to: refrigeration, air conditioning and heat pumps; foams; aerosols; chemical manufacturing; cleaning solvents; fire suppression and explosion protection; and semiconductor manufacturing.

Specified component for purposes of equipment in the refrigeration, air conditioning, and heat pump sector means condensing units, condensers, compressors, evaporator units, and evaporators.

Subsector means processes, classes of applications, or specific uses that are related to one another within a single sector or subsector.

Substitute means any substance, blend, or alternative manufacturing process, whether existing or new, that may be used, or is intended for use, in a sector or subsector with a restriction on the use of regulated substances and that has a lower global warming potential than the GWP limit or restricted list of regulated substances and blends in that sector or subsector.

System means an assemblage of separate components that typically are connected and charged in the field with a regulated substance or substitute to perform a function or task.

Use means for any person to take any action with or to a regulated substance, regardless of whether the regulated substance is in bulk, contained within a product, or otherwise,

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except for the destruction of a regulated substance. Actions include, but are not limited to, the utilization, deployment, sale, distribution, offer for sale or distribution, discharge, incorporation, transformation, or other manipulation.

§ 84.54 Restrictions on the use of hydrofluorocarbons.

(a) No person may manufacture or import any product in the following sectors or subsectors that uses a regulated substance as listed in this paragraph:

(1) Effective January 1, 2025, self-contained residential and light commercial air conditioning and heat pump products using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 700 or greater;

(2) Effective January 1, 2025, residential dehumidifiers using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 700 or greater;

(3) Effective January 1, 2025, household refrigerators and freezers using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 150 or greater;

(4) Effective January 1, 2025, retail food refrigeration – stand-alone units using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 150 or greater;

(5) Effective January 1, 2025, vending machines using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 150 or greater;

(6) Effective January 1, 2025, refrigerated transport – intermodal containers with the temperature of the refrigerant entering the evaporator (for direct heat exchange systems) or the temperature of the fluid exiting (for chillers) of -50 °C (-58 °F) or higher using a

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regulated substance, or a blend containing a regulated substance, with a global warming potential of 700 or greater;

(7) Effective January 1, 2025, self-contained products in refrigerated transport – road and refrigerated transport – marine subsectors using any of the following: R-402A, R-402B, R-404A, R-407B, R-408A, R-410B, R-417A, R-421A, R-421B, R-422A, R-422B, R-422C, R-422D, R-424A, R-428A, R-434A, R-438A, R-507A, R-125/290/134a/600a (55/1/42.5/1.5), RS-44 (2003 formulation) or GHG-X5;

(8) Self-contained automatic commercial ice machines as follows:

(i) Effective January 1, 2026, ice maker products with a harvest rate as determined in accordance with 10 CFR 431.134, using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 150 or greater as follows:

(A) Batch type, as defined in 10 CFR 431.132, with a harvest rate less than or equal to 1,000 pounds of ice per 24 hours;

(B) Continuous type, as defined in 10 CFR 431.132, with a harvest rate less than or equal to 1,200 pounds of ice per 24 hours;

(ii) Effective January 1, 2027, batch type ice maker products, as defined in 10 CFR 431.132, with a harvest rate greater than 1,000 pounds of ice per 24 hours, as determined in accordance with 10 CFR 431.134, and continuous type ice machine products, as defined in 10 CFR 431.132, with a harvest rate greater than 1,200 pounds of ice per 24 hours, as determined in accordance with 10 CFR 431.134, using any of the following: R-402A, R-402B, R-404A, R-407A, R-407B, R-407C, R-407F, R-408A, R-410A, R-410B, R-411A, R-411B, R-417A, R-417C, R-420A, 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-442A, R-507A,

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HFC-134a, R-125/290/134a/600a (55/1/42.5/1.5), RB-276, RS-24 (2002 formulation), RS-44 (2003 formulation), GHG-X5, G2018C, or Freeze 12;

(9) Self-contained refrigerated food processing and dispensing products as follows:

