6560-50-P

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 84

[EPA-HQ-OAR-2025-0005; FRL-12166-02-OAR]

RIN 2060-AW39

Phasedown of Hydrofluorocarbons: Reconsideration of Certain Regulatory Requirements Promulgated Under the Technology Transitions Provisions of the American Innovation and Manufacturing Act of 2020

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: The U.S. Environmental Protection Agency (EPA) is finalizing changes to regulations promulgated under the Technology Transitions provision of the American Innovation and Manufacturing Act of 2020 (AIM Act), which authorizes the Administrator to restrict fully, partially, or on a graduated schedule, the use of a "regulated substance" in the sector or subsector in which they are used. This final rule addresses administrative petitions and input received from regulated industry and other interested parties relevant to requirements and restrictions across various refrigeration and air conditioning subsectors, including: refrigerated transport – intermodal containers; industrial process refrigeration and chillers for industrial process refrigeration used in semiconductor manufacturing; retail food supermarket systems; retail food remote condensing unit systems; cold storage warehouses; refrigerated laboratory centrifuges and laboratory shakers; and condensing units in residential and light commercial air conditioning and heat pumps. This final rule also allows the inventory of residential and light commercial air conditioning and heat pump equipment that was manufactured in the United States or imported into the United States before January 1, 2025, to continue to be installed.

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

ADDRESSES: The EPA has established a docket for this action under Docket ID No. **EPA-HQ-OAR-2025-0005**. All documents in the docket are listed on the *https://www.regulations.gov* website. Although listed, some information is not publicly available, *e.g.,* Confidential Business Information or other information whose disclosure is restricted by statute. The EPA does not place certain other material, such as copyrighted material, on the internet; this material is publicly available only as Portable Document Format versions and accessible only on the EPA computers in the docket office reading room. The public cannot download certain databases and physical items from the docket but may request these items by contacting the docket office by telephone at (202) 566-1744. The docket office has 10 business days to respond to such requests. Except for these items, publicly available docket materials are available electronically at *https://www.regulations.gov* or on the EPA computers in the docket office reading room at the EPA Docket Center, WJC West Building, Room Number 3334, 1301 Constitution Ave. NW, Washington, DC. The Public Reading Room hours of operation are 8:30 a.m. to 4:30 p.m. Eastern Time, Monday through Friday. The telephone number for the Public Reading Room is (202) 566-1744.

FOR FURTHER INFORMATION CONTACT: For further information about this final rule, contact Joshua Silver, Chemicals, Coatings, and Products Division, Office of Clean Air Programs (Mail Code 6205A), Environmental Protection Agency, 1200 Pennsylvania Ave. NW, Washington, DC 20460; telephone number: (202) 564-2473; email address: *silver.joshua@epa.gov*. You may also visit the EPA's website at *https://www.epa.gov/climate-hfcs-reduction* for further information.

SUPPLEMENTARY INFORMATION:

Preamble acronyms and abbreviations. Throughout this document, whenever "we," "us," "the Agency," or "our" is intended to refer to the EPA. We use multiple acronyms and terms in this preamble. While this list may not be exhaustive, to ease the reading of this preamble and for reference purposes, the EPA defines the following terms and acronyms here:

AC	Air Conditioning
AC/HP	Air Conditioning and Heat Pumps
AHJ	Authority Having Jurisdiction
AHRI	Air-Conditioning, Heating, and Refrigeration Institute
AIM Act	American Innovation and Manufacturing Act of 2020
ANSI	American National Standards Institute
APA	Administrative Procedure Act
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
BTU	British Thermal Units
CAA	Clean Air Act
CFR	Code of Federal Regulations
CO_2	Carbon Dioxide
CRA	Congressional Review Act
CUSER	Coalition for the Use of Safe and Efficient Refrigerants, Inc.
EAV	Equivalent Annualized Value
EPA	U.S. Environmental Protection Agency
FMI	Food Industry Association
FR	Federal Register
GHG	Greenhouse Gas
GWP	Global Warming Potential
HARDI	Heating, Air-Conditioning, and Refrigeration Distributors International
HCFC	Hydrochlorofluorocarbon
HFC	Hydrofluorocarbon
HFO	Hydrofluoroolefin
HVAC	Heating, Ventilation, and Air Conditioning
IBC	International Building Code
ICC	International Code Council
IEBC	International Existing Building Code
IFC	International Fire Code
IFR	Interim Final Rule
IMC	International Mechanical Code
IPR	Industrial Process Refrigeration
ISO	International Organization for Standardization
MCA	Maximum Credible Accident
MMTEVe	Million Metric Tons of Exchange Value Equivalent
NAICS	North American Industry Classification System
NFPA	National Fire Protection Association
NTTAA	National Technology Transfer and Advancement Act
ODS	Ozone-Depleting Substance
OEM	Original Equipment Manufacturer
OMB	Office of Management and Budget
PFAS	Per- and Polyfluoroalkyl Substances
PRA	Paperwork Reduction Act
PV	Present Value
RFA	Regulatory Flexibility Act

RTC	Response to Comments
SC-GHG	Social Cost of Greenhouse Gases
SEMI	Semiconductor Equipment and Materials International
SMRE	Semiconductor Manufacturing and Related Equipment
SNAP	Significant New Alternatives Policy
UL	Underwriters Laboratories (formerly)
UMC	Uniform Mechanical Code
UMRA	Unfunded Mandates Reform Act
U.S.C.	United States Code
VRF	Variable Refrigerant Flow

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I. General Information

A. Executive Summary

The AIM Act was included as part of the Consolidated Appropriations Act, 2021 that included funding for the Federal Government and the Coronavirus Response and Relief Supplemental Appropriations, 2021.[1] The AIM Act authorizes the EPA to regulate hydrofluorocarbons (HFCs) in three main areas: phasing down the production and consumption of listed HFCs; management of 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. The AIM Act is inherently inflationary because it phases down the production and consumption of HFCs, which increases the consumer prices of goods and services that rely upon or use HFCs for refrigeration or other purposes. This final rule addresses where the AIM Act was forcing more expensive technology onto consumers (through the Technology Transitions provisions). This reconsideration ensures that the EPA meets our statutory obligations under the AIM Act while ensuring that the Agency keeps the cost of living as low as legally possible for all Americans.

[1] Pub. L. 116-260, div. S, § 103, 134 Stat. 1182, 2255 (2020).

1. Purpose of the Deregulatory Action

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[2] in the sector or subsector in which the regulated substance is used."[3] The EPA may exercise this discretionary authority either on its own initiative or in response to petitions for a restriction on the use of one or more regulated substance(s). In deciding whether and how to exercise this authority, the EPA must consider the best available data, the availability of substitutes (including technological achievability, commercial demand, affordability for consumers, safety, and other relevant factors), overall economic costs and environmental impacts as compared to historical trends, and the remaining phasedown period for the regulated substance(s), if applicable.[4]

On October 24, 2023, the EPA published a final rule under subsection (i) of the AIM Act entitled "Phasedown of Hydrofluorocarbons: Restrictions on the Use of Certain Hydrofluorocarbons Under the American Innovation and Manufacturing Act of 2020" (2023 Final Rule).[5] This final rule restricted the use of HFCs in specific sectors or subsectors, established a process for submitting technology transitions petitions, established recordkeeping and reporting requirements, and addressed certain other elements related to the effective implementation of the AIM Act. The 2023 Final Rule became effective on December 26, 2023. The 2023 Final Rule applied to over 40 subsectors across the aerosols, foams, and refrigeration, air conditioning, and heat pumps sectors.

After publication of the 2023 Final Rule, manufacturers, importers, and distributors of residential and light commercial air conditioning and heat pump equipment informed the EPA that the compliance date for the restriction on installation will result in substantial stranded inventory in that subsector for residential new construction, including both single-family and

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[2] "Regulated substance" and "HFC" are used interchangeably in this rule. The AIM Act defines "regulated substance" by reference to a list of HFCs and the EPA has not attempted to add any additional saturated hydrofluorocarbons to the statutory list pursuant to subsection (c)(3). *See* 42 U.S.C. 7675(c)(1), (c)(2)(A).
[3] *See* 42 U.S.C. 7675(i)(1).
[4] *See* 42 U.S.C. 7675(i)(4)-(5).
[5] *See* 88 FR 73098 (October 24, 2023).

multi-family dwellings, where builders order heating and cooling equipment well in advance of knowing the exact date of installation. In response, the EPA issued an interim final rule (IFR)[6] to address the unique circumstances of that particular subsector to prevent such equipment from being stranded.

The EPA also received four administrative petitions for reconsideration and several requests to adjust certain provisions of the 2023 Final Rule after its publication.

On January 31, 2025, the President issued Executive Order 14192 (Unleashing Prosperity through Deregulation).[7] On March 12, 2025, against this backdrop, the EPA announced plans for deregulatory actions to, among other things, lower the cost of living for American families.[8] On that same day, and as part of the larger Agency plan, the EPA announced plans to reconsider the regulations promulgated via the 2023 Final Rule "that forces companies to use certain technologies that increased costs on food at grocery stores and semiconductor manufacturing."[9]

On October 3, 2025, the EPA published a notice of proposed rulemaking entitled "Phasedown of Hydrofluorocarbons: Reconsideration of Certain Regulatory Requirements Promulgated Under the Technology Transitions Provisions of the American Innovation and Manufacturing Act of 2020" (October 2025 Proposal)[10] that proposed revisions for restrictions applicable to: certain intermodal refrigerated transport containers, certain industrial process refrigeration and chillers for industrial process refrigeration equipment used in semiconductor manufacturing, retail food – supermarket systems, retail food – remote condensing units, cold storage warehouses, residential and light commercial air conditioning and heat pump systems, and certain laboratory equipment, among other provisions.

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[6] *See* 88 FR 88825 (December. 26, 2023).
[7] *See* 90 FR 9065 (February 6, 2025).
[8] *See* EPA Launches Biggest Deregulatory Action in U.S. History, March 12, 2025, in the docket for this action.
[9] *See* Trump EPA Announces OOOO b/c Reconsideration of Biden-Harris Rules Strangling American Energy Producers, March 12, 2025, in the docket for this action.
[10] *See* 90 FR 47999 (October 3, 2025).

2. Summary of the Major Provisions of this Regulatory Action

This final rule addresses significant issues raised in administrative petitions and input received from regulated industry and other interested parties with respect to regulatory provisions promulgated in the Code of Federal Regulations (CFR) pursuant to the AIM Act subsection (i). In particular, the EPA received four administrative petitions[11] to reconsider certain provisions of 40 CFR part 84, subpart B, entitled "Restrictions on the Use of Hydrofluorocarbons," that were finalized in the 2023 Final Rule. We also received other requests to reassess compliance dates and/or other provisions finalized in the 2023 Final Rule. Specifically, this final rule:

1. Amends the intermodal refrigerated transport provisions at 40 CFR 84.54(a)(6) and 84.54(c)(7) to: (a) adjust the lower bound temperature exclusion threshold of -50 °C to -35 °C, and (b) change the location where that temperature is measured.

2. Amends the compliance date for certain chillers used for industrial process refrigeration (IPR) and certain IPR equipment used to manufacture semiconductors from January 1, 2026, and January 1, 2028, as applicable, to January 1, 2030.

3. Amends the global warming potential (GWP) limit (hereafter "limit") for retail food remote condensing units at 40 CFR 84.54(c)(11) from 150 or 300, as applicable, to 1,400 until January 1, 2032, and either 150 or 300, depending on charge size or whether it is part of the high temperature side of a cascade system, starting January 1, 2032.

4. Amends the limit for supermarket systems at 40 CFR 84.54(c)(12) from 150 or 300, as applicable, to 1,400 until January 1, 2032, and either 150 or 300, depending on charge size or whether it is part of the high temperature side of a cascade system, starting January 1, 2032.

5. Amends 40 CFR 84.54(e)(2) to allow supermarket systems to increase system cooling capacity up to 15 percent from zero percent compared to original installed capacity without this being considered the installation of a new system.

[11] *See* administrative petitions for reconsideration in the docket for this action.

6. Amends the limit for cold storage warehouses at 40 CFR 84.54(c)(9) from 150 or 300, as applicable, to 700 until January 1, 2032, and either 150 or 300, depending on charge size or whether it is part of the high temperature side of a cascade system, starting January 1, 2032.

7. Amends the compliance date for refrigerated laboratory centrifuges and laboratory shakers from January 1, 2026, to January 1, 2028.

8. Removes the installation deadline for systems in the residential and light commercial air conditioning and heat pumps (AC/HP) subsector, where all specified components of such systems were domestically manufactured or imported before January 1, 2025.

9. Corrects a typographical error at 40 CFR 84.58(b).

3. Impacts from this Rule

Table 1 of this preamble below provides a summary of both monetized and non-monetized impacts. Monetized impacts include estimated engineering cost savings for equipment owners in affected subsectors. These cost savings arise from cases where additional flexibility provided by the rule allows for the use of refrigerant-containing equipment with lower capital and/or operating costs than equipment that would otherwise likely be chosen without additional flexibility. As part of fulfilling analytical guidance with respect to Executive Order 12866, the EPA presents estimates of the present value (PV) of the benefits and costs over the full time series included in this analysis (2026-2050). To calculate the PV of the cost savings of the rule, annual savings are discounted to 2025 at three percent and seven percent discount rates as directed by Office of Management and Budget (OMB) Circular A-4. The EPA also presents the equivalent annualized value (EAV), which represents a flow of constant annual values that, had they occurred in each year in the time series, would yield a sum equivalent to the PV, discounted at three percent and seven percent.

Table 1 – Summary of Monetized and Non-Monetized Economic Impacts, 2026-2050 (millions of 2024 dollars)

Monetized Impacts

Engineering Cost Savings in Affected Subsectors	*3 Percent Discount Rate*		*7 Percent Discount Rate*	
	PV	EAV	PV	EAV
	$976	$56	$653	$56
Non-Monetized Impacts				
Benefits and Cost Savings: • Avoided loss of ability to produce semiconductor wafers within the United States • National security benefits Costs and Forgone Benefits: • Indirect costs via HFC market impacts • Costs to equipment manufacturers and suppliers related to incremental investments required • Forgone benefits from potential increased emissions of HFCs				

The EPA anticipates that this action will result in indirect market and/or distributional consumer effects not explicitly included in the monetized impacts. For example, as supermarkets operate with extremely thin margins (1 – 2%), supermarkets are not able to internalize additional regulatory costs much and externalize those costs on customers, thereby driving up costs of food and other goods. Therefore, we expect that almost all, if not all, of the cost savings for supermarkets will be passed onto customers, thus reducing the burden of AIM Act implementation under subsection (i) on consumers in the form of increased prices for food and other goods.

There are economic effects with potentially significant consequences related to other provisions as well, including for semiconductor manufacturing. For example, under the baseline requirements, semiconductor facilities using IPR or Chillers for IPR equipment with charge sizes of 100 pounds or less faced technically infeasible requirements. Such facilities would have been forced to delay operations or invest in costly pre-commercial technologies. To the

extent productivity may have been impacted, the costs could have been significantly larger than the costs of refrigeration equipment.[12]

In addition, this action may result in increased demand for HFCs. This in turn may result in tighter supply[13] and higher HFC prices for downstream consumers, including users of HFCs in subsectors outside the scope of this final rule. In combination with other AIM Act rules, the adjustments in this action can continue to support an efficient transition from HFCs to lower-GWP alternatives, consistent with the statutory requirements under the AIM Act.

For more detailed information, see the memorandum entitled *Analysis of Economic and Environmental Impacts – Phasedown of Hydrofluorocarbons: Reconsideration of Certain Regulatory Requirements Promulgated Under the Technology Transitions Provisions of the American Innovation and Manufacturing Act of 2020* ("Economic and Environmental Impacts Memo"). The information provided in the Economic and Environmental Impacts Memo and in this section of the preamble is descriptive and for informational purposes only; it is not part of the rationale for reaching the decisions in this final rule. The EPA is not relying on this section or the Economic and Environmental Impacts Memo as a record basis for the final action.

B. Does this action apply to me?

You may be potentially affected by this rule if you manufacture, import, export, sell, distribute, install, or use refrigerated transport intermodal containers, chillers and industrial process refrigeration equipment used in the manufacture of semiconductors, retail food refrigeration equipment for remote condensing units and supermarkets, refrigeration systems in cold storage warehouses, refrigerated centrifuges, refrigerated laboratory shakers, or residential and light commercial air-conditioning and heat pump systems. Potentially affected categories, by North American Industry Classification System (NAICS) code, are:

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[12] Comment from Semiconductor Equipment and Materials International (SEMI): "The economic costs of downtime in semiconductor production are extraordinary. A modern fabrication plant can lose millions of dollars per day in halted output." *See* Docket ID No. EPA-HQ-OAR-2025-0005-0051.

[13] Overall supply of HFCs is constrained by the statutory HFC phasedown caps contained in subsection (e) of the AIM Act.

- 236116; New Multifamily Housing Construction (except For-Sale Builders)
- 236117; New Housing For-Sale Builders
- 236118; Residential Remodelers
- 236210; Industrial Building Construction
- 236220; Commercial and Institutional Building Construction
- 238220; Plumbing, Heating, and Air Conditioning Contractors
- 325120; Industrial Gas Manufacturing
- 333242; Semiconductor Machinery Manufacturing
- 333415; Air Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing
- 333998; All Other Miscellaneous General Purpose Machinery Manufacturing
- 334413; Semiconductor and Related Device Manufacturing
- 335220; Major Household Appliance Manufacturing
- 423620; Household Appliances, Electric Housewares, and Consumer Electronics 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
- 424410; General Line Grocery Merchant Wholesalers
- 424420; Packaged Frozen Food Merchant Wholesalers
- 445110; Supermarkets and Other Grocery (except Convenience) Stores
- 445131; Convenience Retailers
- 449210; Electronics and Appliance Retailers

- 452311; Warehouse Clubs and Supercenters
- 483111; Deep Sea Freight Transportation
- 484230; Specialized Freight (Except Used Goods) Trucking, Long-Distance
- 493120; Refrigerated Warehousing Storage
- 531110; Lessors of Residential Buildings and Dwellings
- 531120; Lessors of Nonresidential Buildings (except Miniwarehouses)
- 541380; Testing Laboratories
- 561210; Facilities Support Services
- 811412; Appliance Repair and Maintenance

This list is not intended to be exhaustive but rather provides a guide for readers regarding entities likely to be regulated by this action. This list includes the types of entities that the EPA is now aware could potentially be regulated by this action. Other types of entities not listed could also be regulated. To determine whether your entity may be regulated by this action, you should carefully examine the applicability criteria found in 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.

II. Statutory Background and Regulatory History

A. What is the authority for this action?

The AIM Act authorizes the EPA to regulate HFCs in three main areas: phasing down the production and consumption of listed HFCs; management of 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 rule focuses on the third area: the transition to next-generation technologies.

Subsection (i) of the AIM Act, titled "Technology Transitions," 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."[14] Unlike other provisions in the AIM Act, the Administrator's subsection (i) authority is discretionary. When deciding whether and how to exercise this discretionary authority, the EPA "shall, to the extent practicable, factor in" several enumerated considerations, including use of "the best available data," "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 factors, including the quantities of regulated substances available from reclaiming, prior production, or prior import," "overall economic costs and environmental impacts, as compared to historical trends," and "the remaining phase-down period for regulated substances" under applicable regulations.[15] In this way, Congress expressly required the EPA to consider the cost of subsection (i) rules, including costs to consumers, as well as additional factors like technical feasibility, and authorized the Agency to consider "other relevant factors" pertaining to the availability of substitutes. For additional discussion of the EPA's authorities under subsection (i) of the AIM Act, please refer to the 2023 Final Rule.[16]

In addition, subsection (k)(1)(A) of the AIM Act authorizes the EPA to promulgate such regulations as are necessary to carry out the AIM Act's functions, including its obligations to ensure that requirements of the AIM Act are satisfied.[17] Subsection (k)(1)(C) of the AIM Act further provides that CAA sections 113, 114, 304, and 307 apply to the AIM Act and any

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[14] *See* 42 U.S.C. 7675(i)(1).
[15] *See* 42 U.S.C. 7675(i)(4)(A)-(D); *see also id.* 7675(i)(5) ("In carrying out this subsection, the Administrator shall – (A) evaluate substitutes for regulated substances in a sector or subsector, taking into account technological achievability, commercial demands, safety, overall economic costs and environmental impacts, and other relevant factors; and (B) make the evaluation under subparagraph (A) available to the public, including the factors associated with the safety of those substitutes.").
[16] *See* 88 FR 73098 (October 24, 2023).
[17] *See* 42 U.S.C. 7675(k)(1)(A).

regulations promulgated thereunder as though the AIM Act were part of title VI of the CAA.[18] Accordingly, this rulemaking is subject to the procedural requirements of CAA section 307(d).[19]

The EPA noted in the preamble to the proposed rule that this rulemaking does not merit the use of negotiated rulemaking procedures described in paragraph (i)(2). The EPA received no comments on this issue and is not revisiting it in this final rule.