(i) Effective January 1, 2027, products outside the scope of UL 621, "Ice Cream Makers," Edition 7, dated May 07, 2010, with revisions through September 16, 2020, as of [**INSERT DATE 60 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER**], with refrigerant charge sizes less than or equal to 500 g using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 150 or greater;

(ii) Effective January 1, 2027, products outside the scope of UL 621, "Ice Cream Makers," Edition 7, dated May 07, 2010, with revisions through September 16, 2020, as of [**INSERT DATE 60 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER**], with refrigerant charge sizes greater than 500 g, using any of the following: R-402A, R-402B, R-404A, R-407A, R-407B, R-407C, R-407F, R-407H, R-408A, R-410A, R-410B, R-411A, R-411B, R-417A, R-417C, R-420A, 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-507A, HFC-134a, HFC-227ea, R-125/290/134a/600a (55/1/42.5/1.5), RB-276, RS-24 (2002 formulation), RS-44 (2003 formulation), GHG-X5, or Freeze 12; and

(iii) Effective January 1, 2028, for refrigerated food processing and dispensing products within the scope of UL 621, "Ice Cream Makers," Edition 7, dated May 07, 2010, with revisions through September 16, 2020, as of [**INSERT DATE 60 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER**], using any of the following: R-402A, R-402B, R-404A, R-407A, R-407B, R-407C, R-407F, R-407H, R-408A, R-410A,

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R-410B, R-411A, R-411B, R-417A, R-417C, R-420A, 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-507A, HFC-134a, HFC-227ea, R-125/290/134a/600a (55/1/42.5/1.5), RB-276, RS-24 (2002 formulation), RS-44 (2003 formulation), GHG-X5, or Freeze 12.

(10) Chillers, when a stand-alone product, as follows:

(i) Effective January 1, 2025, chillers for comfort cooling using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 700 or greater;

(ii) Effective January 1, 2025, chillers for ice rinks using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 700 or greater;

(iii) Effective January 1, 2026, chillers for industrial process refrigeration where the temperature of the fluid exiting the chiller is greater than -22 °F (-30 °C) using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 700 or greater;

(iv) Effective January 1, 2028, chillers for industrial process refrigeration where the temperature of the fluid exiting the chiller is greater than or equal to -50 °C (-58 °F) and less than or equal to -30 °C (-22 °F) using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 700 or greater;

(11) Effective January 1, 2027, self-contained products in data center, information technology equipment facility, and computer room cooling using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 700 or greater;

(12) Industrial process refrigeration products, other than chillers, as follows:

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(i) Effective January 1, 2026, products with a refrigerant charge capacity of 200 pounds or greater and with the refrigerant temperature entering the evaporator higher than -30 °C (-22 °F) using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 150 or greater;

(ii) Effective January 1, 2026, products with a refrigerant charge capacity less than 200 pounds and with the refrigerant temperature entering the evaporator higher than -30 °C (-22 °F), using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 300 or greater;

(iii) Effective January 1, 2028, where the temperature of the refrigerant entering the evaporator is greater than or equal to -50 °C (-58 °F) and is less than or equal to -30 °C (-22 °F), using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 700 or greater;

(13) Motor vehicle air-conditioning as follows:

(i) Effective **[INSERT DATE ONE YEAR AFTER PUBLICATION IN THE FEDERAL REGISTER]**, for Model Year 2025 and subsequent model year light-duty passenger cars and trucks (vehicles with a gross vehicle weight rating less than 8,500 lb) using or intended to use a regulated substance, or a blend containing a regulated substance, with a global warming potential of 150 or greater;

(ii) For Model Year 2028 and subsequent model year medium-duty passenger vehicles, heavy-duty pick-up trucks, and complete heavy-duty vans, as defined by the Federal Highway Administration at 40 CFR 86.1803-01, which have air conditioning equipment that will not be modified by upfitters using or intended to use a regulated substance, or a blend containing a regulated substance, with a global warming potential of 150 or greater;

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(iii) Effective January 1, 2028, certain nonroad vehicles (agricultural tractors greater than 40 horsepower; self-propelled agricultural machinery; compact equipment; construction, forestry, and mining equipment; and commercial utility vehicles) using or intended to use a regulated substance, or a blend containing a regulated substance, with a global warming potential of 150 or greater;

(14) Effective January 1, 2025, foam products (but not including foam products in paragraph (15)) in the following subsectors using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 150 or greater:

(i) Rigid polyurethane appliance foam, commercial refrigeration foam, laminated boardstock, marine flotation foam, sandwich panels, and slabstock;

(ii) Flexible polyurethane;

(iii) Integral skin polyurethane;

(iv) Polystyrene – extruded boardstock, billet, and extruded sheet;

(v) Phenolic insulation board and bunstock;

(vi) Polyisocyanurate laminated boardstock;

(vii) Polyolefin; and

(viii) Rigid polyurethane spray foam (*i.e.*, high-pressure two-component, low-pressure two-component, and one-component foam sealants).

(15) Effective January 1, 2026, foam products in the formulations specified in paragraph 14(i)-(viii) that are for use in space and military applications, except spray and pour foams that are for use in space vehicles as defined in § 84.3, which are not subject to a use restriction.

(16) Aerosol products as follows:

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(i) Effective January 1, 2025, all aerosol products using a regulated substance with a global warming potential of 150 or greater, except products that use HFC-43-10mee (1,1,1,2,3,4,4,5,5,5-pentafluoropentane) or HFC-245fa (1,1,1,3,3-pentafluoropropane) as an aerosol solvent or those that use HFC-134a in the following specific uses;

(A) Cleaning products for removal of grease, flux and other soils from electrical equipment or electronics;

(B) Refrigerant flushes;

(C) Products for sensitivity testing of smoke detectors;

(D) Lubricants and freeze sprays for electrical equipment or electronics;

(E) Sprays for aircraft maintenance;

(F) Sprays containing corrosion preventive compounds used in the maintenance of aircraft, electrical equipment or electronics, or military equipment;

(G) Pesticides for use near electrical wires or in aircraft, in total release insecticide foggers, or in certified organic use pesticides for which EPA has specifically disallowed all other lower-GWP propellants;

(H) Mold release agents and mold cleaners;

(I) Lubricants and cleaners for spinnerets for synthetic fabrics;

(J) Duster sprays specifically for removal of dust from photographic negatives, semiconductor chips, specimens under electron microscopes, and energized electrical equipment;

(K) Adhesives and sealants in large canisters;

(L) Document preservation sprays;

(M) Wound care sprays;

(N) Topical coolant sprays for pain relief;

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(O) Products for removing bandage adhesives from skin.

(ii) Effective January 1, 2028, all aerosol products using a regulated substance with a global warming potential of 150 or greater.

(b) Effective three years after the dates listed for each subsector in paragraph (a), no person may sell, distribute, offer for sale or distribution, make available for sale or distribution, purchase or receive for sale or distribution, or attempt to purchase or receive for sale or distribution, or export any product that uses a regulated substance as listed in paragraph (a) of this section.

(c) No person may install any system, nor have any such system be installed through their position as a designer, owner, or operator of that system, in the following sectors or subsectors that uses a regulated substance as listed in this paragraph:

(1) Effective January 1, 2025, residential or light commercial air-conditioning or heat pump systems using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 700 or greater, except for variable refrigerant flow air-conditioning and heat pump systems;

(2) Effective January 1, 2026, variable refrigerant flow systems for use as residential and light commercial air-conditioning or heat pumps, using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 700 or greater;

(3) Effective January 1, 2025, chillers for comfort cooling using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 700 or greater;

(4) Effective January 1, 2025, chillers for ice rinks using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 700 or greater;

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(5) Effective January 1, 2026, chillers for industrial process refrigeration where the temperature of the fluid exiting the chiller is greater than -22 °F (-30 °C) using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 700 or greater;