Unless provided otherwise by statute, an agency may revise or rescind prior actions so long as it acknowledges the change in position, provides a reasonable explanation for the new position, and considers legitimate reliance interests in the prior position.[20] Relevant case law confirms that legitimate reliance interests do not create a higher bar for adopting a new policy but rather serve as relevant considerations along with other relevant factors informing the new policy.[21]

The EPA has considered the reliance interests presented to the Agency in this rulemaking in the comments and elsewhere. Here, the Agency has considered the reliance interests detailed in the comments along with other considerations, including the AIM Act's subsection (i)(4) statutory factors, and has determined that the requirements should be amended as is detailed in this rulemaking. The EPA received specific comments on reliance interests relating to the retail food – supermarkets, retail food – remote condensing units, and cold storage warehouses subsectors. For particular responses to those comments, *see* section IV.K.2 of this preamble.

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[18] *See* 42 U.S.C. 7675(k)(1)(C).
[19] *See* 42 U.S.C. 7607(d)(1)(I).
[20] *See FDA v. Wages & White Lion Invs., LLC*, 145 S. Ct. 898 (2025); *FCC v. Fox TV Stations, Inc*., 556 U.S. 502 (2009); *Motor Vehicle Mfrs. Ass'n v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29 (1983); *Clean Air Council v. Pruitt*, 862 F.3d 1, 8 (D.C. Cir. 2017) ("Agencies obviously have broad discretion to reconsider a regulation at any time.").
[21] *DHS v. Regents of Univ. of Cal.*, 591 U.S. 1, 21 (2020) ("Agencies are not compelled to explore every alternative device and thought conceivable by the mind of man. But, because DHS was not writing on a blank slate, it was required to assess whether there were reliance interests, determine whether they were significant, and weigh any such interests against competing policy concerns.") (internal citations omitted); *MediNatura, Inc. v. FDA*, 998 F.3d 931, 942-43 (D.C. Cir. 2021) (in withdrawing a 30-year old guidance document on enforcement of homeopathic drugs, FDA considered reliance interests and reasonably explained that the new policy was supported by safety concerns, the continued expansion in the impacted industry, and the agency's general interest in its risk-based enforcement approach).

B. Severability

This final rule addresses restrictions in several distinct refrigeration and air conditioning applications regulated under subsection (i) of the AIM Act. The EPA has independently considered each of those provisions in this rule, and intends that each change to restrictions in distinct applications be severable from all other changes to restrictions in distinct applications. The changes made for each application are supported by their own record and analyses, including separate analysis of the AIM Act statutory factors under subsection (i)(4). If a court were to review the EPA's final action and invalidate any particular change to a restriction, the Agency would intend that any remaining changes remain effective. This final rule also includes an interpretation of the requirements contained in subsection (i)(6) of the AIM Act. If a court were to review the EPA's final action and invalidate the Agency's interpretation of subsection (i)(6), the EPA would intend that the substantive amendments to applicable restrictions remain with an effective date reflecting the outcome of judicial review.

C. Summary of 2023 Final Rule

In the 2023 Final Rule, the EPA considered a number of petitions submitted under subsection (i)(3) to restrict, fully, partially, or on a graduated schedule, the use of HFCs in the sector or subsector in which the regulated substance is used.[22] The Agency's analysis supporting that final rule endeavored to apply the factors in subsection (i)(4) of the AIM Act to the information available to the EPA at that time, including with respect to availability of substitutes, overall economic costs and environmental impacts, and the remaining phasedown period for HFCs. Among other things, the 2023 Final Rule prohibited the domestic manufacture and import of aerosols, foams, and factory-completed refrigeration, AC, and heat pump products as well as the installation of refrigeration, AC, and heat pump systems that use HFCs or HFC blends above specified limits.

[22] *See* 88 FR 73098 (October 24, 2023).

The compliance dates for these restrictions varied by sector and subsector and generally ranged from January 1, 2025, to January 1, 2028. The rule also prohibited the sale, distribution, and export of factory-completed products that do not comply with the relevant restrictions three years after the prohibition on domestic manufacture and import goes into effect. The rule did not prohibit the sale, distribution, and export of components needed to repair existing refrigeration and air conditioning systems.

To meet the compliance dates and limits for the sectors and subsectors with restrictions in the 2023 Final Rule, various degrees of change were required. The Agency based decisions for compliance dates and limits on a variety of factors, including, but not limited to: petitions submitted under AIM Act subsection (i), comments received on those petitions, information we provided in market characterization technical support documents located in the docket for the 2023 Final Rule, and comments on the proposal to the 2023 Final Rule. For example, for sectors such as aerosols and foams, alternatives below the limits were in use, often to large degrees. Similarly, several subsectors in the refrigeration and AC sector, such as motor vehicle air conditioning, household refrigerators and freezers, retail food – refrigeration stand-alone units, and others, had alternatives below the applicable limits that were widely available and in use. Other subsectors had known alternatives with more nascent technologies such as retail food – supermarket systems. The subsectors with identified alternatives with more limited use generally had later compliance dates, such as Chiller for IPR systems and IPR systems that operate at temperatures between -50 °C to -30 °C. Equipment in such subsectors had compliance dates of January 1, 2028. See the 2023 Final Rule and the Regulatory Impact Analysis and other documents in that docket for additional information.

D. Summary of 2023 Interim Final Rule

After publication of the 2023 Final Rule, manufacturers, importers, and distributors of residential and light commercial AC/HP equipment informed the EPA that the compliance date for the restriction on installation will result in substantial stranded inventory in that subsector for

residential new construction, including both single-family and multi-family dwellings, where builders order heating and cooling equipment well in advance of knowing the exact date of installation. In response, the EPA issued an IFR[23] to address the unique circumstances of that particular subsector to prevent such equipment from being stranded. In particular, that rule extended the installation compliance date from January 1, 2025, to January 1, 2026, so long as all the components were manufactured in the United States or imported into the United States before January 1, 2025.

E. Summary of administrative petitions and requests related to this rulemaking

The EPA received four administrative petitions to reconsider certain aspects of the 2023 Final Rule.[24] One petitioner requested that the EPA adjust the temperature threshold and temperature location for transport refrigeration – intermodal containers. Another requested an extension of the compliance date for process refrigeration equipment used in semiconductor manufacturing. Two separate petitioners requested that the EPA consider limiting import, domestic manufacture, and installation of condensing units used for residential and light commercial AC/HP systems. The EPA granted reconsideration of these administrative petitions in June 2024[25] and the October 2025 Proposal for this rulemaking provided an opportunity for public comment on a set of proposed changes based on these administrative petitions. The EPA also received other requests to adjust certain restrictions at 40 CFR part 84, subpart B for certain retail food subsectors,[26] cold storage warehouses,[27] refrigerated laboratory centrifuges,[28] and laboratory shakers.[29] In response to these requests and additional concerns identified by the Agency and stakeholders, the EPA announced a reconsideration of aspects of the 2023 Final

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[23] *See* 88 FR 88825 (December 26, 2023).
[24] Three petitions for judicial review of the 2023 Final Rule were also filed in the U.S. Court of Appeals for the D.C. Circuit and are being held in abeyance. *See Semiconductor Equipment & Materials Int'l v. EPA* (D.C. Cir. Case No. 23-1344); *Chemours Co. FC, LLC v. EPA* (D.C. Cir. Case No. 23-1345); and *Food Marketplace, Inc. et al. v. EPA* (D.C. Cir. Case No. 23-1347).
[25] The four administrative petitions for reconsideration and the EPA's responses granting reconsideration are in the docket for this action.
[26] *See* letter from trade association dated February 11, 2025, in the docket for this action.
[27] *See* request from trade association dated March 6, 2025, in the docket for this action.
[28] *See* request from manufacturer dated June 6, 2024, in the docket for this action.
[29] *See* request from manufacturer, dated April 8, 2025, in the docket for this action.

Rule on March 12, 2025, as one of the deregulatory actions included in the Administrator's "Powering the Great American Comeback" initiative.[30]

F. Judicial Review and Administrative Review

The AIM Act regulations promulgated herein may be challenged in the United States Court of Appeals for the District of Columbia Circuit. Pursuant to CAA section 307(b)(1), petitions for judicial review of the AIM Act regulations must be filed in that court within 60 days after the date notice of this final action is published in the *Federal Register*.

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]."[31] Among the applicable sections of the CAA is section 307, which includes provisions on judicial review. CAA 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 a determination of nationwide scope or effect."[32]

The AIM Act regulations promulgated herein are "nationally applicable regulations" within the meaning of CAA section 307(b)(1). These regulations establish regulatory requirements applicable across the entire United States to implement restrictions under subsection (i) of the AIM Act. The regulations promulgated herein amend an existing nationally applicable regulation by adjusting a compliance deadline for certain systems. The deadlines in the amended regulation and the conditions required to qualify for those extended deadlines are nationally applicable to all affected entities. Accordingly, under CAA section 307(b)(1), petitions for judicial review of these AIM Act regulations must be filed in the United States Court of

[30] *See* EPA Launches Biggest Deregulatory Action in U.S. History, March 12, 2025, in the docket for this action.
[31] *See* 42 U.S.C. 7675(k)(1)(C).
[32] *See* 42 U.S.C. 7607(b)(1).

Appeals for the District of Columbia Circuit by [**INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER**].

CAA section 307(d)(7)(B) further provides that "[o]nly an objection to a rule or procedure which was raised with reasonable specificity during the period for public comment (including any public hearing) may be raised during judicial review." This section also provides a mechanism for the EPA to convene a proceeding for reconsideration "[i]f the person raising an objection can demonstrate to the EPA that it was impracticable to raise such objection within [the period for public comment] or if the grounds for such objection arose after the period for public comment, (but within the time specified for judicial review) and if such objection is of central relevance to the outcome of the rule."[33] Any person seeking to make such a demonstration to us should submit a Petition for Reconsideration to the Office of the Administrator, U.S. Environmental Protection Agency, Room 3000, WJC South Building, 1200 Pennsylvania Ave. NW, Washington, DC 20460, with a copy to both the person(s) listed in the preceding **FOR FURTHER INFORMATION CONTACT** section and the Associate General Counsel for the Air and Radiation Law Office, Office of General Counsel (Mail Code 2344A), U.S. EPA, 1200 Pennsylvania Ave. NW, Washington, DC 20460.

III. Summary of Final Action

A. Refrigerated Transport – Intermodal Containers

The EPA is finalizing amendments to provisions related to refrigerated transport – intermodal containers, as proposed. Specifically, this final rule raises the lower-bound temperature exclusion threshold of -50 °C to -35 °C and changes the location where that temperature is measured to the inside of the container, referred to as the box temperature.

1. Background

Refrigerated transport – intermodal containers are refrigerated containers with an integrated power source that allow uninterrupted storage during transport on different mobile

[33] *See* 42 U.S.C. 7607(d)(7)(B).

platforms, including railways, road trucks, and vessels.[34] These intermodal containers used for refrigerated transport are regulated as products and systems at 40 CFR 84.54(a)(6) and (c)(7), respectively, depending on their design. They primarily carry perishable goods (*e.g.*, food) and pharmaceuticals at temperatures between −30 °C and 16 °C and can be designed to operate at higher and lower temperatures.

The 2023 Final Rule restricted the use of HFCs in intermodal containers when the temperature of the refrigerant entering the evaporator (for direct heat exchange systems) or the temperature of the fluid exiting (for chillers) is -50 °C or higher.[35] These regulations do not apply where temperatures are below -50 °C. At the time, the EPA understood that several substitutes were available for refrigerated transport – intermodal containers, including R-744 (also known as carbon dioxide or CO_2),[36] R-450A, R-513A.[37] As discussed in the October 2025 proposal, the EPA received comments on the proposal to the 2023 Final Rule, including a request for a higher limit than 700 for such equipment operating below -50 °C.[38] The EPA did not receive information at the time indicating that operating such equipment with refrigerants below a 700 limit at temperatures above -50 °C and below -35 °C was infeasible.

After publication of the 2023 Final Rule, a manufacturer of intermodal containers that maintain a range of temperatures, petitioned the EPA to raise the temperature threshold and change the temperature measurement location for this subsector.[39] The petitioner requested the regulatory text at 40 CFR 84.54(a)(6) and (c)(7) be changed to, "Effective January 1, 2025, refrigerated transport – intermodal containers *designed to reach and maintain -35 °C box temperature* or higher using a regulated substance, or a blend containing a regulated substance,

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[34] *See* 88 FR 73171 (October 24, 2023).
[35] The restrictions for refrigerated transport – intermodal containers began January 1, 2025. The EPA issued a no action assurance on January 17, 2025, regarding the restrictions at 40 CFR 84.54(a)(6) and (c)(7), which remained in effect until January 1, 2026. The EPA extended the no action assurance on December 22, 2025, until September 1, 2026, or the date this rulemaking is finalized, whichever occurs earlier.
[36] R-744 is the ASHRAE refrigerant designation for carbon dioxide (CO_2).
[37] *See* 88 FR 73172 (October 24, 2023).
[38] *See* 90 FR 48002 (October 3, 2025).
[39] *See* manufacturer's administrative petition for reconsideration in the docket for this action.

with a global warming potential of 700 or greater." In particular, the petitioner requested that the EPA adjust the temperature threshold to distinguish between refrigerants used for deep frozen cargo and those used for fresh and frozen cargo. The petitioner noted that deep frozen cargo containers are used to transport cargo that require temperatures at or below -35 °C and include critical life sciences products such as blood plasma and pharmaceuticals. The petitioner stated that intermodal containers used to transport deep frozen cargo must use refrigerants with lower boiling points, including R-404A and R-452A.[40] This contrasts with fresh and frozen cargo containers, which the petitioner noted require temperatures that range from -30 °C to 30 °C, and previously could use R-134a. One compliant refrigerant that can achieve temperatures in this range, and is currently used, includes R-513A.[41] The petitioner indicated that there are no available refrigerants below the applicable limit that can achieve and maintain box temperatures below -35 °C.

In the administrative petition, the petitioner also requested an adjustment to the location at which the temperature is measured from the "temperature of the refrigerant entering the evaporator (for direct heat exchange systems) or the temperature of the fluid exiting (for chillers)" to the "box temperature" because this measurement is more commonly used by the industry in this subsector. The box temperature is the temperature within the intermodal refrigerated transport container (*i.e.*, the "box"). The petitioner also requested that the EPA clarify that the temperature measurement be based on the lowest temperature at which the equipment is "designed to reach and maintain." The petitioner further explained that this subsector uses direct expansion equipment, not chillers, so the reference to chillers in the regulatory text is unnecessary.

Based on the new information from the administrative petition, the EPA agreed with the petitioner that there are currently no refrigerants available with sufficiently low boiling points

[40] *See* email from manufacturer, dated January 16, 2025, in the docket for this action.
[41] *See* materials from manufacturer submitted November 2023 in the docket for this action.

and high refrigeration capacities for this temperature range. The EPA thus proposed to raise the temperature threshold for this equipment from -50 °C to -35 °C. The EPA also agreed with the petitioner that the location at which the temperature is measured is better suited as the box temperature. The EPA thus also proposed to adjust the location at which the temperature is measured to be the box temperature.[42]

2. Final Rule

The EPA is amending the provisions related to refrigerated transport – intermodal containers as proposed. The EPA evaluated the additional information provided by the petitioner[43] after publication of the 2023 Final Rule, the comments provided on the proposed rule, and other information, and reassessed the factors under AIM Act subsection (i)(4). The Agency concludes that refrigerants used to reach and maintain such low temperatures in intermodal containers require refrigerants with sufficiently low boiling points and high refrigeration capacities.[44] Among other rationale provided within this section, section IV.A of this preamble, and in the Response to Comments document, the Agency finds that there is no alternative that is currently available that meets the limit established in the 2023 Final Rule and which could meet the needs of intermodal refrigerated transport equipment designed to operate at box temperatures below -35 °C. Given the transportation conditions necessary for shipping blood plasma, pharmaceuticals, temperature-sensitive enzymes, dangerous goods, and other materials at temperatures below -35 °C, the EPA concludes that targeted relief is appropriate and consistent with the factors and considerations set out in AIM Act subsection (i)(4) given the change in our understanding of availability of substitutes for this temperature range for this equipment. The Agency describes and responds to comments in section IV.A of this preamble and the Response to Comments document in the docket.

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[42] *See* 90 FR 47999 (October 3, 2025).
[43] *See* materials from manufacturer submitted November 2023 in the docket for this action.
[44] *See* table of refrigerants (R-404A, R-452A, R-513A, R-450A, R-744), their boiling points, and refrigeration capacities in the docket for this action.

B. *Industrial Process Refrigeration and Chillers for Industrial Process Refrigeration in Semiconductor Manufacturing*

The EPA is finalizing amendments to provisions related to IPR and Chillers for IPR used to manufacture semiconductors as proposed. Specifically, the EPA is extending the compliance date for certain IPR and Chillers for IPR. The compliance date is extended from January 1, 2026, and January 1, 2028, as applicable, to January 1, 2030. This extension is limited to equipment used in semiconductor manufacturing that has a charge size of 100 pounds or less.

1. Background

The EPA considers refrigeration equipment used in semiconductor manufacturing to fall within the IPR and Chillers for IPR subsectors.[45] The refrigeration equipment is often built into specialized machines that sort, mark, and cut wafers during the semiconductor manufacturing process, referred to as "Semiconductor Manufacturing and Related Equipment," or SMRE, throughout this rule. SMRE may operate at a range of temperatures depending on the function being performed and typically must maintain precise temperatures to produce high-quality semiconductor wafers.

IPR systems are used to cool process streams at a specific point in manufacturing and other industrial processes (*e.g.*, in the chemical, pharmaceutical, and petrochemical 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.[46]

A chiller is a type of equipment that uses refrigerant to 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 the conditioned spaces. The heat absorbed by the water or brine can be used for heating purposes and/or transferred directly to the air ("air-cooled"), to a cooling tower or body of water ("water-

[45] *See* 88 FR 73119 (October 24, 2023).
[46] *See* 88 FR 73141-42.

cooled"), or through evaporative coolers ("evaporative-cooled").[47] Chillers can be used to cool process streams in industrial applications; in such instances, these chillers are regulated as "Chillers for IPR" and not as "IPR." Throughout this rule, the term "IPR" refers to IPR equipment that does not use chillers. The term "Chillers for IPR" refers to IPR equipment that utilizes chillers.

Restrictions on the use of HFCs and HFC blends in IPR and Chillers for IPR, including process equipment used to manufacture semiconductors, are implemented at different limits (150, 300, and 700). The restrictions put in place by the 2023 Final Rule start on either January 1, 2026, or January 1, 2028, depending on charge size and the temperature at which the equipment is designed to operate.[48] IPR and Chillers used for IPR at temperatures below -50 °C are not subject to restrictions under the 2023 Final Rule.