(6) Effective January 1, 2028, chillers for industrial process refrigeration where the temperature of the fluid exiting the chiller is greater than or equal to -50 °C (-58 °F) and less than or equal to -30 °C (-22 °F) using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 700 or greater;

(7) Effective January 1, 2025, refrigerated transport – intermodal containers with the temperature of the refrigerant entering the evaporator (for direct heat exchange systems) or the temperature of the fluid exiting (for chillers) of -50 °C (-58 °F) or higher using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 700 or greater;

(8) Effective January 1, 2025, refrigerated transport – road or refrigerated transport – marine systems using any of the following: R-402A, R-402B, R-404A, R-407B, R-408A, R-410B, R-417A, R-421A, R-421B, R-422A, R-422B, R-422C, R-422D, R-424A, R-428A, R-434A, R-438A, R-507A, R-125/290/134a/600a (55/1/42.5/1.5), RS-44 (2003 formulation) or GHG-X5;

(9) Effective January 1, 2026, cold storage warehouse systems as follows:

(i) Systems with a refrigerant charge capacity of 200 pounds or greater, that are not the high temperature side of a cascade system, using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 150 or greater;

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(ii) Systems with a refrigerant charge capacity less than 200 pounds, using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 300 or greater;

(iii) Cascade refrigerant systems using a regulated substance, or a blend containing a regulated substance, on the high temperature side of the system with a global warming potential of 300 or greater;

(10) Industrial process refrigeration systems, other than chiller systems, as follows:

(i) Effective January 1, 2026, systems with a refrigerant charge capacity of 200 pounds or greater and with the refrigerant temperature entering the evaporator higher than -30 °C (-22 °F), that are not the high temperature side of a cascade system, using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 150 or greater;

(ii) Effective January 1, 2026, systems with a refrigerant charge capacity less than 200 pounds and with the refrigerant temperature entering the evaporator higher than -30 °C (-22 °F), using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 300 or greater;

(iii) Effective January 1, 2026, the high temperature side of cascade systems with the refrigerant temperature entering the evaporator higher than -30 °C (-22 °F) using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 300 or greater;

(iv) Effective January 1, 2028, where the temperature of the refrigerant entering the evaporator is greater than or equal to -50 °C (-58 °F) and is less than or equal to -30 °C (-22 °F), using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 700 or greater;

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(11) Effective January 1, 2026, remote condensing units in retail food refrigeration systems as follows:

(i) Systems with a refrigerant charge capacity of 200 pounds or greater, that are not the high temperature side of a cascade system, using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 150 or greater;

(ii) Systems with a refrigerant charge capacity less than 200 pounds using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 300 or greater;

(iii) Cascade refrigerant systems using a regulated substance, or a blend containing a regulated substance, on the high temperature side of the system with a global warming potential of 300 or greater;

(12) Effective January 1, 2027, supermarket systems as follows:

(i) Systems with a refrigerant charge capacity of 200 pounds or greater, that are not the high temperature side of a cascade system, using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 150 or greater;

(ii) Systems with a refrigerant charge capacity less than 200 pounds using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 300 or greater;

(iii) Cascade refrigerant systems using a regulated substance, or a blend containing a regulated substance, on the high temperature side of the system with a global warming potential of 300 or greater;

(13) Effective January 1, 2027, data center, information technology equipment facility, and computer room cooling systems using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 700 or greater;

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(14) Effective January 1, 2027, automatic commercial ice machines with a remote condenser using any of the following: R-402A, R-402B, R-404A, R-407B, R-408A, R-410B, R-417A, R-421A, R-421B, R-422A, R-422B, R-422C, R-422D, R-424A, R-428A, R-434A, R-438A, R-507A, R-125/290/134a/600a (55/1/42.5/1.5), RS-44 (2003 formulation), or GHG-X5.