A trade association representing the semiconductor industry petitioned the EPA on December 22, 2023, to reconsider the compliance dates that affect SMRE for the IPR and Chillers for IPR subsectors. The petitioner submitted multiple supplemental letters to the Agency in the following months clarifying requests in their administrative petition. In one letter, they clarified that the administrative petition seeks relief only for SMRE that have a charge size of 100 pounds or less. They also clarified that for the relevant restrictions with compliance dates of January 1, 2026, or January 1, 2028, they request delaying the compliance date to January 1, 2030.[49] Five SMRE suppliers also submitted letters to the Agency between May 2024 and August 2024 indicating their support of the trade association's request to extend the relevant compliance dates to January 1, 2030.[50]

The petitioner stated that equipment using substitute refrigerants that fit this industry's unique circumstances will not be available by the current compliance dates and estimated that

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[47] *See* 88 FR 73174.
[48] The EPA issued a no action assurance on December 22, 2025, for this equipment that lasts until September 1, 2026, or until this rule is finalized, whichever comes sooner.
[49] *See* semiconductor trade association's letter to the EPA, dated May 3, 2024, in the docket for this action.
[50] *See* letters of support from five semiconductor equipment manufacturing suppliers in the docket for this action.

developing and implementing alternatives that are fit for purpose could take five years.[51] In particular, the petitioner noted that to manufacture semiconductors, process refrigeration equipment must be able to maintain precise control of narrow temperature tolerances, which can be as small as 0.1 °C ± 0.05 °C for some applications. The petitioner also explained that using certain substitutes such as CO_2 or lower flammability and flammable alternatives as a refrigerant in SMRE would require changing how equipment is integrated into semiconductor manufacturing facilities or limit the capabilities of the process equipment.

The petitioner stated that CO_2 offers a potential path, yet some challenges would require further validation and testing.[52] The petitioner has indicated that although R-728[53] may also be a viable refrigerant, it would not be tested and validated in time to meet the compliance dates established in the 2023 Final Rule.[54] The petitioner also indicated that R-32 and R-454C are not immediately viable solutions because they both are flammable and R-32 would not meet the limit for all SMRE use cases.

The petitioner noted that SMRE are custom-engineered and that equipment availability is limited to meet the precise temperature and humidity control requirements, particularly in the range between -50 °C and -30 °C. Due to the combination of factors that present unique circumstances for this industry, the petitioner asserted that the development of substitutes for SMRE will take more time than for IPR and Chillers for IPR used in other sectors.[55] Further details are found in the proposed rule for this action.

The EPA agreed with the petitioner on the time needed to design, test, qualify, validate, and deploy substitutes for SMRE with charge sizes of 100 pounds or less. The EPA also agreed that a compliance deadline of January 1, 2030, for this equipment, as suggested by the petitioner

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[51] *See* semiconductor trade association's supplemental submission to the EPA, dated June 18, 2024, in the docket for this action.
[52] *See* semiconductor trade association's supplemental submission to the EPA, dated June 18, 2024, in the docket for this action.
[53] R-728 is the ASHRAE refrigerant designation for nitrogen gas (N_2).
[54] *See* February 20, 2024, meeting between semiconductor trade association and the EPA in the docket for this action.
[55] *See* semiconductor trade association's letter to the EPA, dated May 3, 2024, in the docket for this action.

and five semiconductor equipment manufacturing suppliers, is reasonable for available substitutes to be developed. The EPA therefore proposed to extend the compliance date for IPR and Chillers for IPR equipment used in semiconductor manufacturing which have a charge size of 100 pounds or less from January 1, 2026, and January 1, 2028, as applicable, to January 1, 2030.

2. Final Rule

The EPA is finalizing provisions related to IPR and Chillers for IPR used to manufacture semiconductors as proposed. Specifically, the EPA is delaying the compliance dates for certain IPR and Chillers for IPR from January 1, 2026, and January 1, 2028, as applicable, to January 1, 2030. This extension is limited to equipment used in semiconductor manufacturing that has a charge size of 100 pounds or less.

Given the additional information the Agency received since the 2023 Final Rule, the Agency has reassessed the factors under subsection AIM Act subsection (i)(4). The EPA finds that the semiconductor manufacturing industry faces unique circumstances in manufacturing semiconductors, including ensuring that available substitutes can satisfy precise temperature control requirements. For example, the petitioner explained that precise control is required to realize process performance, including a uniform application of photoresist coatings. They noted that small changes in temperature during production can impact semiconductor device features, product functionality, and product yields. As a further example, the petitioner described how a 1 °C change in temperature in a projection lens can result in a few microns accuracy loss and would be "catastrophic"[56] for semiconductor production. The EPA reviewed the comments and information provided by industry, including letters submitted by five semiconductor manufacturing equipment suppliers,[57] that provided additional details on the time needed to test and validate alternatives. The EPA agrees with semiconductor manufacturers' concerns,

[56] *See* 90 FR 48004 (October 3, 2025).
[57] *See* letters of support from five semiconductor equipment manufacturing suppliers in the docket for this action.

particularly for potential downtime and that such downtime could have impacts on critical industries and national security. An inability to acquire compliant technology could disrupt semiconductor manufacturing output, which could lead to supply chain disruptions, with global repercussions in the form of shortages and price volatility. These supply chain disruptions could cascade across industries dependent on advanced semiconductor chips, including defense manufacturing, telecommunications, energy production, artificial intelligence, and the automotive industry.

Given the information provided by the petitioner on the need for more time to test, qualify, and validate substitutes, additional related information from five semiconductor manufacturing equipment suppliers, and comments on the proposed rule, the EPA agrees that a transition to available substitutes will be able to be made by January 1, 2030. The EPA also finds that semiconductor manufacturing equipment faced technically infeasible requirements to transition and that companies that run facilities with such equipment would have been forced to delay operations or invest in costly pre-commercial technologies. To the extent that productivity may have been impacted, the costs could have been significantly larger than the costs of refrigeration. The Agency concludes that the targeted relief provided for this equipment is appropriate given our change in understanding of the availability of substitutes and the overall economic costs and environmental impacts. The Agency describes and responds to comments in section IV.B of this preamble and the Response to Comments document in the docket.

C. Retail Food – Supermarket Systems

The EPA is finalizing, as proposed, amendments to the limits for supermarket systems to establish a graduated schedule with an interim limit of 1,400 starting January 1, 2027, and 150 or 300, depending on charge size or whether it is part of the high temperature side of a cascade system, starting January 1, 2032. The EPA is also finalizing a provision allowing for a 15 percent increase in cooling capacity of an existing supermarket system without triggering the requirements that apply to new installations.

1. Background

Supermarket systems, also known as multiplex or centralized systems, operate with racks of compressors installed in a machinery room where different compressors turn on to match the refrigeration load necessary to maintain temperatures in display cases in the sales area. Direct supermarket designs circulate refrigerant 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.[58] Indirect supermarket designs include secondary loop systems and cascade refrigeration systems. 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 chiller versions of an indirect system rely on a lineup of 10 to 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 for purposes of 40 CFR part 84, subpart B. 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,[59] with 5 to 10 such systems in a store.[60]

Supermarket systems account for a significant amount of HFC demand. In particular, supermarket systems accounted for 24 percent of the demand for HFCs in the refrigeration and AC/HP sector in 2025.[61] Supermarket systems' large charge sizes and higher leak rates than

[58] 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.
[59] A supermarket may also use other types of refrigeration equipment covered by separate subsectors, including stand-alone units, remote condensing units, refrigerated beverage dispensers, and ice machines. Such equipment is not a part of the "supermarket system" subsector for purposes of 40 CFR part 84, subpart B merely as a result of being located in a supermarket.
[60] *See* 88 FR 73157-58 (October 24, 2023).
[61] *See* EPA's Vintaging Model of ODS Substitutes Peer Review Factsheet, in the docket for this action.

many other subsectors[62] drive the demand for HFCs in these systems. Prior to 2010, this subsector used R-22, which is an ozone-depleting substance (ODS) that has been phased out, consistent with the requirements of title VI of the CAA and its implementing regulations. Since 2010, the majority of refrigeration systems in this subsector have used refrigerants such as R-404A, R-407A, and R-507A. More recently, supermarket systems have transitioned to substitutes such as HFC/hydrofluoroolefin (HFO) blends, like R-448A, R-449A, and R-513A, while a portion of the market has transitioned to CO_2.

The 2023 Final Rule established restrictions on the installation of HFCs and HFC blends in new supermarket systems starting January 1, 2027. The limit finalized in the 2023 Final Rule was 150 for systems with refrigerant charge capacities greater than or equal to 200 pounds, and 300 for systems with refrigerant charge capacities less than 200 pounds or for the high temperature side of cascade systems irrespective of the total charge capacity. The EPA distinguished between larger and smaller supermarket systems by their refrigerant charge capacity based on a distinction between charge sizes in the safety standards.[63]

The 2023 Final Rule would have required new retail food supermarket systems to be installed with refrigerants below a 150 or 300 limit, as applicable, including CO_2, certain HFOs, or certain HFC/HFO blends.[64] While some retailers had installed CO_2 in new systems at the time, certain HFOs and HFC/HFO blends were still under development and had not yet been listed by the SNAP program as acceptable for use in new supermarket systems. While these additional options were listed by SNAP in June 2024,[65] and in advance of the January 1, 2027, compliance date, the 2023 Final Rule would have largely required retailers to install either CO_2 or newly listed alternatives.

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[62] *See* Annex 3.9 of the 2024 U.S. Inventory of GHG Emissions and Sinks, pg. 113, *https://www.epa.gov/system/files/documents/2024-04/us-ghg-inventory-2024-annex-3-additional-source-or-sink-categories-part-a.pdf*.

[63] The same distinction exists for systems in industrial process refrigeration, cold storage warehouses, and retail food remote condensing units. Elsewhere this notice refers to these limits as "150 or 300, as applicable" with the meaning described here. *See* 87 FR 76775-76 (December 15, 2022).

[64] *See* 88 FR 73158-59 (October 24, 2023).

[65] *See* 89 FR 50410 (June 13, 2024).

Certain food retailers and a trade association representing the supermarket industry expressed concerns about the limited number and types of substitutes that the EPA determined in the 2023 Final Rule that would be available for use in supermarket systems by January 1, 2027. Specifically, they stated the rule restricts the food industry to a handful of substitute refrigerants, including CO_2, ammonia,[66] and those that are flammable,[67] which they said are impractical, infeasible, or create safety concerns.[68]

In addition, they asserted that CO_2 technologies are unreasonably costly, and that, in their current state, they expend a significant amount of energy to function at a cooling level comparable to commonly used HFCs, that such technologies are unreliable, that leaks are difficult to detect and repair, and that such leaks can be catastrophic to the system's performance.[69] These food retailers shared that since water is used to cool CO_2 in such systems, some states' water laws, like those in Nevada, would also be prohibitive to the effective use of CO_2 systems.[70] They also asserted that CO_2 is not suitable for very large stores, such as those that are 50,000 square feet or larger. They also raised safety concerns about using ammonia, a regulated, toxic, and flammable substance, in some retail environments.[71] These food retailers also said that refrigerants with flammability classifications, such as A2L and A3 refrigerants, may not be universally available due to delays in updates to local building codes and potential shortages in technicians trained to use them. Furthermore, these food retailers are concerned that

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[66] The ASHRAE designation for ammonia is R-717.

[67] ANSI/ASHRAE Standard 34-2024 Designation and Safety Classification of Refrigerants. This standard 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 flammability. The toxicity class is determined based on allowable exposure and is signified with a capital letter, where "A" denotes lower toxicity and "B" denotes refrigerants of higher toxicity. 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. The flammability classification "1" is given to refrigerants that show no flame propagation. The flammability classification "2L" is given to refrigerants that have lower flammability. The flammability classification "2" is given to refrigerants that are flammable. The flammability classification "3" is given to refrigerants that have higher flammability.

[68] *See* trade association's letter to the EPA, dated February 11, 2025, in the docket for this action.

[69] *Id*.

[70] *See* Memorandum - EPA Meetings Related to the Technology Transitions Reconsideration Notice of Proposed Rulemaking, April 18, 2025, in the docket for this action.

[71] *See* trade association's letter to the EPA, dated February 11, 2025, in the docket for this action.

future regulation of per- and polyfluoroalkyl substances (PFAS) could require retailers to change systems again from certain compliant fluorinated refrigerants to others.[72] Based on these concerns, food retailers requested additional time to allow the technology and building codes to catch up. They requested the EPA move the compliance deadline for supermarket systems to the end of 2032 and suggested an interim limit of 1,400 starting January 1, 2027.[73] In the proposal for this rulemaking, the EPA requested comments on various topics including on costs associated with transitioning to refrigerants in supermarkets systems below the compliance limit of 150 or 300, as applicable, as well as costs associated with meeting an interim compliance limit of 1,400.

The EPA proposed an interim limit of 1,400 starting January 1, 2027, for new supermarket systems. Starting January 1, 2032, the EPA proposed the limit for supermarket systems to be 150 or 300, depending on the characteristics of the system, as described previously in this section.

A trade association representing the supermarket industry also requested clarifications and potential changes to the codified regulations at 40 CFR 84.54(e)(2) and (3) to ensure that certain routine store refreshes, remodels, or layout changes do not trigger the requirements for new systems.[74] The 2023 Final Rule discussed two scenarios in which the EPA would consider modifications to an existing system to be equal to a new installation requiring the use of compliant refrigerants:

- When an existing system's cooling capacity is increased as measured in British Thermal Units (BTU) per hour, and
- When 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.

[72] CO_2, hydrocarbons, and ammonia are not fluorinated chemicals and are not PFAS. The EPA notes that the Federal Government has not adopted a specific definition of PFAS and has not included HFCs or HFOs in any PFAS-related restrictions.
[73] *See* trade association's presentation dated April 18, 2025, in the docket for this action.
[74] *See* email from trade association, dated April 24, 2025, in the docket for this action.

The trade association stated that it is normal for stores to modestly expand the cooling capacity of existing systems when doing a remodel to accommodate additional products and layouts. They gave a specific example in which expanding a refrigerated case by 60 inches could increase the overall cooling capacity of the system, meaning it would be treated as a new system under the regulations at 40 CFR part 84 subpart B. The trade association requested that the EPA allow supermarkets to increase the cooling capacity measured in BTU per hour by up to 25 percent before the equipment is considered a new system. The EPA requested comments on whether to allow supermarket systems to expand cooling capacity by some amount without triggering the criteria for installation of a new system, and if so, what that increase could be (*e.g.*, 25 percent).

The EPA requested comments on whether to allow supermarket systems to increase cooling capacity to a certain degree without triggering a new installation during routine store refreshes, remodels, or layout changes. The EPA did not propose a specific increase in cooling capacity that would be allowable without triggering a new installation of a supermarket system.

2. Final Rule

The EPA is finalizing, as proposed, amendments to the limits for supermarket systems to establish a graduated schedule with an interim limit of 1,400 starting January 1, 2027, and 150 or 300, depending on charge size or whether it is part of the high temperature side of a cascade system, starting January 1, 2032. The EPA is also finalizing a provision allowing for a 15 percent increase in cooling capacity of an existing supermarket system without triggering the requirements that apply to new installations.

a. Graduated Schedule

The EPA is finalizing a graduated schedule for the use of HFCs in new supermarket systems as proposed. Specifically, the EPA is relaxing the existing limit, on an interim basis, to 1,400 starting January 1, 2027, and a limit of 150 or 300 starting January 1, 2032. The limit of 150 is for supermarket systems with refrigerant charge capacities greater than or equal to 200

pounds, and 300 for supermarket systems with refrigerant charge capacities less than 200 pounds or for the high temperature side of cascade systems irrespective of the total charge capacity. The limits of 150 or 300, as described here, are the same limits as those promulgated with the 2023 Final Rule, just on an extended timeline. The EPA has reassessed the four factors under AIM Act subsection (i)(4) given the additional information received ahead of the October 2025 Proposal and during the comment period. The Agency understands the need for additional flexibility for supermarket systems in the near term, and acknowledges the complexity involved with designing and installing such systems and potential challenges with building code adoption, particularly at the local level. The interim limit provides additional flexibility to retailers installing new equipment in the near term. The EPA also notes that challenges in deploying such systems vary across certain geographical areas of the United States which can result in lagging adoption in certain areas. The targeted relief in this rule is appropriate given changes in our understanding of the availability of substitutes and the overall economic costs and environmental impacts. The Agency describes and responds to comments, including those related to building codes, energy efficiency, and more, in section IV.C of this preamble and the Response to Comments document in the docket.

The EPA also recognizes that some supermarkets already use refrigerants that would have complied with the 2023 Final Rule's limits. This final rule does not prevent manufacturers or installers from choosing to use refrigerants below the limits of 150 or 300 ahead of the new compliance requirements for new systems. The EPA anticipates the additional time for compliance will allow these systems to continue to be improved and have additional widespread availability across the country. Supermarket systems are not off-the-shelf systems and are configured with many different components to meet the specific needs of store in which it will be used. The graduated schedule considers this as some retailers may transition to these available substitutes sooner than January 1, 2032, while others may require additional flexibility.

b. Expansion of Existing Supermarket Systems

In this final rule, the EPA is establishing that an increase in cooling capacity of a supermarket system measured in BTU per hour of up to 15 percent would not be considered a new installation. The EPA is aware that supermarkets often undergo routine store refreshes, remodels, or layout changes which may occur once or twice over the lifetime of the supermarket system to update the look of the retail floor or improve overall efficiency. The proposed rule discussed the EPA's intention, consistent with past practice from the phaseout of R-22, where the Agency considered if there was sufficient cooling capacity within the system to support the expansion *(e.g.* new display cases), then the store is not changing the intended purpose of the system, and may use virgin R-22 after the modification/remodel. If the expansion includes an increase in cooling capacity, then the EPA presumes that the system's purpose is changing and a new system is being manufactured. In other words, changes that expanded cooling capacity for R-22 supermarket systems beyond the initial system designs were treated as new systems. In this rule the EPA is acknowledging that for the purposes of subsection (i) of the AIM Act, minor changes during store refreshes, remodels, or layout changes do not trigger treatment as a new system and has set an upper bound as discussed in section IV.C.2 of this preamble.

D. Retail Food – Remote Condensing Unit Systems

The EPA is finalizing amendments to the limits for retail food remote condensing units to establish an interim limit of 1,400 upon the effective date of this rule, and 150 or 300, depending on charge size or whether it is part of the high temperature side of a cascade system, starting January 1, 2032.

1. Background

Remote condensing units are a type of retail food refrigeration equipment with refrigeration capacities typically ranging from 1 kW to 20 kW (0.3 to 5.7 refrigeration tons). They 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, for example, to reach low temperatures in a long-term storage room. A supermarket often uses remote condensing units in food retail environments such as dairy and deli displays. Remote condensing units are also commonly installed in convenience stores and specialty shops, such as bakeries and butcher shops.[75]

The 2023 Final Rule established restrictions on the use of HFCs in new remote condensing unit systems installed starting January 1, 2026. The limit was 150 for systems with refrigerant charge capacities greater than or equal to 200 pounds, and 300 for systems with refrigerant charge capacities less than 200 pounds or for the high temperature side of cascade systems irrespective of the total charge capacity. The EPA distinguished between larger and smaller remote condensing units by their refrigerant charge capacity based on a distinction between charge sizes in the safety standards.[76]

The 2023 Final Rule would have required new retail food remote condensing unit systems to be installed with refrigerants below a 150 or 300 limit, as applicable, including CO_2, certain HFOs, or certain HFC/HFO blends.[77] In general, retail food remote condensing units have lower relative charge sizes compared to supermarket systems, often under 200 pounds, meaning they can generally use refrigerants complying with the 300 limit. While some retailers had installed CO_2 in new systems at the time, other alternatives including certain HFOs and HFC/HFO blends were still under development and had not yet been listed by the SNAP program as acceptable for use in new remote condensing units. While these additional options were listed by SNAP in June 2024,[78] and in advance of the January 1, 2026, compliance date, the

[75] *See* 88 FR 73157 (October 24, 2023).
[76] *See* 87 FR 76775-76 (December 15, 2022).
[77] *See* 88 FR 73157 (October 24, 2023).
[78] *See* 89 FR 50410 (June 13, 2024).

2023 Final Rule would have largely made these relatively new HFC/HFO blends as the primary options for new installations of remote condensing units.

Certain supermarket retailers and a trade association expressed concerns about the limited number and types of substitutes that the EPA determined in the 2023 Final Rule would be available for use in remote condensing units by January 1, 2026. Specifically, they stated that the rule restricts the food industry to a handful of substitute refrigerants, including CO_2, ammonia, and those that are flammable,[79] which they stated are either impractical, infeasible, or create safety concerns.[80]

In addition they asserted that CO_2 technologies are costly, and that, in their current state, they expend a significant amount of energy to function at a cooling level comparable to commonly used HFCs, that such technologies are unreliable, that leaks are difficult to detect and repair, and that such leaks can be catastrophic to the system's performance.[81] These food retailers also said that refrigerants with flammability characteristics, such as A2L and A3 refrigerants, may not be universally available due to delays in updates to local building codes and potential shortages in technicians trained to use them. Furthermore, these food retailers are concerned that future regulation of PFAS could require retailers to change systems again from certain compliant fluorinated refrigerants to others.[82] Based on these concerns, food retailers requested additional time to allow the technology and building codes to catch up. They requested that the EPA move the compliance deadline for retail food remote condensing units to the end of 2032 with an interim limit of 1,400 starting January 1, 2026.[83]

The EPA considered concerns from stakeholders in the retail food industry to allow additional flexibility in refrigerant choice for retail food remote condensing units, understanding there may be challenges such as building codes to adopting newer technologies. Thus, the EPA

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[79] ANSI/ASHRAE Standard 34-2024 Designation and Safety Classification of Refrigerants.
[80] *See* trade association's letter to the EPA, dated February 11, 2025, in the docket for this action.
[81] *Id.*
[82] CO_2, hydrocarbons, and ammonia are not considered PFAS. The EPA notes that the Federal Government has not adopted a specific definition of PFAS and has not included HFCs or HFOs in any PFAS-related restrictions.
[83] *See* trade association's presentation dated April 18, 2025, in the docket for this action.

proposed a graduated schedule with an interim limit of 1,400 starting January 1, 2026, for new retail food remote condensing units to allow additional flexibility for a limited period of time. Such additional flexibility allows for the use of nonflammable options such as R-448A and R-449A. As previously described, the EPA also proposed limits of 150 or 300, depending on the characteristics of the system, starting January 1, 2032, given that the Agency anticipated that the period of the interim limit would be a sufficient amount of time for implementation challenges to resolve.

2. Final Rule

The EPA is finalizing the graduated schedule for the use of HFCs in new retail food remote condensing units similar to what was proposed. Specifically, the EPA is relaxing the existing limit, on an interim basis, to 1,400 upon the effective date of this rule, and limits of 150 or 300, depending on charge size or whether it is part of the high temperature side of a cascade system, starting January 1, 2032. For remote condensing units with a charge size of 200 pounds or more, excluding the high temperature side of a cascade system, the limit is 150. For remote condensing unit systems with a charge size less than 200 pounds or remote condensing unit systems on the high temperature side of a cascade system, the limit is 300. The limits of 150 or 300, as described here, are the same limits as those promulgated with the 2023 Final Rule, just on an extended timeline. The EPA has reassessed the factors under AIM Act subsection (i)(4) given the additional information received ahead of the October 2025 Proposal and during the comment period. The Agency concludes that the targeted relief in this rule is appropriate given changes in our understanding of the availability of substitutes, particularly with regard to building codes and safety, and the overall economic costs. Similar to supermarket systems, the interim limit temporarily allows for the use of a set of certain refrigerants and reduces the burden on remote condensing unit systems as they transition to new substitutes. The EPA also recognizes that many remote condensing units are already using refrigerants that would have complied with the 2023 Final Rule's limits. This rule does not prevent anyone from choosing to

use refrigerants below the limits of 150 or 300 ahead of the new compliance requirements for new systems. The Agency describes and responds to comments in section IV.D of this preamble and the Response to Comments document in the docket.

E. Cold Storage Warehouses

The EPA is finalizing amendments to the limits for cold storage warehouses to establish a graduated schedule with an interim limit of 700 upon the effective date of this rule, and 150 or 300, depending on charge size or whether it is part of the high temperature side of a cascade system, starting January 1, 2032.

1. Background

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: packaged systems and central plant 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 compressors. 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.[84]

The 2023 Final Rule established restrictions on the use of HFCs in new cold storage warehouses installed starting January 1, 2026. The limit is 150 for systems with refrigerant charge capacities greater than or equal to 200 pounds, and 300 for systems with refrigerant

[84] *See* 88 FR 73162 (October 24, 2023).

charge capacities less than 200 pounds or for the high temperature side of cascade systems irrespective of the total charge capacity.

The 2023 Final Rule would have required new cold storage warehouses to be installed with refrigerants below a 150 or 300 limit, as applicable, including ammonia, CO_2, certain HFOs, or certain HFC/HFO blends.[85] While most cold storage warehouses had used ammonia at the time, substitutes with lower toxicity and lower flammability were still under development and had not yet been listed by the SNAP program as acceptable for use in new cold storage warehouses. While additional options were listed by SNAP in June 2024,[86] in advance of the January 1, 2026, compliance date, the 2023 Final Rule would have largely made these newer refrigerant blends, ammonia, or CO_2 the only options for new installations of cold storage warehouses.

A new trade association submitted a request to the EPA on March 6, 2025, to adjust the limits for cold storage warehouses from 150 or 300, as applicable, to 700. The trade association highlighted that ammonia, a higher toxicity and flammable refrigerant, can present potential safety concerns particularly when cold storage warehouses are not located in isolated, unpopulated areas. The trade association cited a number of recent examples of fatalities, injuries, and facility evacuations related to the use of ammonia as a refrigerant in cold storage warehouses in the United States.

The trade association's request was to adjust the limit for cold storage to allow for the use of additional refrigerants, and in particular, R-513A. The trade association identified R-513A as a refrigerant in this subsector that met their safety, commercial availability, energy efficiency, and usability requirements. The trade association indicated that the substitutes identified by the EPA in the 2023 Final Rule would not necessarily be available in every situation due to flammability or toxicity concerns, commercial availability, decreased energy efficiency, not

[85] *See* 88 FR 73157 (October 24, 2023).
[86] *See* 89 FR 50410 (June 13, 2024).

being mechanically practical due to excessive displacement, building codes not being updated, and/or economic costs.[87]

The EPA also received information from another trade association representing cold storage warehouses on June 9, 2025, in response to the March 6, 2025, request, concerning a 2023 survey from the Global Cold Chain Alliance (GCCA).[88] That survey showed that over 90 percent of cold storage warehouse refrigeration systems in the United States used either ammonia or CO_2.

The EPA proposed an interim limit of 700 starting January 1, 2026, for new cold storage warehouses. Starting January 1, 2032, the EPA proposed limits of 150 or 300, depending on the characteristics of the system, as described previously. To balance near-term safety, feasibility, and substitute availability, the EPA proposed an interim limit of 700 for new cold storage warehouses to allow the use of nonflammable, lower toxicity options such as R-513A, where ammonia or alternatives with flammability designations are impractical due to documented safety incidents, building code constraints, mechanical and efficiency considerations, and/or supply-chain limitations. Beginning January 1, 2032, the EPA proposed to lower the limit to 150 or 300, as applicable in anticipation that building codes will be updated, technologies will mature, and market availability of substitutes will expand.

2. Final Rule

The EPA is finalizing the graduated schedule for the use of HFCs in new cold storage warehouses similar to what was proposed. Specifically, the EPA is amending the existing limit, on an interim basis, to 700, upon the effective date of this rule, and limits of 150 or 300, depending on charge size or whether it is part of the high temperature side of a cascade system, starting January 1, 2032. For cold storage warehouse systems with a charge size of 200 pounds or more, excluding the high temperature side of a cascade system, the limit is 150. For cold

[87] *See* request from trade association, dated March 6, 2025, in the docket for this action.
[88] *See* letter from trade association, dated June 9, 2025, in the docket for this action.

storage warehouse systems with a charge size less than 200 pounds, or for the high temperature side of a cascade system, the limit is 300. The limits of 150 or 300, as described here, are the same limits as those promulgated with the 2023 Final Rule, just on an extended timeline. The EPA has reassessed the factors under AIM Act subsection (i)(4) given the additional information received ahead of the October 2025 Proposal and during the comment period. The Agency concludes that the targeted relief in this rule is appropriate given changes in our understanding of the availability of substitutes, and in particular a need for additional non-flammable, lower toxicity alternatives in the near term. The interim limit temporarily allows for the use of a set of certain refrigerants and reduces the burden on cold storage warehouse systems as they transition to new substitutes. The EPA also recognizes that most cold storage warehouses are already using refrigerants that would have complied with the 2023 Final Rule's limits, including ammonia and CO_2. This rule does not prevent anyone from choosing to use refrigerants below the limits of 150 or 300 ahead of the new compliance requirements for new systems.

While entities in many areas of the United States can and do use substitute refrigerants in this subsector, the EPA acknowledged in the proposal that factors such as the use of ammonia in a system containing thousands of pounds of refrigerant charge could pose a safety risk in densely populated areas if a leak were to occur, or if such a system were to be handled improperly and could hinder compliance on a nationwide scale, including in densely populated areas. The Agency describes and responds to comments in section IV.E of this preamble and the Response to Comments document in the docket.

F. Replacement Condensing Units in the Residential and Light Commercial Air Conditioning and Heat Pump Subsector

The EPA did not propose and is not finalizing changes to the treatment of new condensing units used as replacements in the residential and light commercial AC/HP subsector.

1. Background

The residential and light commercial AC/HP subsector includes many types of equipment, from self-contained products such as packaged terminal air conditioners and window AC units to unitary split systems such as ducted and non-ducted mini-splits, multi-splits, and ducted air conditioners and heat pumps. This section pertains only to the treatment of condensing units used in split AC/HP systems, including mini-splits and multi-splits, that are field assembled and charged. These systems consist of an outdoor unit with a condenser and a compressor, refrigerant lines, and an indoor unit with an evaporator. The evaporator and air handler may, or may not, be connected to ducts to carry conditioned air throughout a building.

The unit in which the condenser and compressor are packaged together is called a "condensing unit." The condensing unit discharges heat and is typically located outside. ASHRAE defines a condensing unit as a "machine designed to condense refrigerant vapor to a liquid by compressing the vapor in a positive displacement compressor and rejecting heat to a cooling medium. A condensing unit usually consists of one or more positive displacement compressors and motors, condensing coils, liquid receivers, and other devices mounted on a common base."[89]

In proposing the 2023 Final Rule (hereinafter "Proposed 2023 Rule") the EPA proposed that restrictions would apply to "products," which would have included condensing units.[90] Specifically, the proposal stated, "effective January 1, 2025, no person may manufacture or import *any product*… as listed in §84.56(a)" (emphasis added).[91] Likewise, "effective January 1, 2026, no person may sell or distribute, offer to sell or distribute, make available to sell or distribute, purchase or receive, attempt to purchase or receive, or export *any product*… as listed in § 84.56(a)" (emphasis added). The proposed definition of "product" in 40 CFR 84.56(a)

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[89] *See* ASHRAE Terminology in the docket for this action, and at *https://terminology.ashrae.org*.
[90] *See* 87 FR 76738 (December 15, 2022).
[91] 40 CFR 84.56(a)(24) lists "Residential and light commercial air-conditioning and heat pump systems, when using or intended to use 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 systems." The Proposed 2023 Rule did not distinguish between "products" and "systems" like the 2023 Final Rule.

would have contained a non-exhaustive list that included "equipment, appliances, components, [and] subcomponents." A condensing unit is a component of the larger unitary split AC/HP system and therefore, under the proposed rule, would have been subject to restrictions. Under that proposal, the condenser and compressor housed within a condensing unit would have been considered either components or subcomponents and would have been subject to restrictions.

The EPA received many comments on the Proposed 2023 Rule expressing concern about the impact of restricting components and subcomponents using legacy refrigerants. The comments were almost universally opposed, with the specific concerns varying on the type of restriction placed on the component, including: manufacture and import; sale and distribution; and the purchase and use to maintain existing equipment. Most comments were made in the context of refrigeration systems, such as supermarket systems, which contain numerous components, including multiple compressors on a rack, that are commonly replaced to keep the expensive and complex systems operational. One comment made in the context of AC systems expressed concern about the ability to honor warranties for existing systems without replacement components. Based on the concern expressed by commenters, the Agency removed components and subcomponents from the final definition of "product." Instead, the final rule classified condensing units as one of five "specified components" at 40 CFR 84.52 to make clear that they were not subject to the restrictions on manufacture, import, sale, distribution, or export and thus allow for the continued servicing and maintenance of existing equipment. The EPA prohibited specified components using legacy refrigerant to be installed as new systems after the applicable installation compliance date.

After finalization of the 2023 Final Rule, the EPA received two administrative petitions, one from a chemical manufacturer and the other from a group of trade associations, requesting that the Agency reconsider that final rule as it applies to the residential and light commercial AC/HP subsector. The two administrative petitions requested reconsideration of separate

provisions of the regulations as means to achieve a similar outcome, that is, reconsideration of the treatment of condensing units used as replacements in existing systems.

The administrative petition from the chemical manufacturer requested that the EPA remove provisions that allow the continued use of specified components that use regulated substances above the 700 limit in the residential and light commercial AC/HP subsector. The petitioner stated that the EPA did not propose a definition of "specified component," nor did it propose to exempt specified components from the HFC use prohibitions. The petitioner noted that the EPA proposed the opposite by including components and subcomponents in the list of products subject to the proposed restrictions. The petitioner stated that the final rule allows for unlimited replacement of condensers, evaporators, and compressors in this subsector, thereby extending the life of existing systems beyond their designed lifetimes without taking comment on the impacts of such extended use. In meetings with the EPA regarding the petition, the petitioner clarified that its concern was limited to the replacement of condensing units used in split AC systems in the residential and light commercial AC/HP subsector, not the other four specified components, nor condensing units used in refrigeration subsectors.[92]

The administrative petition from the group of trade associations requested that the EPA make a determination that replacing certain condensing units in the residential and light commercial AC/HP subsector would be considered the installation of a new system under 40 CFR 84.54(e). The administrative petition is limited to condensing units in this subsector that are designed for use with a single condenser and a single evaporator. The administrative petition requested that the EPA not restrict condensing units used in variable refrigerant flow (VRF) systems,[93] multi-split systems, and commercial AC systems with more than one condenser and/or more than one evaporator. After submitting their initial administrative petition, the group of trade

[92] *See* Memorandum - EPA Meetings Related to the Technology Transitions Reconsideration Notice of Proposed Rulemaking in the docket for this action.
[93] *See* 88 FR 73178 for a description of VRF systems.

associations submitted a letter to the EPA containing supplemental information that limited their request to condensing units with a capacity less than 65,000 BTUs.[94]

In the proposal for this rule and in response to stakeholder administrative petitions, the EPA proposed to retain the requirements established by the 2023 Final Rule regarding the treatment of condensing units used in the residential and light commercial AC/HP subsector. The proposal provided an opportunity for the public to comment on the treatment of condensing units in this subsector and in doing so, the EPA noted it was addressing one petitioner's concerns about their inability to comment on changes made between proposal and finalization of the 2023 Final Rule regarding the treatment of components.

2. Final Rule

In this final rule, the EPA is not making any changes to the treatment of new condensing units in the residential and light commercial AC/HP subsector. This includes no change to the definitions at 40 CFR 84.52, the installation restriction at 40 CFR 84.54(c)(1), the list of actions that the EPA considers an installation of a new system at 40 CFR 84.54(e), the exemption for components at 40 CFR 84.56(b), or the labeling, reporting, and recordkeeping requirements applicable to specified components. Allowing a continued market (*i.e.*, manufacture, import, export, sale, or distribution) for specified components enables end-users to maintain their existing systems, even if those systems use legacy HFC refrigerants. By making no changes to the current regulations, a homeowner can choose to replace their failed condensing unit rather than purchase a whole new system. The EPA's decision to not change the treatment of condensing units aligns with subsection (i)(7)(B) of the AIM Act and consistent with the Agency's historical practice of allowing repair of legacy equipment throughout its useful life. This final decision is also consistent with the Presidential Memorandum titled *Delivering Emergency Price Relief for American Families and Defeating the Cost-of-Living Crisis,* which directs "the heads of all executive departments and agencies to deliver emergency price relief,

[94] *See* supplemental letter from trade associations, dated April 30, 2024, in the docket for this action.

consistent with applicable law, to the American people and increase the prosperity of the American worker," including by "pursuing appropriate actions to . . . eliminate counterproductive requirements that raise the costs of home appliance[.]" If restrictions were to be placed on replacing the condensing unit, the owner's only recourse would be to replace the entire system. Installing a new system is more costly than replacing just the condensing unit, particularly if the system is relatively new, and in some instances, warranties or insurance will only cover the replacement of like equipment. The Agency describes and responds to comments in section IV.F of this preamble and the Response to Comments document in the docket.

G. Industrial Process Refrigeration in Certain Laboratory Equipment

The EPA is finalizing provisions related to certain laboratory equipment within the industrial process refrigeration subsector. This final rule extends the compliance date for refrigerated centrifuges and laboratory shakers to January 1, 2028.

1. Background

a. Refrigerated Centrifuges

A refrigerated centrifuge is a laboratory device that spins samples at a high speed while keeping them at a low, controlled temperature. Refrigerated centrifuges are a niche subset of equipment used in laboratories and have narrow technical requirements which limit the refrigerants that can be used. The EPA understands that refrigerated centrifuges are critical for blood processing and other essential pharmaceutical and medical industries.

The 2023 Final Rule included refrigerated laboratory equipment within the IPR subsector.[95] Specifically, the 2023 Final Rule stated that refrigerated laboratory equipment covered by either the 2nd edition of the UL 61010-2-011 standard or the 2nd edition of the UL 60335-2-89 standard are subject to the restrictions in the rule.[96] The restrictions on the use of HFCs and HFC blends in new IPR equipment vary based on the lowest temperature at which the

[95] The EPA is not aware of IPR centrifuge configurations used for laboratory applications that would be covered by the IPR chiller subsector as opposed to the IPR subsector at 40 CFR 84.54(a)(10), (c)(5), or (c)(6).
[96] *See* p. 209 of the Response to Comments document for the 2023 Final Rule.

equipment is designed to operate, charge size, and the configuration of the equipment. IPR equipment with refrigerants entering the evaporator at temperatures between -50 °C and -30 °C have a compliance date of January 1, 2028, while IPR equipment with refrigerants entering the evaporator at temperatures at or above -30 °C have a compliance date of January 1, 2026. These restrictions are codified at 40 CFR 84.54(a)(12) and 84.54(c)(10).

The 2023 Final Rule excluded centrifuges with charge sizes above the threshold consistent with UL 61010-2-011. The EPA recognized that refrigerated centrifuges that contain less than 150 g of flammable refrigerant charge (or 370 g of nonflammable refrigerant charge) can meet the UL standards using refrigerants below the limits for IPR and are subject to the HFC use restriction. Conversely, the EPA recognized that refrigerated centrifuges that require more refrigeration capacity than can be achieved using refrigerants that meet the HFC use restrictions while meeting the charge size limits in UL 61010-2-011 are not restricted. This is because the refrigerants that meet the IPR restrictions are either flammable, have a higher toxicity, or have higher pressure than other available refrigerants, and as such, either require an upper limit on charge size to meet the UL standard's safety requirements or are outside the current scope of the UL standard altogether.

After issuance of the 2023 Final Rule, a manufacturer contacted the EPA concerning refrigerated centrifugal equipment that follows UL 61010-2-011 or UL 61010-2-020. The manufacturer stated that refrigerated centrifuges need to be tested to American National Standards Institute (ANSI)/UL standards 61010-2-011 or 61010-2-020 before mass production. The manufacturer described how UL 61010-2-020 requires a particular test for refrigerated centrifuges called the Maximum Credible Accident (MCA) test which assesses the safety of centrifugal equipment in a worst-case mechanical failure. The test simulates an accident scenario where the rotor assembly, a high-speed spinning part of the centrifuge, experiences catastrophic failure or becomes detached during rotation. This test ensures that the design and structure of the equipment are robust enough to contain debris and prevent personnel from hazardous exposure

in such an event. The manufacturer explained that the MCA test itself is currently not designed in a manner that allows for testing of flammable or high-pressure refrigerants.