(15) Effective January 1, 2027, refrigerated food processing and dispensing equipment with a remote condenser using any of the following: R-402A, R-402B, R-404A, R-407A, R-407B, R-407C, R-407F, R-407H, R-408A, R-410A, R-410B, R-411A, R-411B, R-417A, R-417C, R-420A, 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-507A, HFC-134a, HFC-227ea, R-125/290/134a/600a (55/1/42.5/1.5), RB-276, RS-24 (2002 formulation), RS-44 (2003 formulation), GHG-X5, or Freeze 12.

(d) The compliance date for the installation of a system in paragraph (c) of this section for the industrial process refrigeration systems with a January 1, 2026, compliance date, retail food – supermarket, cold storage warehouse, and ice rink subsectors is extended one year beyond the specified compliance date when an approved building permit issued prior to October 5, 2023, specifies the use of a restricted regulated substance, or blend containing a regulated substance, in a system detailed in that permit.

(e) The following actions, upon charging the system to full charge, are considered an installation of a refrigeration, air conditioning, and heat pump system under paragraph (c) of this section:

(1) Assembling a system for the first time from used or new components;

(2) Increasing the cooling capacity, in BTU per hour, of an existing system; or

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(3) Replacing 75 percent or more of evaporators (by number) and 100 percent of the compressor racks, condensers, and connected evaporator loads of an existing system.

(f) Effective upon the dates listed for each subsector in § 84.54(a) and (c), no person may manufacture, import, sell, distribute, offer for sale or distribution, make available for sale or distribution, purchase or receive for sale or distribution, or attempt to purchase or receive for sale or distribution, or export any product or specified component that is not labeled in accordance with § 84.60.

(g) Every product or system using or intended to use a regulated substance or blend containing a regulated substance that is manufactured, imported, sold, distributed, offered for sale or distribution, made available for sale or distribution, purchased or received for sale or distribution, or attempted to be purchased or received for sale or distribution, or exported in contravention of paragraphs (a) through (f) constitutes a separate violation of this subpart.

(h) No person may provide false, inaccurate, or misleading information to EPA when reporting or providing any communication required under this subpart.

(i) No person may falsely indicate through marketing, packaging, labeling, or other means that a product or specified component uses or is intended to use a regulated substance, blend containing a regulated substance, or substitute that differs from the regulated substance, blend containing a regulated substance, or substitute that is actually used.

(j) Section (k) of the AIM Act states that sections 113, 114, 304, and 307 of the Clean Air Act (42 U.S.C. 7413, 7414, 7604, 7607) shall apply to this section and any rule, rulemaking, or regulation promulgated by the Administrator pursuant to this section as though this section were expressly included in title VI of that Act (42 U.S.C. 7671 *et*

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seq.). Violation of this part is subject to Federal enforcement and the penalties laid out in section 113 of the Clean Air Act.

§ 84.56 Exemptions.

(a) The regulations under this subpart, including 84.54, 84.58, 84.60, and 84.62, do not apply to:

(1) Equipment in existence in the United States prior to December 27, 2020; and

(2) Any product using a regulated substance or a blend containing a regulated substance, or intended to use a regulated substance or a blend containing a regulated substance, in an application listed at § 84.13(a), for a year or years for which that application receives an application-specific allowance as defined at § 84.3.

(b) The prohibitions on the manufacture, import, sale, distribution, offer for sale or distribution, or export of products in § 84.54(a) and (b) do not apply to components that use, or are intended to use, any regulated substance.

(c) The prohibitions on the sale, distribution, offer for sale or distribution, or export of products in § 84.54(b) do not apply to:

(1) products after a period of ordinary utilization or operation by a consumer; or

(2) products within the disposal or recycling chain.

(d) The prohibition on the import of used products in § 84.54(a) does not apply to:

(1) systems in use by a conveyance in trade travelling into U.S. jurisdiction including refrigeration, air-conditioning, and heat pump systems in operation aboard ships, planes, motor vehicles, and intermodal containers;

(2) products in the possession of a consumer for personal use; or

(3) products imported solely for recycling or disposal.