The EPA understands that this update to the UL safety testing procedure impacts all centrifuge manufacturers. The manufacturer noted that the MCA test was expected to be updated in 2025, before the January 1, 2026, compliance date, but that additional time would be needed for manufacturers to redesign, test, and certify centrifuges to the revised standards. The manufacturer later stated in a meeting that they anticipate that standards and equipment will be updated by January 1, 2028.[97] The EPA understands that as of February 2026, the updates to UL 61010-2-020 have not yet been finalized to accommodate testing refrigerated centrifuges with the MCA test using flammable and high-pressure refrigerants. While the EPA does not know when the updates will be completed, we have no information to suggest it will not be completed by January 1, 2028.

The EPA proposed and is now finalizing an extension of the compliance date for refrigerated laboratory centrifuges within the IPR subsector from January 1, 2026, to January 1, 2028. This extension allows additional time for the industry standard setting process to finalize updated test procedures specific to refrigerated centrifuges so that new refrigerants can be safely deployed for use in this niche application.

b. Refrigerated Laboratory Shakers

Laboratory shakers are specialized pieces of equipment used in scientific and medical laboratories to continuously agitate liquid biological samples at controlled temperatures. These devices are designed for applications that require temperature-sensitive conditions, such as growing microbial cell cultures or eukaryotic tissue cultures. The temperature range can span in some applications from around 4 °C to 80 °C.

[97] *See* Memorandum - EPA Meetings Related to the Technology Transitions Reconsideration Notice of Proposed Rulemaking in the docket for this action.

The 2023 Final Rule indicated that refrigerated laboratory equipment that use an HFC or blend containing HFC(s) are regulated within the IPR subsector.[98] Refrigerated laboratory shakers are covered by the UL 60335-2-89 standard and are regulated as a part of this subsector.

Under the regulations at 40 CFR 84.54, IPR equipment with refrigerants entering the evaporator at temperatures at or above -30 °C have a compliance date of January 1, 2026. After issuance of the 2023 Technology Transition Rule, a manufacturer contacted the EPA regarding refrigerated laboratory shaker equipment. The manufacturer stated that there are currently limited alternatives for small, compact IPR systems, such as laboratory shakers.[99] The manufacturer noted that while there are some non-HFC alternatives currently on the market in some laboratory equipment applications, such as R-290[100] and R-1234yf, these alternatives pose safety, efficiency, and cooling capacity challenges in compact lab environments and in certain laboratory applications. For example, flammability is a particular concern from both a regulatory and safety perspective, as laboratories often have open flames, solvents, or other electronics present that could trigger an ignition.

Since laboratory shakers are used in various cell culture applications, the manufacturer also described how a wide temperature operation range and precise temperature control are crucial to ensure optimal cell growth conditions and experimental accuracy. A temperature operation range that extends as low as 4 °C and up to 80 °C allows for a range of biological laboratory research applications. The manufacturer indicated that currently R-134a is the only refrigerant used that can achieve such a wide temperature range. Not all shakers have this wide temperature range, and in particular, some do not extend as high as 80 °C. Shakers that use R-600a[101] or a Peltier cooling method[102] can operate at temperatures as high as 60 °C. This limits

[98] The EPA is not aware of IPR shaker configurations used for laboratory applications that would be covered by the IPR chiller subsector as opposed to the IPR subsector at 40 CFR 84.54(a)(10), (c)(5), or (c)(6).
[99] *See* materials from manufacturer at EPA-HQ-OAR-0005-0007.
[100] Commonly known as propane.
[101] Commonly known as isobutane.
[102] Peltier cooling uses a thermoelectric effect for cooling. It does not contain refrigerant.

the capability of such shakers from operating at temperatures above 60 °C, in which certain niche research processes are conducted.

While a range of options are used to control temperature in laboratory shakers, including compliant refrigerants that can meet the requirements in some refrigerated laboratory shaker applications, there remain some use cases in which compliant refrigerants are unable to meet the requirements. The manufacturer noted that temperature accuracy to within 0.1 °C is required to maintain the integrity of the cell cultures and reliability of results in certain research applications.[103] The manufacturer shared information that illustrated how not all shakers have this precise temperature control capability. Some laboratory shakers can provide an accuracy within 0.3 °C, and some of those are already using compliant refrigerants, including R-600a.

The manufacturer noted that one feasible alternative that could achieve desired temperature specifications is CO_2, but that current IPR systems for this refrigerant are primarily designed for large-scale industrial refrigeration systems and that there are limited solutions for small-scale laboratory equipment. Systems are currently in development but are not expected to be available until mid-2027 at the earliest.[104]

The EPA proposed and is now finalizing an extension of the compliance date for refrigerated laboratory shakers within the IPR sector from January 1, 2026, to January 1, 2028. This extension is to allow additional time for the safe deployment of new refrigerants and not-in-kind substitutes (*e.g.*, Peltier cooling) for use in this niche refrigerated laboratory application.

2. Final Rule

The EPA is extending the compliance date to January 1, 2028, for refrigerated laboratory centrifuges and refrigerated laboratory shakers within the IPR subsector. This extension does not apply to other types of equipment in the IPR subsector or to refrigerated laboratory equipment

[103] *See* materials from manufacturer at EPA-HQ-OAR-0005-0007.
[104] *See* materials from manufacturer at EPA-HQ-OAR-0005-0007.

not discussed in this action. After reviewing public comments received during the comment period, the EPA is finalizing this extension as proposed.

a. Refrigerated Centrifuges

Comments received on the October 2025 Proposal reiterated information received from requests to reconsider the compliance deadline for refrigerated laboratory centrifuges finalized in the 2023 Final Rule. This extension allows additional time for the industry standard setting process to finalize updated test procedures specific to refrigerated centrifuges so that new refrigerants can be safely deployed for use in this niche application. The EPA did not receive adverse comments opposing the proposal.

The EPA has reassessed the four factors under AIM Act subsection (i)(4) given the additional information received ahead of the October 2025 Proposal and during the comment period. Based on comments and the information provided by manufacturers, the Agency agrees that the MCA test required in UL 61010-2-020 cannot be performed until modifications are made to accommodate the safety risks associated with fire hazards, ballistic threats, or toxicity hazards and understands that the standards and equipment updates are expected to be completed by January 1, 2028. Therefore, the EPA concludes that the targeted relief in this rule is appropriate given changes in our understanding of the availability of substitutes and is extending the compliance date to January 1, 2028, for refrigerated centrifuges within the IPR subsector. The Agency describes and responds to comments in section IV.G of this preamble and the Response to Comments document in the docket.

b. Refrigerated Laboratory Shakers

Comments received on the October 2025 Proposal reiterated information received from requests to reconsider the compliance deadline for refrigerated laboratory shakers finalized in the 2023 Final Rule. This extension is to allow additional time for the safe deployment of new refrigerants and not-in-kind substitutes (*e.g.*, Peltier cooling) for use in this niche refrigerated laboratory application. The EPA did not receive adverse comments opposing the proposal.

The EPA has reassessed the factors under AIM Act subsection (i)(4) given the additional information received ahead of the October 2025 Proposal and during the comment period. Based on comments and the information provided by manufacturers, the Agency acknowledges that several refrigerants are currently being used in refrigerated laboratory shakers but that they do not all have the same temperature operation range or control capacity. The Agency is also aware that CO_2 is being developed for use in laboratory shakers to have the necessary specifications that can meet manufacturers and researchers' requirements in time before 2028. As such, the EPA concludes that the targeted relief in this rule is appropriate given changes in our understanding of the availability of substitutes and is extending the compliance date from January 1, 2026, to January 1, 2028, for all refrigerated laboratory shakers, to provide additional time for compliant refrigerant options to be developed for refrigerated laboratory shaker uses. The Agency describes and responds to comments in section IV.G of this preamble and the Response to Comments document in the docket.

H. Preventing Stranded Inventory of Residential and Light Commercial Air Conditioning and Heat Pump Equipment

The EPA is finalizing, as proposed, the removal of the deadline for installing residential and light commercial AC/HP systems when using equipment that was domestically manufactured or imported into the United States before January 1, 2025.

1. Background

The 2023 Final Rule restricted installation of new residential and light commercial AC/HP systems using refrigerants above a limit of 700 beginning January 1, 2025. Systems in this subsector include unitary split systems such as ducted and non-ducted mini-splits, multi-splits, and ducted air conditioners and heat pumps.

After that rule was finalized, the EPA received information including data concerning how the January 1, 2025, installation date restriction would result in substantial stranded inventory for residential new construction, including both single-family and multi-family

dwellings, where builders order heating and cooling equipment well in advance of knowing the exact date of installation. The EPA published an IFR on December 26, 2023, to address the unique circumstances of this subsector to prevent equipment from being stranded.[105] That rule extended the installation compliance date for such systems by one year, to January 1, 2026, so long as the equipment was manufactured in the United States or imported into the United States before January 1, 2025. Since publication of the IFR, other entities requested additional time beyond January 1, 2026, to install residential and light commercial AC/HP systems.[106] These requesters shared that additional time is needed because of construction delays particularly for certain large construction projects (*e.g.*, for multifamily housing) that have long timelines.[107] Without further extension of the installation compliance date, they noted that there could still be stranded inventory of equipment domestically manufactured or imported before 2025.

In addition, at the time of the 2023 Final Rule, the EPA understood that substitutes, including R-454B and R-32, were being developed and deployed. The rate of new installations that used these substitutes has increased significantly, in particular in 2025.[108] This left larger inventories than expected of equipment using refrigerants above the 700 limit at risk of being stranded.

Further, the EPA observed that the transition to equipment in the residential and light commercial AC/HP subsector using compliant refrigerants, including R-454B, saw unexpected supply issues during deployment.[109] While there was a sufficient supply of R-454B, there were challenges supplying the refrigerant in service cylinders to contractors and technicians, resulting

[105] S*ee* 88 FR 88825 (December. 26, 2023).
[106] *See* comment on the IFR (88 FR 88825 (December. 26, 2023)) from the National Multifamily Housing Council and National Apartment Association, as well as a list of stakeholders who submitted relevant questions and comments to the EPA, both at EPA-HQ-OAR-0005-0007.
[107] *See* comment on the IFR (88 FR 88825 (December. 26, 2023)) from the National Multifamily Housing Council and National Apartment Association at EPA-HQ-OAR-0005-0007.
[108] *See* HARDI press release, "A2L Equipment Reaches 90% of Market Share as Cooling Season Ends," November 19, 2025, in the docket for this action.
[109] *See* Memorandum – Overview of R-454B Refrigerant Shortage and Current Status, in the docket for this action.

in R-454B scarcity in some regions. In particular, some contractors and technicians had difficulties securing R-454B refrigerant in the field to charge these units during installation.

The EPA proposed to remove the installation compliance date for the residential and light commercial AC/HP subsector if the components were manufactured domestically or imported into the United States before January 1, 2025, to avoid stranded inventory. The EPA also considered extending the installation compliance date to January 1, 2027, as an alternative means by which to also avoid stranding inventory.

2. Final Rule

The EPA is finalizing, as proposed, the removal of the deadline for installing residential and light commercial AC/HP systems that use specified components that were domestically manufactured or imported into the United States before January 1, 2025.

The EPA has reassessed the factors under AIM Act subsection (i)(4) given the additional information received ahead of the October 2025 Proposal and during the comment period. The EPA proposed and is now finalizing this provision to provide additional options to support consumers given the specific circumstances discussed in this section and in section IV.H of this preamble concerning the introduction of R-454B equipment ahead of 2026 and the resulting supply chain issues observed in 2025. Removing the installation compliance date allows for the installation of the remaining inventory of R-410A equipment that had been manufactured in the United States or imported into the United States before January 1, 2025, for use in this subsector, which could be a lower cost option for consumers. The EPA does not expect there to be discernible impacts from those already modeled in the analysis for the 2023 Final Rule, since the total number of systems available for installation using legacy refrigerants would match what the Agency modeled for that rule. The EPA concludes that the targeted relief in this rule is appropriate given changes in our understanding of the supply chain issues that resulted in more limited availability of substitutes than was anticipated and overall economic costs. The Agency

describes and responds to comments in section IV.H of this preamble and the Response to Comments document in the docket.

I. Labeling Correction

The EPA is finalizing the correction of an erroneous citation in the regulatory text at 40 CFR 84.58(b). The regulatory text now correctly directs the reader to paragraph (d), not to paragraph (c).

J. Effective Date of Rules under Paragraph (i)(6)

The EPA is making this final rule effective 60 days after publication in the *Federal Register*, as proposed.

Subsection (i)(6) of the AIM Act states that "no 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."[110] The best reading of this statutory text is that the one-year clock begins upon promulgation of the "applicable rule" that established the restrictions at issue—here, the 2023 Final Rule, which invoked the EPA's discretionary authority under subsection (i) for the first time to establish the restrictions at issue in this reconsideration action. In other words, the one-year effective date delay requirement does not apply to subsequent rules that are unambiguously less stringent than the existing restrictions, including the relaxation or removal of existing restrictions.

The 2023 Final Rule described the EPA's interpretation of subsection (i)(6) of the AIM Act as applying to the establishment of restrictions on the use of HFCs under subsection (i)(1) of the AIM Act. Based on that interpretation, the Agency established compliance dates for the restrictions on the domestic manufacture and import of products and installation of systems that were at least one year from the date of promulgation. At the same time, we did not delay compliance or effective dates for provisions pertaining to program administration and petitions processing and elected to make those provisions effective 60 days after publication in the

[110] *See* 42 U.S.C. 7675(i)(6).

Federal Register.[111] Thus, in the 2023 Final Rule, the Agency recognized that subsection (i)(6) does not require a one year delayed effective date for all regulatory actions under subsection (i).

This interpretation flows from the statutory text of subsection (i)(6): "No 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."[112] Congress's inclusion of the word "applicable" makes it clear that the "rule under this subsection" referred to at the beginning of the sentence may be different in at least some cases than the "applicable rule under this subsection" referenced at the end. The canon against surplusage argues that every word and phrase in a statute should be assumed to have an effect. If this section was drafted with the intent that the two rules referenced are always one and the same—i.e., that the effective date requirement applies to any rule—the word "applicable" could be simply struck from the text and the meaning would remain the same: "No rule under this subsection may take effect before the date that is 1 year after the date on which the Administrator promulgates the [] rule under this subsection."

Assuming that the word "applicable" means something, the best interpretation of the statutory text in this provision is that the "applicable" rule is a rule that creates new restrictions for a particular sector or subsector, which is when a one-year delay accomplishes Congress's objectives. Providing a full year delay between promulgation and application of a compliance deadline is important when a new sector or subsector is being regulated, as with the 2023 Final Rule, to provide regulated parties sufficient notice to plan for and adjust to new restrictions. However, when the EPA is revising an existing restriction by, for example, providing additional time for compliance or changing a temperature threshold to make the previously existing restriction less stringent, the need for adequate notice to parties subject to the restriction is less compelling. In that case, the "applicable rule" is the rule that created the original restrictions, not

[111] S*ee* 88 FR 73104 (October 24, 2023).
[112] *See* 42 U.S.C. 7675(i)(6).

a subsequent rule making the restrictions less stringent. That interpretation is consistent with the purpose of subsection (i)—authorizing the EPA to manage the transition toward non-HFC substitutes while ensuring that implementation is not unduly disruptive—and with general principles of administrative law.[113] This interpretation also aligns best with the text and structure of subsection (i), which contemplates the remaining provisions of subsection (i) applying to rules creating restrictions: "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."[114] The Agency therefore finds the best reading of the effective date provision in subsection (i)(6) as not restarting the one-year delay in effective date upon promulgation of the adjustments in this rulemaking that provide relief from existing restrictions originally promulgated in the 2023 Final Rule. The provision would still require a one-year delay in effective date for the creation of any new restrictions, whether in the sectors or subsectors covered by the 2023 Final Rule or otherwise, as that would be an "applicable rule" under subsection (i)(6).

Since finalizing the 2023 Final Rule, the EPA has issued two rules under subsection (i) of the AIM Act that adjusted existing restrictions based on new information. In those rules, we made changes to the requirements under subsection (i), including extending compliance dates, at least one year before the restriction taking effect.[115] To the extent those previous rules took a position to the contrary, the Agency has reconsidered its position and finds that the best reading of subsection (i)(6) is that the one-year clock begins upon promulgation of the "applicable rule" at issue, and does not begin again upon promulgation of a rule modifying existing restrictions that were originally promulgated under subsection (i) if those modifications provide relief from a restriction.

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[113] Congress has long recognized in the Administrative Procedure Act, for example, the distinction between "a substantive rule" that "relieves a restriction" and one that does not for effective-date purposes. 5 U.S.C. 553(d)(1). *See Indep. U.S. Tanker Owners Comm. v. Skinner*, 884 F.2d 587 (D.C. Cir. 1989) (effective date requirement did not apply even when a waiting period would have benefited third parties).

[114] *See* 42 U.S.C. 7675(i)(1) (emphasis added).

[115] S*ee* 88 FR 88826 (December. 26, 2023); 89 FR 100381 (December. 12, 2024).

IV. Comments and Responses

This section of the preamble presents a summary of, and the EPA's responses to, the significant comments received on the October 2025 Proposal for the topics addressed in each subsection. The EPA's full response to comments on the October 2025 Proposal, including any comments not discussed in this preamble, is available in the EPA's Response to Comments (RTC) document for this final rule.

A. Refrigerated Transport – Intermodal Containers

Comment: Commenters that addressed this provision were generally supportive of the EPA's proposal to raise the temperature threshold. Many commenters noted that this was a targeted change based on new data that properly differentiates low-temperature transport refrigeration equipment that has unique technical challenges from other equipment. One commenter indicated this adjustment is tailored, technically justified, and administratively sound. Another commenter described this change as a "technical tweak" that relaxes an overly stringent use condition and does not introduce any new restrictions.

Response: The EPA agrees with the commenters that supported the proposal for reasons that include it is tailored, technically justified, administratively sound, and a technical adjustment.

Comment: A few commenters disagreed with the Agency's proposal. One commenter suggested that the threshold be -40 °C since intermodal containers that use compliant refrigerants at that temperature have been commercially available on the global market for more than a decade. This commenter also did not believe that there is a significant distinction between the temperature needs of deep frozen versus fresh and frozen cargo in the -35 °C to -40 °C range, and that most critical life sciences products such as blood plasma and pharmaceuticals require temperatures below -50 °C. A few commenters who were generally opposed to any relaxing of the requirements of the 2023 Final Rule were opposed to changing the temperature threshold due to environmental impacts. One commenter suggested that relief could be time-limited. This

commenter noted that if the relief is provided for the purpose of shipping critical materials, then the reliable supply of refrigerant is also critical.

Response: The EPA disagrees with commenters who opposed changing the temperature threshold for refrigerated transport intermodal containers. These commenters did not provide technical information to counter the information cited in the proposed rule that demonstrated the need for a change given a lack of available refrigerants that would be effective at this low temperature range.

The EPA disagrees with the suggestion of a temporary change to this restriction as the Agency does not have information at this time indicating when an alternative will be available that would meet the limit established in the 2023 Final Rule which could meet the needs of intermodal refrigerated transport equipment in this temperature range. Given the transportation conditions necessary for shipping blood plasma, pharmaceuticals, temperature-sensitive enzymes, dangerous goods, and other materials at temperatures below -35 °C, the EPA agrees to provide targeted relief. However, to the extent that alternatives are developed in the future, the Agency may consider a rulemaking to restrict the use of legacy refrigerants. The EPA also disagrees with one commenter's request to change the temperature threshold to -40 °C. While this commenter indicated that there is not a significant distinction between the temperature needs of cargo in the -35 °C to -40 °C range, the commenter did not provide technical information to support the change, such as which refrigerant(s) or any supporting documentation. The lack of a distinction between -35 °C and -40 °C supports the Agency's decision.

The EPA also clarifies that the lowest temperature at which equipment is designed to operate determines whether it is subject to use restrictions. This means that if a refrigerated transport – intermodal container is designed to achieve a box temperature below -35 °C, it would not be subject to restrictions even if at times the container is operated at temperatures at or above -35 °C.

Comment: Several commenters who addressed this provision in their comments confirmed that utilizing box temperature is the standard industry practice for designing, marketing, and selling refrigeration equipment used in intermodal refrigerated transport, and no commenter opposed the Agency's proposal to change the temperature measurement location.

Response: The EPA is finalizing the box temperature as the point of temperature measurement to better align with common industry practice.

B. *Industrial Process Refrigeration and Chillers for Industrial Process Refrigeration in Semiconductor Manufacturing*

Comment: Commenters that addressed this provision in their comments were generally supportive of the Agency's proposal. Commenters in the semiconductor manufacturing industry agreed with the charge size threshold of 100 pounds or less for SMRE and stated that the proposal correctly recognizes the additional time needed to design, test, qualify, validate, and deploy the type of specialty equipment used in semiconductor manufacturing. Two commenters noted that the proposal appropriately accounts for long qualification cycles and complex supply chain integration that is unique to the industry.

Response: The EPA acknowledges commenters' support for the rationale behind the proposed revisions and is finalizing as proposed.

Comment: One commenter described the impacts if additional time to transition is not provided. This commenter stated there could be supply chain disruptions that could cascade across industries dependent on advanced chips, including automotive, telecommunications, energy production, and defense manufacturing. This commenter further noted that semiconductor manufacturing is uniquely capital-intensive, and even temporary interruptions can reverberate globally and cause shortages and price volatility.

Response: The EPA agrees with the semiconductor manufacturers' concerns, particularly for potential downtime and that such downtime could have impacts on critical industries and

national security. Given the information provided on more time to test, qualify, and validate substitutes, the EPA is providing until January 1, 2030, as described above.

Comment: One commenter stated the contribution of SMRE to overall HFC emissions is minimal, estimated at less than one-tenth of one percent of annual U.S. greenhouse gas emissions. Several commenters who were generally opposed to relaxing the requirements of the 2023 Final Rule due to impacts on the environment were opposed to this proposal.

Response: The EPA agrees that any potential impacts on HFC emissions would be minimal. The EPA also notes that the statute directs the Agency to factor in to the extent practicable the factors listed in subsection (i)(4) which includes the availability of substitutes, among other things. Based on the totality of the record for this rulemaking, and in particular the information on alternatives, the Agency has determined that more time is needed for substitutes to be designed, tested, qualified, validated, and deployed.

Comment: Three commenters said that an extension to January 1, 2030, may still be insufficient. Two of these commenters suggested that it may be insufficient for applications between -50 °C and -30 °C. The other commenter recommended an extension until December 31, 2030, to provide regulatory predictability and flexibility noting that the proposed timeline to transition may be too short. This commenter also supported an exemption for this equipment, noting that transition challenges will likely continue to persist past 2030. One commenter noted that even where substitutes may eventually become viable, equipment redesign, testing and qualification processes typically take at least five years from concept to deployment.

Response: The EPA acknowledges that qualification cycles for process refrigeration equipment in the semiconductor manufacturing industry can take a long time. The EPA notes that the submitter of the administrative petition indicated January 1, 2030, as a realistic compliance deadline, and that five semiconductor equipment manufacturers submitted letters in support of the petition. At this time, the EPA does not have any technical information or data that justifies a date

other than what the Agency proposed. To the extent additional information is provided that January 1, 2030, may not be sufficient, the EPA will consider revising the compliance date.

Comment: One commenter suggested that the EPA should provide a mechanism to re-evaluate the compliance date in 2028 for very low temperature applications.

Response: The EPA appreciates this comment, but the Agency did not propose and is not finalizing a mechanism to re-evaluate the 2030 compliance date. The Agency will continue to monitor the transition and encourages regulated entities to continue to share information on the development and deployment of alternative refrigerants, including those for low temperature applications. Based on the information and data the EPA currently has, the Agency anticipates this sector will be able to meet the January 1, 2030, compliance date as it will continue its progress on equipment redesign, testing, and qualification processes.

Comment: One commenter suggested the EPA establish a formal supply chain readiness review in advance of the 2030 deadline.

Response: The EPA did not propose and is not finalizing a formal mechanism to evaluate supply chain readiness in advance of 2030. The Agency will continue to monitor supply chain readiness. Based on the information the EPA currently has, the Agency does not foresee any supply challenges with meeting a 2030 deadline. However, if that changes, the EPA will reevaluate whether the 2030 deadline is achievable.

Comment: Commenters requested that the EPA narrow or expand the scope of equipment subject to this provision. One commenter encouraged the EPA to be clear that this flexibility applies to a narrow subset of equipment that requires extreme-precision projection lenses (*e.g.*, lithography), and not to other chillers and refrigeration systems used in fabrication plants. One commenter suggested that the EPA consider extending the proposal to all industrial process chillers with charge sizes up to 100 pounds, not just those used in SMRE. They stated that a uniform compliance date for these equipment types would be easier for manufacturers and users to administer, given the practical difficulty of identifying end-use applications.

Response: The EPA reaffirms that it is finalizing an extension only for a narrow subset of process refrigeration equipment that requires extreme precision used in the manufacture of semiconductors. Based on the information provided to the EPA, these process chillers and IPR equipment are highly specialized and require time to be qualified, validated, and deployed for use in semiconductor manufacturing. The EPA does not have sufficient technical information and does not consider it necessary to further narrow this provision to a specific subset(s) of semiconductor manufacturing equipment, such as projection lenses. The EPA finds that a delineation of SMRE with a charge size of 100 pounds or less is appropriate given the shared challenges of this equipment to be qualified, validated, and deployed for use.

The EPA did not propose and is not finalizing an exemption for all IPR and Chillers for IPR equipment with a charge size of 100 pounds or less except where such equipment is used for semiconductor manufacturing. The EPA acknowledges that IPR and Chillers for IPR are used in a range of applications. The EPA understands from the petitioner and from supporting information that semiconductor manufacturing use of IPR and Chillers for IPR equipment have unique challenges.

As described in this section IV.B, section III.B of this preamble, and in the October 2025 Proposal, the Agency received and considered new information after the issuance of the 2023 Final Rule specifically about semiconductor manufacturing. The Agency did not receive information concerning the limit or compliance for IPR and Chillers for IPR equipment containing 100 pounds or less more generally. Further, the EPA does not have information that would support the conclusion that it would be impossible to differentiate semiconductor manufacturers from other users of IPR or Chillers for IPR equipment.

Comment: Two commenters supported the EPA's clarification in the proposal that "the lowest temperature at which equipment is designed to operate determines whether it is subject to use restrictions."

Response: The EPA acknowledges these commenters' support. The EPA reiterates that IPR and Chillers for IPR used in the semiconductor manufacturing industry may operate at one temperature while being designed to reach lower temperatures. As stated in section III.A of this preamble, the lowest temperature at which equipment is designed to operate determines whether it is subject to use restrictions.

C. Retail Food – Supermarkets

1. Graduated Schedule

Comment: Some commenters supported the proposed graduated schedule to provide time for manufacturers and contractors to adapt, train technicians, develop safety protocols, and update building codes. One commenter also claimed that the original transition dates would disproportionately affect independent grocers, who would bear additional costs and pass them on to consumers. Another commenter stated that the phased approach benefits small and/or rural supermarkets with reasonable capital planning, coordinated vendor engagement, and long-term equipment investment, all of which provide critical flexibility for independent grocers.

Another commenter supported the limit of 1,400 for retail food applications to allow industry to organically transition to A2L refrigerants. According to one commenter, industry experts estimate that a minimum of 2-3 years is required after code updates before safe implementation can begin. Another commenter stated that the extended compliance date to 2032 allows code officials to put the appropriate Life Safety codes in place before introducing lower flammability refrigerants. One commenter agreed that supermarket systems required a later start date compared to remote condensing units in the phase-in approach, given they are more complex. The commenter also stated that the revisions to the compliance schedule provide immediate relief for stores needing to install new systems while providing a workable pathway to the 2023 Technology Transition Rule's targets.

Response: The EPA acknowledges commenters' support for the proposed graduated schedule of limits for supermarket systems. The Agency understands the need for additional

flexibility for supermarket systems in the near term, and acknowledges the complexity involved with designing and installing such systems and potential challenges with building code adoption, particularly at the local level. The EPA understands that many factors may be considered by store owners and operators when selecting a supermarket system, including choice of refrigerant. The EPA assessed the additional flexibility of providing the interim limit of 1,400 beginning on January 1, 2027, as adding for an additional set of refrigerants to be available for such consideration and aligns with the comments the EPA received. Commenters pointed to the need for more flexibility when selecting a refrigerant for their supermarket systems as well as allowing additional time for wider adoption of building codes to allow even more options, including A2L refrigerants.

Delaying the compliance date to 2032 for the limit of 150 or 300, as applicable, provides an additional five years for retailers to continue to install systems using HFC refrigerants below the 1,400 limit, which provides sufficient time for any current concerns identified by commenters to be resolved. The EPA is aware that there are already available options in use for supermarket systems that meet the requirements in the 2023 Final Rule; however, based on the information received ahead of the proposed changes and during the comment period, the EPA concludes that there are challenges related to deploying such systems in certain geographical areas of the United States that result in lag which is addressed by this rule. The Agency describes and responds to these comments and concerns, including building codes, energy efficiency, and more, in later responses in this section and in the Response to Comments found in the docket for this rule.

Comment: Some commenters opposed the sector-wide delay and interim limit for supermarket systems and stated that the requirements established in the 2023 Final Rule should be maintained. One commenter stated that weakening the rules for retail food systems will confuse the market, penalize early adopters, reward laggards, and lock in more environmentally harmful refrigerants for decades to come. Another commenter stated that California state regulations adopted a 150 limit for commercial and industrial refrigeration that have been

enforced since 2022. They noted that through extensive stakeholder outreach, the retail food industry expressed desire to have future-proof solutions rather than interim solutions that would be more costly.

One commenter stated that EPA proposed these delays and increases in limits without having necessary information available, as evidenced by the Agency seeking multiple types of information in the proposed rule, and thus the proposed timelines and limits are not supported by technical information. One commenter stated that maintaining the previous compliance schedule preserves the United States as an early mover promoting American innovation and technology.

Delays in the compliance schedule would re-open the domestic market to outdated technologies and give foreign manufacturers a competitive advantage. Another commenter stated that delaying implementation until 2032 would negate potential reductions in emissions of refrigerants, and the delay goes against the AIM Act's requirement for a rapid transition to alternatives.

Response: The EPA disagrees with the commenters' opposition to the proposal and generally disagrees with these comments related to retaining the limits and compliance dates for supermarket systems. The EPA is finalizing a graduated schedule approach which retains as a first step the January 1, 2027, compliance date, consistent with the compliance date in the 2023 Final Rule for supermarket systems. The Agency reiterates that it is aware that some retailers are able to use refrigerants below the limits set in the 2023 Final Rule already; however, the Agency concludes for reasons stated elsewhere in this section, there are supermarkets that will benefit from the flexibility the EPA is creating by moving to the graduated schedule. While the interim limit is in effect from January 1, 2027, until January 1, 2032, store owner and operators would have options for refrigerants that are above the 150 and 300 limits and below the 1,400 limit,

including but not limited to R-448A, R-449A, and R-513A.[116, 117] R-448A, R-449A, and R-513A are classified under ASHRAE as A1 refrigerants, meaning they are non-flammable and do not have the same installation challenges as refrigerants with A2, A2L, and A3 flammability characteristics.[118] Thus, this offers retailers the opportunity to use a refrigerant with similar flammability and pressure ratings to what the industry may have historically used. However, the EPA notes that there will be other reasons for retailers to move to refrigerants with 150 or 300 limits ahead of 2032.

For example, the HFC phasedown and particularly the 2029 HFC reduction step could impact price and availability of R-448A, R-449A, R-513A, and other HFC or HFC refrigerant blends. There will also be time for the supermarket industry to become more familiar with CO_2 systems. Therefore, some retailers may choose to use a substitute that is below 150 or 300, as applicable, prior to the compliance date of January 1, 2032. The EPA disagrees that finalizing the graduated schedule would go against the goals of the AIM Act for a rapid transition to alternatives. While subsection (e) of the AIM Act establishes the HFC phasedown schedule, the AIM Act does not prescribe a defined schedule for the transition to alternatives for any specific sectors and subsectors.

The EPA understands that a delay in the compliance date for the limits of 150 or 300, as applicable, could result in additional use of HFCs in this subsector; however, the EPA does not agree that this would have a significant impact on the continued use of legacy HFC systems. The interim limit of 1,400 beginning on January 1, 2027, means that legacy HFC refrigerant blends, such as R-404A, R-407A, and R-507A, would not be installed in new supermarket systems starting January 1, 2027, and instead only those that meet the interim limit could be used. The EPA considers the 2027 interim limit to be significant, and it is important that it occurs ahead of

[116] R-448A is a blend of three HFCs and two HFOs. R-449A is a blend of three HFCs and one HFO. R-513A is a blend of one HFC and one HFO.
[117] *See* trade association's letter to the EPA, dated February 11, 2025, in the docket for this action, and GreenChill "Partnership Accomplishments" at *https://www.epa.gov/greenchill/partnership-accomplishments*.
[118] ANSI/ASHRAE Standard 34-2024 Designation and Safety Classification of Refrigerants.

the 2029 phasedown step. Further, the EPA disagrees that the graduated schedule approach finalized in this rulemaking would discourage American innovation and reward foreign entities.

By providing the interim limit for five years, the EPA is providing additional time for U.S. companies to further develop, design, and distribute technologies for supermarket systems that use refrigerants below the 2032 limits that meet the needs of particular stores. Retailers also still have the option to adopt technologies that use refrigerants below the 150 or 300 limit sooner than the 2032 compliance date in this rule.

Comment: Some commenters suggested alternate compliance dates or limits compared to the proposal for supermarket systems. Commenters requested the limit align with the next stepdown date of the allocation phasedown schedule and should be adjusted to 2029 for supermarket systems. One commenter stated that instituting the interim limit of 1,400 followed by a limit of 150 or 300, as applicable, beginning in 2029 would still allow flexibility in the near term and would accelerate retrofits or replacements to available substitutes. Another commenter stated that a shorter extension to 2029 would avoid possible long-term cost increases for regulated refrigerants.

Some commenters opposed the proposed delays and interim limits but said if the EPA were to finalize a delayed compliance date for the limits of 150 or 300, as applicable, it should be no later than January 1, 2029. One commenter stated that a two-year extension would be needed for supermarket systems due to constraints on the use of A2L refrigerants that meet the limits of 150 or 300, as applicable.

Response: The EPA disagrees with these commenters' assertion that EPA must or should align the 150 or 300 limit, as applicable, with the 2029 phasedown step. As a general matter, the EPA does not agree that compliance dates established under the Technology Transitions subsection of the AIM Act need to align with the dates Congress established for the phasedown schedule under AIM Act subsection (e). These are two distinct subsections, each with their own direction and authority. The EPA concludes that only providing an additional two years would

provide limited flexibility to retailers and would not be sufficient. As described elsewhere in comment responses in this section, the interim limit and delay in the final limit for the subsector, as finalized, provide sufficient flexibility in refrigerant choice and time for industry nationwide to fully prepare with the 150 or 300 limits, as applicable. For example, the additional five years will allow OEMs more time to develop equipment meeting the needs of all their customers and to establish supply chains to distribute such equipment throughout the United States.

Comment: Commenters stated that the proposed delay in compliance dates for supermarket systems would conflict with the AIM Act's requirement for phasing down production of HFCs, and there will be a much greater demand for HFCs by 2032 than allowed production can support. One commenter stated that delays in the compliance dates and limits would continue to elevate demand for new systems as the phasedown gets tighter, which would draw down HFC inventories and push demand above supply by 2030. One commenter stated that the delays to the requirements would increase near-term HFC demand and misalign the AIM Act's intended ability to guide an orderly transition. Another commenter expressed concern that extending use of legacy refrigerants in the retail food sectors will significantly add to demand, draw down existing stocks of HFCs, and shift the allowance pool away from HFCs that meet lower limits towards unnecessary legacy refrigerants.

Another commenter stated that raising the limit for refrigerants in commercial refrigeration systems would increase HFC consumption, given high average leak rates in this sector, and would contradict the overall phasedown of HFCs under the AIM Act. One commenter stated that an extension to 2029 for supermarket systems would not materially impact a potential shortage of HFCs in 2029, while delaying to 2032 could have such adverse effects and since supermarkets would have a longer period of time to use legacy HFC systems.

Some commenters noted that the delays and increased demand will cause prices to increase for HFCs in the retail food sector. One commenter expressed warning that the delays may come with broader negative impacts to the entire consumer base in the near term, including

refrigerant shortages as soon as 2028. Another commenter stated the increased costs for maintenance and refrigerants in the retail food sector would be passed on to American consumers. Another commenter stated that any shortfall between available supply and required servicing demand is likely to cause higher prices for all end users.

One commenter anticipates that a refrigerant shortage may occur starting in 2027 if compliance dates and limits are relaxed. They commented that such delays and relaxed limits will further cause shortages beyond the commercial refrigeration sector and would affect other sectors such as residential and commercial air conditioning, leading to increased servicing costs for consumers.

Response: The EPA disagrees with commenters that assert that delaying the 2023 Final Rule limits of 150 or 300, as applicable, for supermarket systems by an additional five years would adversely affect the overall phasedown of HFCs under the AIM Act. As noted previously, the phasedown schedule Congress established in subsection (e) of the AIM Act is wholly separate from the Technology Transitions provisions in subsection (i). The EPA acknowledges that continued installation of new HFC supermarket systems inherently results in future demand for HFCs to service such systems.

The EPA disagrees that it is necessary or appropriate to choose compliance dates under subsection (i) based on the phasedown schedule that align the limits for supermarket systems with the next phasedown step are a hook upon which to establish a date. Congress' direction under subsection (i) is to the extent practicable, factor in "the remaining phase-down period for regulated substances," among other factors. In addition, the phasedown itself is a separate and key market driver for all refrigerant users. The EPA has considered the remaining phasedown period as well as the other factors listed in subsection (i)(4) and factored them in to the extent practicable, consistent with Congressional direction.

Comment: One commenter suggested adjusting the interim limits to 750 rather than 1,400 and reduce to 150 or 300 in 2032. The commenter stated this aligns more closely with currently available technology.

Response: The EPA disagrees that an interim limit of 750 would be appropriate for the supermarket systems subsector. The EPA acknowledges that to a large extent, in the 2023 Final Rule, the Agency used a few numerical limits, such as 150 or 700. However, the EPA did not use 750 in any sector or subsector and, moreover, it made its decisions based on information relevant specifically to each sector or subsector. As described in other comment responses in this section, two HFC refrigerant blends (*i.e.*, R-448A and R-449A) are currently being used in new supermarket system installations and are below the 1,400 limit; however, these substitutes are above a limit of 750. While R-513A was also mentioned as a refrigerant option for this subsector and could meet a 750 limit, such a limit would not allow R-448A or R-449A and would limit the flexibility in refrigerant choice for supermarket systems during the interim period.

Comment: Commenters stated that there are substitutes and technologies available for supermarket systems. One commenter noted that the record does not support claims that substitutes are not available, or the building codes require sector-wide delays. One commenter stated that many distributors report that complete supermarket refrigeration solutions that meet the 150 or 300 limit are on the market and used in the installation of supermarket systems in various regions across the country, including the southern United States. Other commenters stated that there are multiple Significant New Alternatives Policy (SNAP) listings for available substitutes for supermarket systems with safety standards incorporating Underwriters Laboratories (UL) 60335-2-89 and ASHRAE 15-2022.

Response: As stated previously, the EPA understands that there are challenges with transitioning to substitutes and technologies in certain cases even if there are substitutes available for supermarket systems that may be able to comply with the 2023 Final Rule compliance timelines and limits. The EPA indicated in the 2023 Final Rule that several substitutes, including

CO_2 and some A1 and A2L HFC blends, were available or would soon be available in time for the supermarket systems subsector compliance date of 2027.[119] The EPA finalized SNAP Rule 26 and listed seven A2L substitutes as acceptable, subject to use conditions, for use in new supermarket systems.[120] Two are non-HFC refrigerants (HFO-1234yf and HFO-1234ze(E)) and thus are not subject to subsection (i) rules. Five are HFC/HFO blends (R-457A, R-516A, R-454C, R-455A, and R-454A), which, except for R-454A, satisfy the 150 limit for installation in new supermarket systems that have a charge size of 200 pounds or more. All of these refrigerants may also be installed in such systems that have a charge size less than 200 pounds, or as part of the high temperature side of a cascade system.