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§ 84.58 Labeling.

(a) Effective upon the dates listed for each subsector in § 84.54(a) and (c), any product, specified component, or system manufactured, imported, or installed within the refrigeration, air-conditioning, and heat pump sector using any regulated substance, or blend containing any regulated substance, regardless of global warming potential must have a permanent label compliant with paragraph (d) of this section stating:

(1) The chemical name(s) or American Society of Heating, Refrigerating and Air-Conditioning Engineers designation of the regulated substance(s) or blend containing a regulated substance;

(2) The full date, or at minimum the four-digit year, of manufacture. For field-charged system installations, this shall be the date of first charge and the label shall be completed at first charge. For MVACs listed in § 84.54(a)(13)(i) and (ii),, the model year may be used instead of the date of manufacture.

(3) An indication of the full refrigerant charge capacity, either as the specific charge size of the system, or the charge size as it relates to the threshold for the relevant subsector. This means an indication that the charge is either two hundred pounds or more, or less than two hundred pounds, in the following subsectors:

(i) Industrial process refrigeration (without chillers);

(ii) Retail food refrigeration – supermarket systems;

(iii) Retail food refrigeration – remote condensing units; and

(iv) Cold storage warehouses.

(4) An indication of the charge size of the equipment or the charge size as it relates to the threshold for self-contained refrigerated food processing and dispensing products. This

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means an indication that the charge is greater than or equal to 500 grams, or less than 500 grams.

(5) An indication of the harvest rate, either as the specific harvest rate of the equipment, or the harvest rate as it relates to the threshold for self-contained automatic commercial ice machines, and the type of ice machine (either batch or continuous). This means an indication that that harvest rate is either greater than 1,000 pounds of ice per day or less than or equal to 1,000 pounds of ice per day for batch type ice makers, and an indication that the harvest rate is either greater than 1,200 pounds of ice per day or less than or equal to 1,200 pounds of ice per day for continuous type ice makers.

(6) An indication of the designed exiting fluid temperature range for industrial process refrigeration chillers and the designed refrigerant temperature range when it enters the evaporator for industrial process refrigeration systems without chillers.

(b) Effective upon the date listed for each subsector in § 84.54(c), or the earliest date should the specified component be used in multiple subsectors, any specified component manufactured or imported and intended for use in those subsectors that uses or is intended to use any regulated substance, or blend containing any regulated substance, regardless of global warming potential, must have a permanent label compliant with paragraph (c) containing the information in paragraph (a)(1). For specified components that are intended for use with a regulated substance or blends containing a regulated substance that exceed the applicable GWP limit or HFC restriction, the label must state "For servicing existing equipment only" in addition to the other required labeling elements.

(c) Effective upon the dates listed for each subsector in § 84.54(a) and (c), any product manufactured, imported, or installed within the foam or aerosol sectors using any

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regulated substance, or blend containing any regulated substance, regardless of global warming potential, must have a permanent label compliant with paragraph (d) of this section stating:

(1) The chemical name(s) or American Society of Heating, Refrigerating and Air-Conditioning Engineers designation of any regulated substance(s) or blend containing a regulated substance used;

(2) If an HFC with a GWP higher than the limit is used or if multiple HFCs are used, either the weights of the HFC(s) relative to the other blowing agents, propellants, solvents, or to the other HFCs must be on the label, or the label must state "GWP<150."

(3) The full date, or at minimum the four-digit year, of manufacture.

(d) The permanent label must be:

(1) In English;

(2) Durable and printed or otherwise labeled on, or affixed to, an external surface of the product;

(3) Readily visible and legible;

(4) Able to withstand open weather exposure without a substantial reduction in visibility or legibility, if applicable; and

(5) Displayed on a background of contrasting color.