While increasing the number of refrigerants listed as acceptable under the SNAP program can provide more options, more time is needed for chemical suppliers to provide them in sufficient quantities, for equipment manufacturers to develop equipment for these substitutes, and for this equipment to be incorporated into new supermarket system designs and be deployed. The EPA is seeking to avoid supply chain issues similar to those that arose with the deployment of the new refrigerant blend, R-454B, in the residential and light commercial AC/HP subsector. In that situation, while the refrigerant was being manufactured in sufficient quantities, it was not available in field for equipment installation and servicing.[121]

Extending the compliance date for this subsector to 2032 for the limits of 150 or 300, as applicable, preserves optionality and flexibility in the interim period and allows market pressure and the advantages of the new refrigerants to drive the continued transition to identified substitutes as the commercial availability of newer substitutes matures. The EPA thus expects that refrigerant options below the 150 or 300 limits, as applicable, including those identified as available substitutes for supermarket systems in the 2023 Final Rule and those listed in SNAP

[119] *See* 88 FR 73098 (October 24, 2023).
[120] *See* 89 FR 50410 (June 13, 2024).
[121] *See* Memorandum – Overview of R-454B Refrigerant Shortage and Current Status, in the docket for this action.

Rule 26 for this subsector, will become more widely available for this subsector by January 1, 2032.

Comment: One commenter stated that the EPA contradicted itself in asserting that there are too few refrigerants available that meet the 150 or 300 limit since the EPA already stated there are available substitutes in the 2023 Final Rule. The commenter further stated that any one of the available substitutes identified by the EPA would be enough to support the existing rule (*i.e.*, the 2023 Final Rule). Another commenter further stated that the EPA's request for more information on alternatives was unnecessary because availability of substitutes was already demonstrated in the 2023 Final Rule, and the use of alternatives continues to grow. One commenter stated that the statutory test for availability of alternatives is when one is available, and there is no requirement for an arbitrary number of multiple substitutes to be available.

Response: As described in the prior comment response, the EPA agrees that there are substitutes available for the supermarket systems subsector. However, the EPA disagrees with the comment that there is a statutory test indicating that the availability of a single substitute, or a number of multiple substitutes, demands a particular outcome. The availability of substitutes is one factor the EPA considers when promulgating rulemaking under subsection (i) of the AIM Act. Subsection (i) directs the EPA to factor in, to the extent practicable, more than a half dozen considerations, some or all of which may be applicable for a particular subsector or substitute. Furthermore, the breadth of end uses in a subsector may require multiple substitutes, which the EPA may consider to determine that substitutes are available in that subsector.

Comment: Commenters provided examples of substitutes, primarily CO_2, in use today in supermarket systems. One commenter provided evidence that large and small retail food facilities throughout California have been effectively using CO_2 and other refrigerants that meet the 150 or 300 limit. Another commenter provided multiple examples of large and small grocery stores and chains that have made progress and commitments to transition to CO_2 and refrigerants that meet the 150 or 300 limit in their stores. One commenter stated that in their research, 2,800 retail food

stores in the United States have transitioned to equipment using CO_2 as of the end of 2023. Some commenters stated that approximately 4,100 stores were using transcritical CO_2 systems as of December 2024. One commenter provided data on the numbers of stores by certain companies that are already using CO_2 in supermarket systems, including in larger and smaller format stores. Other commenters stated that the use of CO_2 in supermarket systems increased by over 40-50 percent from 2023 to 2024. Another commenter stated that CO_2 adoption in supermarket systems is projected to grow from 5.8 percent of retail food stores today to 22 percent by 2028.

Another commenter stated that CO_2 systems are proven and widely used by many retailers and that components such as compressors, valves, controls, etc. are available from a diversified supply chain. The commenter noted that there are technician training programs in place nationwide to support adoption. One commenter stated that CO_2 is already being used in supermarket systems, even in warmer climates, and year-to-date manufacturing of equipment that meets the 150 or 300 limit has increased dramatically. The commenter further stated that they use multiple available substitutes for commercial refrigeration categories in the proposal in their standard product offerings, including R–454A, R–454C, R–455A, and CO_2. They commented that they provide a product line that is currently manufactured and sold that meets the 150 or 300 limits, including refrigerant rack systems.

Response: The EPA acknowledges the examples provided by commenters of equipment that is currently available that meets the 150 or 300 limit, as applicable, for supermarket systems, and which aligns with the EPA's understanding of available equipment described in the prior comment response in this section. As stated previously, nothing in this rule would prevent retailers from transitioning to a supermarket system that would comply with the 150 or 300 limits. As commenters stated, there are many such examples, and the EPA expects that there will be retailers who might opt for such refrigerants prior to January 1, 2032, if they are installing a new supermarket system. The EPA anticipates that at least 20% of the market will transition to a supermarket system below the limits of 150 or 300, as applicable, well before the compliance date

on January 1, 2032.[122] The EPA is aware of several major supermarket chains that have made announcements indicating such transitions and thus the EPA assumes those companies will not take advantage of the additional flexibility afforded by this final rule. The EPA anticipates the additional time for compliance will allow these systems to continue to be improved and have additional widespread availability across the country.

As stated in prior responses, while there are supermarket systems available with substitutes below the limit of 150 or 300, as applicable, the graduated schedule in this rule is still necessary to provide flexibility for choice of refrigerant until these limits are effective in 2032. The availability of substitutes is just one factor among many that the EPA considers for establishing the limits in the supermarket systems subsector. Supermarket systems are not off-the-shelf systems and are configured with many different components to meet the specific needs of the store in which it will be used. The graduated schedule considers this as some retailers may transition to these available substitutes sooner than January 1, 2032, while others may require additional flexibility.

Comment: Some commenters provided information on the potential energy efficiency benefits of certain refrigerants in supermarket systems. One commenter disagreed with the EPA's claims that installing CO_2 in warmer climates may be less energy efficient; the commenter provided an example of a grocer who announced they would transition to CO_2 for all stores, including those in warmer climates. One commenter also stated that CO_2 systems can provide energy efficiency benefits, even in warmer climates. One commenter stated that properly configured CO_2 and A2L systems use similar or less energy compared to older HFC technologies. Another commenter stated that A2L blends like R-454C match capacity within 3-5 percent and improve energy efficiency as compared to R-404A for supermarket systems.

Response: The EPA acknowledges that some store owners and operators have experienced energy-efficiency benefits when installing supermarket systems with newer

[122] *See* Economic and Environmental Impacts Memo in the docket for this action.

refrigerants. Retailers may select supermarket systems with a particular refrigerant for a number of reasons, including the overall energy efficiency of the system. However, retailers may also factor in other considerations such as capital and operating costs, required maintenance of a system, availability of technicians trained to use substitutes, and geographic location of the store. New supermarket systems using CO_2 have been installed at an increasing rate in recent years, and it is expected this trend will continue. As the EPA understands, many installations of CO_2 systems have been in colder climates, where existing technology can provide energy efficiency benefits and overall lower cost of ownership throughout the life of the system. There have been installations in warmer climates as well; however, the EPA does not have sufficient information that would allow the Agency to tie a certain energy cost or savings to a certain climate. Further, retailers who choose to install a supermarket system with CO_2 or an A2L blend must also consider other factors such as available technicians to install and service the system. It is likely that more technicians are available in areas of the country where CO_2 supermarket systems have already been deployed, potentially limiting the availability of technicians on a regional basis at this time.

Delaying the compliance date for limits of 150 or 300 for supermarket systems will allow sufficient time for CO_2 technologies to be improved and made more efficient nationwide, as well as provide time for more technicians to be trained and familiar with these types of systems.

Comment: Commenters provided information and comments on the challenges of availability and using substitutes for supermarket systems. One commenter stated that many refrigerants below the 150 or 300 limit are either unavailable or withdrawn from the market and that equipment manufacturers have not yet scaled to demand. One commenter noted that they have experienced issues deploying A2L refrigeration systems, as manufacturers currently only offer a handful of A2L systems and most are small remote condensing units that are not suitable for large grocery stores. Another commenter stated that A2L refrigerants (*e.g.*, R-454A, R-454C) remain prohibited under local building codes that are more prohibitive than the state codes; and

propane has a charge size limit per circuit that requires dozens of self-contained systems per supermarket, which is inefficient and space-intensive. One commenter stated that even where A2L equipment is installed, many installation companies are having issues with sourcing A2L refrigerants in a reliable or timely manner. Conversely, another commenter stated that HFOs, which are components in certain A2L refrigerant blends, are ready to supply A2L refrigerants for use in supermarket systems; however, supermarket systems (*i.e.*, rack systems) using these refrigerants may require more time for development and building codes may need more time for these systems to use A2L refrigerants.

Other commenters stated that CO_2 systems pose numerous challenges in warmer climates, and such systems are only efficient in colder climates where they can be adequately cooled by ambient air. One commenter stated that CO_2 systems are unreliable and only a limited number of systems exist which require additional controls to mitigate energy inefficiency. The commenter also pointed out that there are additional safety and practical concerns with using alternatives, including potential generation of hydrogen fluoride gas if an A2L ignites, energy demand for CO_2 systems compared to HFC systems, and a lack of trained technicians. One commenter stated that there are only a handful of substitutes available for supermarket systems, and each has certain challenges. They state that CO_2 systems consume 20 percent more energy in southeastern states, have higher capital costs, and there are a limited number of qualified technicians available.

Response: The EPA acknowledges that there are currently available substitutes for supermarket systems; however, the EPA has previously indicated that challenges remain that could prevent transition in accordance with the 2023 Final Rule. As stated previously in a comment response in this section, the EPA also indicated in the 2023 Final Rule that several substitutes, including CO_2 and some A1 and A2L HFC blends were available or would be available in time for the compliance date in that rule. Further, the EPA received comments providing examples of stores currently using and planning to use substitute refrigerants meeting

the 150 or 300 limits, as applicable, in their supermarket systems. While these substitutes are available, the challenges with some substitutes that often are specific to regions of the United States, may be related to availability of equipment, installation and operation of equipment on a regional basis, design of complex systems, availability of properly trained technicians, and needed building code updates.

Providing an interim limit of 1,400 for five years will provide additional flexibility and options of refrigerant choice when installing a new supermarket system. The EPA understands that some retailers may need this flexibility where the challenges may be too cumbersome to use an available substitute that meets the 150 or 300 limit in 2027. As stated above in this section, the interim limit of 1,400 allows for certain common HFC blend refrigerants (*e.g.*, R-448A, R-449A, R-513A) in supermarket systems to be used in new installations until the limits of 150 or 300, as applicable, take effect on January 1, 2032. Retailers have been using R-448A, R-449A, and R-513A in recent years and technicians are familiar with and trained to work on equipment using these refrigerants.

Delaying the compliance date for the 150 or 300 limits, as applicable, for supermarket systems to January 1, 2032, provides sufficient time for industry to prepare for these limits for new installations of supermarket systems. The additional five years will provide additional time for more technicians to be trained on supermarket systems using compliant refrigerants. For example, supermarket systems that use CO_2 as a refrigerant operate at high pressures, and technicians will need to be trained to properly and safely maintain these systems. As noted, many technicians across the country may be qualified to service systems using refrigerants meeting the 150 or 300 limits; however, they may be more regionally concentrated in areas of the country where such supermarket systems have had higher adoption rates over recent years. The EPA expects that as more supermarket systems are installed across the country in all regions that are compliant with the 150 or 300 limits, technicians will likewise adapt and become qualified and trained to maintain these systems.

The EPA also acknowledges that there may be certain challenges for supermarket systems that use CO_2 based on where the store is located regionally. Particularly, commenters noted that CO_2 supermarket systems are less efficient in warmer climates where they cannot take advantage of cooling from ambient conditions. The EPA understands that current technologies may present such challenges; however, as noted in a prior response, there have been installations of CO_2 in warmer climates. Other comments submitted on the proposed rule provided examples where CO_2 supermarket systems have been installed across the country in various regions and have proven to be at least as efficient as legacy HFC systems. Further, other commenters noted commitments from retailers to continue with new installations of CO_2 systems in new stores across the country. Nonetheless, the EPA acknowledges that challenges and opportunities may vary in independent cases, as supermarket systems are large and complex. As such, delaying the compliance date for limits of 150 or 300 in supermarket systems will provide sufficient time for innovation in supermarket systems using CO_2. The EPA anticipates that technologies will continue to improve and provide equipment and designs that will operate efficiently in any region of the country.

In addition to CO_2 as a choice of refrigerant in supermarket systems, the EPA recognizes that there are additional substitutes available that are classified as A2L. Commenters described challenges with potential safety concerns and building code updates preventing wide-scale adoption of supermarket systems with A2L refrigerants. Regarding the toxicity of breakdown products such as hydrogen fluoride, the EPA's SNAP program considers potential impacts of breakdown products, including hydrogen fluoride upon combustion. The EPA also notes that HFCs mixed with compressor oil also can be flammable at high enough temperatures, and thus, generation of hydrogen fluoride is not unique to A2L refrigerants. The EPA discusses comments related to building codes and provides a more detailed response later in this section. Building code updates are rapidly occurring and underway in nearly all states with processes in place to use A2Ls where codes have not been fully updated. While this is the case, there may be

challenges or time-consuming approval processes for installations of supermarket systems with large charge sizes in some jurisdictions. Thus, delaying the compliance dates for limits of 150 or 300 in supermarket systems would allow additional time for more uniform adoption of updated building codes across the country, including in local jurisdictions.

Comment: One commenter stated that the initial start-up costs of CO_2 systems have dropped considerably in the last five years. Another commenter also stated that CO_2 technologies have advanced significantly in recent years, resulting in lower sustained costs as initial costs decrease with increased adoption. The commenter also stated that A2L systems have already been developed for the 2026 and 2027 compliance dates, and they are expected to be comparable in cost to HFC systems. Another commenter stated that ultra-low GWP refrigerants provide cost savings, including reduced operating costs through greater energy efficiency.

Response: The EPA appreciates comments provided on the costs of supermarket systems installed with substitute refrigerants. The EPA agrees that with increased adoption of such systems, initial costs would be expected to decrease, although the rate and amount of the decrease in costs is uncertain and the EPA has not assumed declining capital or operating costs over time for purposes of the Economic and Environmental Impacts Memo. The EPA also acknowledges that in some cases, there may be energy efficiency benefits with supermarkets systems using certain refrigerants. The EPA further discusses these considerations in other responses in this section.

Comment: Some commenters stated that CO_2 systems carry higher operating costs than HFC refrigerants due to complexity, inefficiency, and higher leak rates. Another commenter stated that the current compliance schedules would result in exorbitant compliance costs as a result of the barriers for HFC alternative refrigerants and technologies, including higher capital costs and increased costs to consumers. The commenter stated that grocery stores have very slim profit margins (about an average of 1.7% annually), and this low margin makes it challenging to absorb higher capital costs. Another commenter stated that most CO_2 installations for

supermarkets occur when a new store is being built or a major renovation is being conducted. They further commented that beyond costs and energy use, other issues reported with CO_2 systems include lack of consistent supply of refrigerant-grade CO_2, a need for specially trained technicians, and loss of charge resulting in food safety challenges. One commenter stated that, particularly for small-town stores, replacement of refrigeration systems under the limit established in the 2023 Final Rule would cost double normal replacement costs and would result in store closings that would displace employees and create food deserts. Another commenter stated that CO_2 gas prices have increased significantly in recent years and that CO_2 systems are more costly at a 30.5 percent premium. They further commented that one analysis found CO_2 systems consume 20 percent more energy than synthetic refrigerant systems and the total cost of ownership for an average-sized store would be $1.1 million more than an HFC system.

Response: The EPA appreciates the challenges supermarkets face when installing and operating supermarket systems with refrigerants that meet the 150 or 300 limits on the timelines in the 2023 Final Rule. This is particularly relevant when installing new systems, when there are a variety of factors to assess. For example, supermarkets and grocery stores – and the retailers that run them – range in size and are located in differing geographic regions and weather climates. In addition, the EPA appreciates that the low profit margins that supermarkets experience cause certain technologies to be cost prohibitive on the timelines in the 2023 Final Rule. Supermarket and grocery store retailers may choose one option over another due to capital costs, energy efficiency, technician availability, or other considerations.

The graduated schedule of limits established in this rule will mitigate these concerns by allowing for supermarket systems to be installed with an interim limit of 1,400 before the 150 or 300 limits are effective on January 1, 2032. The EPA anticipates that there will be some store owners or operators that will move faster than the compliance timelines and install supermarket systems that meet the 150 or 300 limits earlier than 2032. The EPA anticipates that this will lead

to further innovation of such systems and cause prices to decrease as adoption of these systems increases and become more widespread across the country.

Comment: Commenters state that building code updates have occurred rapidly across the country to allow the use of A2L refrigerants. They note that 49 states have recognized A2L use either through code updates, legislation, or interpretive letter; only Florida and Louisiana are still completing their process, but they remain on timelines to allow compliance with timelines established in the 2023 Final Rule. One commenter stated that home rule structures do not alter the assessment of building code readiness, as statewide adoption of the 2024 model codes or equivalent statutory authorization does not default to a prohibition on A2L use.

Some commenters stated that EPA has not identified any local jurisdiction that has made its building codes stricter than its state's building code by banning A2L refrigerants and they are not aware of any such cases. One commenter specifically noted that they are not aware of any instances of local building codes in California preventing or delaying installation of systems with A2L or A3 refrigerants. Another commenter stated that a majority of states have legislation that prevent local building codes from restricting A2L and A3 refrigerants approved by the SNAP program. One commenter stated that all model codes in the United States, including the International Building Code (IBC), International Mechanical Code (IMC), International Existing Building Code (IEBC), and Uniform Mechanical Code (UMC), contain provisions that authorize authorities having jurisdiction (AHJs) to approve alternate materials, design, methods, and equipment when an applicant demonstrates the proposed system meets the intent of the code and provides equivalent safety. The provisions were created to ensure code adoption lag does not become a barrier to new technology. The commenter further noted that where an official denies a request, the international codes require that a local board of appeals be available to review the decision. One commenter stated that local authorities can and routinely do issue interim approval letters allowing the installation of equipment that complies with UL 60335-2-40, UL 60335-2-89, and ASHRAE 15. The commenter also noted that CO_2 systems are not subject to A2L or

flammability code restrictions and have long been permitted under all model building codes; thus, the claimed building code barriers do not apply to CO_2 systems and do not justify a deferral of the Technology Transitions compliance schedule. Another commenter stated that updates to UL 60335-2-24 allow for expanded charge sizes of A3 refrigerants in commercial and industrial applications, while incorporating safety protocols to mitigate flammability risks. They note that 3.8 million self-contained units that use propane have been installed in the United States. One commenter noted that industry has extensive resources to support small and large owners and operators of A2L technology and other resources to alternate methods of adoption where building codes are not yet fully updated.

Other commenters stated that the revised compliance schedule would allow local jurisdictions the time necessary to adopt local building and fire safety codes to allow the deployment of refrigerants that meet the 150 or 300 limit for supermarket systems. One commenter noted that in multiple states, local codes prohibit the use of A2Ls because of safety concerns. Another commenter stated that in Texas, each AHJ adopts local amendments to fire codes that are established at the national level by the National Fire Protection Association (NFPA) and the International Fire Code (IFC) and that manufacturers may be confusing the IMC standards for A2Ls with Fire and Life Safety codes under NFPA and IFC. The commenter noted that IFC and IMC have standards at this time while NFPA has no codes for installing equipment with A2Ls, and model standards may not be available until the 2030 code cycle. Another commenter stated that thirty states allow local jurisdictions to adopt their own building codes, which may prevent introduction of A2Ls. The commenter also noted that other state laws may prevent certain systems and provided Nevada as an example where there are restrictions on water usage that would essentially prohibit water-dependent cooling systems. One commenter stated that while legislation may be in place to use A2Ls, contractors still need to obtain permits to install A2L equipment. They also commented that while AHJs have the authority to allow more updated building codes where they are not yet adopted, the process takes time and costs for

contractors and equipment owners to educate an AHJ. One commenter noted that the delays in compliance dates would allow for the continued updating of safety standards based on feedback submitted by manufacturers.