(e) The requirements of this section may be met through the use of existing labels required under other authorities that contain the necessary information. The labeling requirements may also be met by providing the required information in packaging materials or through an on-product QR code. The packaging must be present with the product or specified component at the point of sale and import. The QR code must direct

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to the required information and meet all the requirements of the on-product label. The QR code must be functional and include adjacent text to indicate the purpose of the QR code.

(f) For products sold or distributed, offered for sale or distribution, or made available electronically through online commerce, the label must be readily visible and legible in either photographs of the products, photographs of packaging materials that contain the required information, or an item description that contains the required information.

(g) Any product or system, using a regulated substance manufactured, imported, or installed after the compliance date for that sector or subsector, that lacks a label will be presumed to use a regulated substance with a global warming potential that exceeds the limit or is specifically listed in § 84.54(a) or (c).

§ 84.60 Reporting and recordkeeping.

(a) *Reporting*. (1) Effective January 1, 2025, any person who imports or manufactures a product or specified component within a sector or subsector listed in § 84.54 that uses or is intended to use a regulated substance or blend containing a regulated substance must comply with the following reporting and recordkeeping requirements:

(i) Reports must be submitted annually to EPA within 90 days of the end of the reporting period;

(ii) Reports must be submitted electronically in a format specified by EPA;

(iii) Each report shall be signed and attested;

(2) Each report must include:

(i) The reporting entity’s name, address, contact person, email address, and phone number of the contact person;

(ii) The year covered under the report and the date of submittal;

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(iii) All applicable NAICS code(s); and

(iv) A statement of certification that the data are accurate and that the products use regulated substances, or blends containing regulated substances, that meet the requirements of § 84.54, and are labeled in accordance with § 84.58.

(3) Reports for products and specified components in the refrigeration, air-conditioning, and heat pump sector must also include the following information:

(i) For each set of products or specified components with the same combination of charge size and regulated substance(s), the report must specify the subsector of the product or specified component based on the categorization in § 84.54; the identity of the regulated substance or blend containing a regulated substance, the charge size (including holding charge or no charge, if applicable), and the number of units imported, manufactured, and exported;

(ii) For products and specified components that include closed-cell foam containing a regulated substance, the report must include the identity of the regulated substance(s) in the foam, the mass of the regulated substance(s) in the foam, and the number of products manufactured, imported, or exported with the same combination of mass and identity of regulated substance(s) within the closed-cell foam.

(iii) Total mass in metric tons of each regulated substance or blend containing a regulated substance contained in all products or specified components manufactured, imported, and exported annually.

(4) Reports for products in the foam sector must also include the following information:

(i) For containers or foam blowing products that contain foam blowing agent and are intended for use to blow foam, the report must specify the subsector of the product based on the categorization in § 84.54, the identity of the regulated substance(s) contained in

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the product, the mass of the regulated substance(s) used, and the number of units manufactured, imported, or exported.

(ii) For each set of products, other than containers described in paragraph (i), with the same combination of density and identity of regulated substance(s), the report must specify the subsector of the product based on the categorization in § 84.54, the identity of the regulated substance(s) contained in the foam, the volume of foam, and the number of units manufactured, imported, or exported; and

(iii) Total mass in metric tons of each regulated substance contained in all products manufactured, imported, and exported annually.

(5) Reports for products in the aerosol sector must also include the following information:

(i) For each set of products with the same combination of regulated substance(s) and quantity of regulated substance(s), the report must specify the subsector of the product based on the categorization in § 84.54, the identity of the regulated substance(s), their percentages if more than one regulated substance is used, and the number of units manufactured, imported, or exported; and

(ii) Total mass in metric tons of each regulated substance contained in all products manufactured, imported, and exported annually.

(6) Any failure by a domestic manufacturer or importer of a product or specified component that uses or is intended to use a regulated substance or a blend containing a regulated substance to report required information or provide accurate information pursuant to this section shall be considered a violation of this section.

(b) *Recordkeeping*. (1) Each domestic manufacturer or importer of a product or specified component within a sector or subsector listed in § 84.54 that uses or is intended to use a

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regulated substance or blend containing a regulated substance must retain the following records for a minimum of three years from the date of creation of the record and must make them available to EPA upon request:

(i) Records that form the basis of the reports required in paragraph (a) of this section; and

(ii) The entity to whom the product or specified component using a regulated substance were sold, distributed, or in any way conveyed to.

(2) In addition to the records in paragraph (b)(1) of this section, importers of products and specified components using or intended to use a regulated substance or a blend containing a regulated substance must retain the following records for each import for a minimum of three years from the date of creation of the record and must make them available to EPA upon request:

(i) A copy of the bill of lading;

(ii) The invoice;

(iii) The U.S. Customs and Border Protection entry documentation;

(iv) Port of entry;

(v) Country of origin and the country of shipment to the United States.

§ 84.62 Technology transitions petition requirements.

(a) Each petition sent to the Administrator under subsection (i) of the AIM Act shall include the following elements:

(1) The sector and subsector(s) for which restrictions on use of the regulated substance would apply.

(2) For each sector and subsector identified in a petition, the restriction on the use of a regulated substance through any of the following:

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(i) A global warming potential limit that will apply to regulated substances or blends containing regulated substances with global warming potentials at or above that limit;

(ii) Identification of the regulated substance(s) or blend(s) containing a regulated substance to be restricted and its global warming potential according to § 84.64; or

(iii) Another form of restriction with an explanation for why a restriction under (i) or (ii) would not be appropriate.

(3) For each restriction on the use of a regulated substance contained in a petition, the effective date on which the regulated substance use restriction would commence and information supporting the identified effective date.

(4) Address whether the Administrator negotiate with stakeholders in accordance with the negotiated rulemaking procedure provided for under subchapter III of chapter 5 of title 5, United States Code, including an explanation of their position to support or oppose the use of the negotiated rulemaking procedure.

(5) For each requested restriction, to the extent practicable, information related to the considerations provided in subsection (i)(4) of 42 U.S.C. 7675 to facilitate the Agency's review of the petition.

(b) Any petition submitted to the Administrator must be submitted electronically using the methods prescribed by the Administrator.

§ 84.64 Global warming potentials.

(a) The global warming potential of a regulated substance is the exchange value for the regulated substance listed in subsection (c) of the AIM Act and in appendix A to this part 84.

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(b) For blends containing a regulated substance, the global warming potential of the blend is the sum of the global warming potentials of each constituent of the blend multiplied by the nominal mass fraction of that constituent within the blend. The global warming potential of each constituent shall be as follows:

Substance Name	100-Year Global Warming Potential
2-chloropropane	1
Acetone	0.5
Acetone/isopentane blend	1
Dimethyl ether	1
Formic acid	5
HCFO-1224yd(Z)	1
HCFO-1233yd(Z)	1
HCFO-1233zd(E)	4
HCO-1130(E)	5
HFE-347pcf2	987
HFE-449s1 (HFE-7100)	297
HFE-569sf2	59
HFO-1234yf	1
HFO-1234ze(E)	1
HFO-1336mzz(E)	26
HFO-1336mzz(Z)	2
Hydrocarbons (C5-C20)	1-2.7
Methoxytridecafluoroheptane (MPHE) isomers	2.5
Methyl formate	13
Methylal (dimethoxymethane)	1
Oxygenated organic solvents (esters, ethers, alcohols, ketones)	1-13
R-170 (ethane)	5.5
R-290 (propane)	3.3
R-600 (butane)	4
R-600a (isobutane)	1
R-717 (ammonia)	1
R-744 (carbon dioxide)	1
R-1150 (ethylene)	3.7
R-1270 (propylene)	1.8
Saturated light hydrocarbons (C3-C6)	1-4

(c) For constituents of a blend containing a regulated substance that do not have a global warming potential as provided in paragraph (b) of this section, the constituent and its

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nominal mass fraction in the blend shall be excluded from the calculation in paragraph

(b) of this section.