Response: The EPA appreciates the comments and information provided on the status of updated building codes across the country and acknowledges that rapid adoption has taken place. The EPA understands that not all local jurisdictions have adopted updated building codes to allow complete deployment of A2L refrigerants in supermarket systems nationwide. The EPA agrees that there are substitutes available that have been approved by the SNAP program, and where building codes have not yet been updated, there may be legislation in place to allow A2Ls or processes to approve equipment using A2Ls. While local building codes may not fully prevent adoption of A2L refrigerants due to these processes and legislation, the processes in place to allow A2L technologies may be time-consuming and challenging for those installing supermarket systems. Where the most up-to-date building codes have yet to be adopted, local jurisdictions or AHJs may have concerns or lack the in-depth knowledge to fully review a permit application for installing a complex supermarket system that uses an A2L refrigerant.

The EPA agrees that CO_2 used in supermarket systems would not face the same challenges with building codes since it is an A1 refrigerant. As discussed in other responses in this section, there may be other challenges or potential opportunities related to using CO_2 in supermarket systems. For example, the EPA understands that there are challenges with installing CO_2 supermarket systems in certain regions of the country. Further, supermarket systems using CO_2 operate at high pressures and require technicians that are trained to service and maintain these systems.

While adoption of building code updates continues rapidly across the country, the EPA acknowledges the challenges that are present for A2L refrigerants in supermarket systems. Several commenters have noted that building code updates would be in place in time for the compliance schedule prescribed in the 2023 Final Rule. However, as described above, building

code updates have not been solidified across all local jurisdictions. This could create confusion or challenges for store owners and operators who would select an A2L refrigerant for their supermarket system and the local jurisdiction is not prepared to review such a permit application. Thus, the Agency finds that additional time is required for local jurisdictions to continue to adopt updated building codes. In the case that typical code cycles may take longer than the compliance dates finalized in this rule, local jurisdictions will have additional time to review updated codes to allow approval processes to be more efficient.

The EPA anticipates that by January 1, 2032, any remaining building code issues would be fully resolved, given that the UL safety standard updates addressing these refrigerants will have been published for a sufficient amount of time prior.[123] Information provided by food retailers indicates that updating model codes at a local level could take up to eight years.[124] Thus, the graduated schedule finalized in this rule provides sufficient additional time for building code updates across the country and addresses concerns raised in comments. It provides flexibility in the interim period to use certain refrigerants such as R-448A, R-449A, and R-513A which are A1 refrigerants and do not face building code challenges for installations. The five-year period of the interim limit will provide time to continue to use these A1 HFC/HFO blends while allowing building code updates to continue to progress.

2. Expansion of Existing Supermarket Systems

Comment: One commenter was opposed to allowing an increase in cooling capacity during a supermarket remodel, as this would lead to an increased charge size of legacy refrigerants or installation of older refrigerants. This commenter stated that allowing an increase in cooling capacity measured in BTU per hour at 25 percent could result in as many as 36 additional display cases, which would surpass a normal remodel. On the other hand, another

[123] *See* UL 60335-2-89 standard, "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 of Motor-Compressor." Edition 2, dated October 27, 2021.
[124] *See* presentation from trade association dated April 18, 2025, in the docket for this action.

commenter stated no objection to an allowable increase in cooling capacity during a store refresh and further commented that normal and usual remodels and redesigns should not be considered the manufacture or installation of a new system.

Other commenters supported modest increases in cooling capacity during routine remodels or layout changes. One commenter stated that it is normal and routine for supermarkets to undergo remodeling activities and modestly expand cooling capacity to accommodate additional products and layouts. The commenter asserted that an increase in BTU per hour should not constitute an installation and suggested that a workable threshold would be to allow increases up to 25 percent in BTU per hour for cooling capacity to provide a clear cut-off while accommodating routine activities. Another commenter supported the clarifications and codifying an explicit tolerance for modest cooling capacity increases during supermarket refreshes or layout adjustments, while retaining the existing triggers in the regulations. The commenter suggested that a percentage below 25 percent, notably 15 percent, is generally more aligned to the EPA's stated purpose to distinguish routine servicing from new installations in major remodels.

One commenter supported the adoption of a remodel tolerance permitting cooling capacity increases of up to 15 percent without treating it as a new installation, which is appropriate to cover typical reconfigurations and modest department expansions. They further commented that standard industry design practice for supermarket equipment must have a minimum of 10 percent excess capacity for future expansion, and allowing an increase of 15 percent could utilize this design practice. The commenter also stated that a 25 percent increase in cooling capacity would more typically reflect a major expansion that goes beyond routine activity and is more appropriately treated as a new installation.

Response: The EPA acknowledges the comments and information related to increases in cooling capacity for a supermarket system during routine remodeling. The Agency understands based on comments that such routine store refreshes, remodels, or layout changes may expand

cooling capacity modestly. The EPA disagrees with commenters that suggested it would be inappropriate to allow modest expansions in cooling capacity related to routine remodels or layout changes. As noted above, even in the context of the CAA R-22 phaseout, the considered if there was sufficient cooling capacity within the system to support the expansion (*e.g.* new display cases), to be changes that would not trigger treatment as a new system. This is consistent with the EPA understanding that supermarket systems are typically designed for both the intended and a modest increase in capacity.

The EPA acknowledges comments that stated that standard industry practice includes designing supermarket systems to include approximately a 10 percent capacity margin above the current load. Knowing that supermarket systems are designed with a 10 percent capacity margin above the typical load could help explain why there was uncertainty among stakeholders. For example, stakeholders questioned the discrepancy between the load of a system as currently operated versus the capacity of a system as designed. The text at 40 CFR 84.54(e)(2) does not recognize that distinction. Based on the general support from industry commenters, a modest percent increase in cooling capacity is appropriate. The EPA, however, recognizes that supermarket systems are custom-built systems, designed specifically to function for a particular store. As such, there may be situations in which a modest increase in capacity is required for a store refresh, remodel, or layout change that is beyond the design capacity. Thus, the EPA is finalizing in this rulemaking to allow increases to capacity of up to 15 percent (measured in BTU per hour) to provide flexibility and accommodate a wide range of circumstances for routine activities at stores. The EPA further clarifies that an increase in capacity beyond 15 percent for supermarket systems would trigger the criteria for the installation of a new system. The EPA is addressing this issue of increasing cooling capacity only in the context of supermarket systems for which such routine refreshes typically happen and is not applying the 15 percent increase to other sectors or subsectors.

The EPA clarifies that the 15 percent increase in cooling capacity finalized in this rulemaking is intended to provide an upper bound on a supermarket system's cooling capacity before a new system installation is triggered. Specifically, the EPA is clarifying in this final rule that modifications to an existing supermarket system that increase the cooling capacity by equal to or less than 15 percent do not trigger the requirements at 40 CFR 84.54(e)(2). As an illustrative example, consider a supermarket system that is installed with a design capacity of 100,000 BTU per hour. The allowable increase in cooling capacity during a routine store refresh, remodel, or layout change would be 15,000 BTU per hour in this scenario. This cap applies throughout the life of the supermarket system, and any number of routine remodels may be performed, so long as the 15 percent cap is not exceeded relative to the cooling capacity provided at installation.

The EPA acknowledges that the associated increase of capacity with a routine store refresh, remodel, or layout change may vary depending on the specific characteristics of the supermarket system and the store itself. However, based on information provided in comments, a 15 percent increase in capacity is sufficient for such routine activities. The EPA disagrees that a 25 percent increase in capacity for a supermarket system would constitute routine activities. The EPA acknowledges and agrees that an allowable increase of 25 percent in cooling capacity would result in expansions that are beyond what constitutes as routine. The EPA recognizes the needs of retailers to perform routine store refreshes, remodels, or layout changes to meet the needs of their customers. Supermarkets and grocery stores may find that remodels or layout changes provide other efficiency benefits even if a modest expansion of the cooling capacity is necessary. A cap of a 15 percent increase in cooling capacity allows room for such routine activities. As stated previously, the EPA is aware that supermarkets and grocery stores may perform routine remodels once or twice during the lifetime of the supermarket system. An allowable 15 percent increase could provide for more than one remodel, such that the total

increase in cooling capacity from all remodels combined does not exceed 15 percent of the cooling capacity provided at installation of the supermarket system.

Comment: One commenter requested the EPA clarify the difference between increasing the capacity of a refrigeration system versus increasing the load on a system. The commenter explained that increasing the capacity is the addition of compressor power (e.g., BTU per hour) to the system and, according to the EPA's rules and public documents, adding system capacity has been a longstanding trigger for changing the intended use of a system going back to regulations for ozone-depleting substances. The commenter further explained that increasing the load on a system does not change the intended use of a system as long as there is sufficient capacity, and that in such a scenario, there would be no need to classify the system as newly installed related to the limits. Another commenter requested clarity on "system cooling capacity," as they understand the term to mean the available cooling provided by the compressors. They commented that a store should be able to add display cases on the current system's existing cooling capacity and that the refrigerated load is not the same as the cooling capacity of the system.

Response: The EPA appreciates the comments provided for additional clarification on the allowable increase in cooling capacity for supermarket systems for routine store refreshes, remodeling, or layout changes. The EPA agrees with the understanding that the load is not the same as the cooling capacity of a supermarket system, where the load is the actual cooling drawn from the supermarket system's total capacity. The EPA agrees that expanding the load, such as through adding cases, as long as there is existing cooling capacity would not change the intended purpose of the supermarket system, which is consistent with the past practice from the phaseout of R-22 described earlier in this section. As described in the previous comment and response, the EPA is finalizing a provision to allow up to a 15 percent increase in cooling capacity for supermarket systems to allow modest increases in cooling capacity during routine store refreshes, remodels, or layout. As the EPA noted in the proposed rule, there may be the case

where improvements – such as installing doors – during a routine store remodel or refresh may decrease the BTU per hour output (*i.e.*, cooling load) required from the supermarket system.[125] In such cases, the 15 percent allowable increase in capacity would still relate to the cooling capacity at the installation of the supermarket system.

Comment: One commenter requested that the EPA remove the component replacement threshold for installation at 40 CFR 84.54(e)(3) or provide clarity for ambiguous language that may trigger an installation if the 100 percent replacement applies collectively or individually to the compressor racks, condensers, and connected evaporator loads. The commenter stated that the more natural reading would be 100 percent replacement of all three components, but that the text could be interpreted as applying to 100 percent of one of the three components.

Response: The EPA did not propose any changes to, nor request comment on, 40 CFR 84.54(e)(3) and does not address that provision in this final rule. However, the EPA is providing additional clarity. The commenter provided two interpretations of the text. The EPA is clarifying that the more natural reading as described by the commenter is consistent with the EPA's interpretation. The intent of the language is that an installation is considered new when replacing 75 percent or more of the evaporators (by number) and 100 percent of all of the compressor racks, condensers, and connected evaporator loads of an existing system. It is not the EPA's intention for existing systems that require routine maintenance or replacements of only certain components to constitute an installation and be fully replaced.

Comment: Some commenters supported the EPA's interpretation of the term "retrofit" and requested that the Agency restate it in the final rule. Some commenters also supported the proposed rule because the costs of retrofitting existing stores to compliant refrigerants.

Response: The EPA reiterates that a "retrofit" is distinct from a store "refresh," "remodel," or "layout change." The AIM Act states that for purposes of regulations issued under subsection (i), the term "retrofit" "means to upgrade existing equipment where the regulated

[125] *See* 90 FR 48008 (October 3, 2025).

substance is changed, which (1) includes the conversion of equipment to achieve system compatibility; and (2) may include changes in lubricants, gaskets, filters, driers, valves, o-rings, or equipment components for that purpose".[126] Thus, a retrofit, for purposes of the restrictions at 40 CFR part 84, subpart B, requires a change in the type of refrigerant used in a system (*e.g.*, switching from R-404A to R-448A). The EPA adopted that definition in the regulations at 40 CFR 84.52 and stated that the requirements of the 2023 Final Rule do not apply to retrofits.[127] Neither the limits nor the provisions at 40 CFR 84.54(e), which specify when a system is sufficiently modified to be characterized as new and subject to the restrictions, currently apply to a retrofit. Therefore, concerns about the cost of retrofitting existing stores to compliant refrigerants are not applicable.

D. Retail Food – Remote Condensing Units

Comment: Many commenters, largely food retailers, supported the delay in compliance dates as proposed for remote condensing units to provide time for manufacturers and contractors to train technicians, develop safety protocols, and update building codes. Commenters generally made the same statements to support such delays in compliance dates and changes in limits for this subsector as those made in support of the proposed changes for supermarket systems. The commenters stated that the proposed changes for remote condensing units would provide more flexibility in refrigerant choices. One commenter was supportive of the interim limit of 1,400 beginning one year earlier for remote condensing units as compared to supermarket systems, given that supermarket systems are more complex.

Response: The EPA acknowledges comments in support of the graduated schedule for remote condensing units. The EPA agrees that the graduated schedule is beneficial for this subsector. Based on comments received and after additional evaluation of remote condensing unit

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[126] *See* 42 U.S.C. 7675(i)(7)(A).

[127] The EPA stated that "[w]hile we recognize the Agency's authority to issue restrictions on retrofit applications in subsection (i)(7)(B)(ii), we do not view, and commenters did not suggest, that the EPA has an obligation to issue such restrictions at this time." For further discussion, see 88 FR 73127. *See* also: *https://www.epa.gov/climate-hfcs-reduction/frequent-questions-phasedown-hydrofluorocarbons#supermarket-systems*.

options currently available on the market, finalizing these changes will address the concerns raised with the original timelines established in the 2023 Final Rule.

The EPA acknowledges commenters' request for additional time to become familiar with newer technologies that meet their needs. The graduated schedule will allow retailers to select remote condensing units with a refrigerant above the 150 or 300 limits until January 1, 2032, that may have characteristics similar to refrigerants historically used in this subsector. However, given many U.S. manufacturers transitioned their manufacturing lines to meet the previous January 1, 2026, compliance date, the EPA expects that many retailers will choose a remote condensing unit compliant with the 2032 limit prior to January 1, 2032.

Comment: Some commenters stated that there are notable differences between remote condensing unit systems and supermarket systems, and that these subsectors should not be treated the same. They also stated that the 2023 Final Rule requirements for remote condensing units should be left in place. One commenter stated that extensions may be appropriate for supermarket systems but specifically stated to retain the compliance dates and limits for remote condensing units. They commented that the EPA has traditionally considered these subsectors separately under the SNAP program and that these subsectors differ in design, purpose, and construction. They commented that the subsectors should not be treated equivalently for the purpose of considering limits. Another commenter suggested extending the stepdown compliance date and limit to January 1, 2029, for supermarket systems, but leaving in place the January 1, 2026, compliance date and limit for remote condensing units.

Commenters stated that remote condensing units have lower refrigeration capacities than supermarket systems, so these systems do not face similar safety challenges, and it is easier to comply with charge size restrictions of A2Ls. One commenter stated that many equipment manufacturers have announced launches for A2L remote condensing units recently. Another commenter stated that remote condensing units are usually installed outdoors and are less

complex than supermarket systems, so they face fewer challenges regarding approval by local building code officials.

Response: The EPA agrees that the consideration of the limits and compliance dates for each sector and subsector should be assessed independently. The EPA provided separate discussions of each of its assessments in the proposed rule.

The EPA acknowledges that a variety of products and systems are used in retail food establishments including remote condensing units and supermarket systems. For each subsector addressed in this rule as well as the 2023 Final Rule, the Agency made separate assessments. Where relevant, the Agency established requirements that use a charge size cut-off for the limits (*i.e.*, 150 or 300). The EPA did not propose and is not changing this approach in this rulemaking. The charge sizes relate to the allowable charge sizes for flammable refrigerants based on alignment with applicable safety standards. The EPA agrees that remote condensing units are, in a majority of cases, under this size threshold; and thus, these types of equipment using flammable refrigerants, including those classified as A2L, do not face as many challenges with building codes. However, the EPA notes that some remote condensing units may still face safety challenges related to building codes. Therefore, based on the totality of the record, the EPA concluded the graduated schedule would be appropriate.

Comment: Many commenters suggested alternate compliance dates or limits compared to the proposal. Commenters provided similar suggestions for compliance dates as with the supermarket systems subsector, including establishing an interim limit until July 1, 2026, January 1, 2028, or January 1, 2029, at which point the limits would return to 150 or 300, as applicable. Commenters in support of the January 1, 2029, compliance date stated that this would be appropriate as it aligns with the next HFC phasedown step while still allowing flexibility in the near term. One commenter stated that if an extension were provided for remote condensing units, it should be no more than one year.

Response: The EPA disagrees with the compliance dates provided by commenters ranging between July 1, 2026, and January 1, 2029, for the limits of 150 or 300, as applicable. While there are available remote condensing units that are compliant with the 150 or 300 limits, the EPA received many comments describing retailers and code officials needing additional time to adopt these technologies, particularly for those using A2L refrigerants. Building codes is among the factors that the EPA factors in, to the extent possible, consistent with subsection (i)(4) of the AIM Act; however, it is not the sole factor.

The EPA also understands that there are many available remote condensing unit equipment options currently offered by manufacturers, which use regulated substances that would be compliant with a limit of 150 or 300, as appliable. The availability of substitutes is among the criteria that the EPA factors in to the extent possible, consistent with subsection (i)(4); however, it is not the sole factor. The EPA understands that amending the compliance date to January 1, 2032, means it is after the 70 percent reduction step of the HFC phasedown schedule in 2029, which in and of itself will constrain HFC production and import and could result in an overall price increase for HFCs. However, as stated in response to similar comments on the amended compliance date for supermarket systems, the HFC phasedown schedule established by subsection (e) of the AIM Act and the technology transitions requirements at subsection (i)(4) are wholly separate.

While subsection (i)(4) requires the EPA to factor in the remaining phasedown period to the extent practicable, that is one factor, like availability of substitutes, that the EPA considers. Both availability of substitutes and the remaining phasedown schedule for HFCs could result in many retailers deciding to choose a remote condensing unit that is compliant with the limits of 150 or 300, as applicable, prior to January 1, 2032. Using a graduated schedule with limits of 150 or 300, as applicable, beginning on January 1, 2032, is based on factoring in, to the extent practicable, all of the subsection (i)(4) factors, including, but not limited to, commercial

demands, affordability for residential and small business consumers, safety, consumer costs, and the factors previously mentioned in this response.

Comment: One commenter suggested adjusting the interim limit to 750 rather than 1,400, and lowering the limit to 150 or 300, as applicable, in 2032. The commenter stated this aligns more closely with currently available technology. Another commenter requested the interim limit for remote condensing units be set at 1,430, rather than 1,400, to allow for continued use of R-134a, as they stated that there are no production-ready compressors for wine cooling remote condensing units with refrigerants meeting the 150 limit. They stated that by setting the limit to allow for the use of R-134a, manufacturers would not need to redesign products for the interim period between 2026 and 2032.

Response: The EPA disagrees that an interim limit of 750 would be appropriate for the remote condensing units subsector. The EPA acknowledges that to a large extent, in the 2023 Final Rule, the Agency set limits of 150, 300, or 700 for sectors or subsectors.

However, the EPA did not set a limit of 750 in any sector or subsector. Moreover, the Agency made its decisions based on information specific to each relevant sector or subsector. As described elsewhere in this section, two HFC refrigerant blends (*i.e.*, R-448A and R-449A) are currently being used in new remote condensing unit installations and are below the 1,400 limit. Based on information from retailers and in comments on the proposed rulemaking, allowing use of these refrigerant blends would provide sufficient flexibility in the interim timeframe. An interim limit of 750 would not allow these substitutes and would significantly limit the flexibility in refrigerant choice for remote condensing units during the interim period.

The EPA also disagrees with setting the interim limit at 1,430 for remote condensing units. While this limit would allow for the use of R-134a in the interim period, the interim limit of 1,400 provides additional available A1 refrigerant options for wine cellar cooling remote condensing units, including R-448A and R-449A.

Comment: Many commenters stated that the proposed delay in compliance dates for remote condensing units conflicts with the AIM Act's requirement for phasing down consumption of HFCs, and there will be a much greater demand for HFCs by 2032 than allowed consumption can support. Commenters stated that delays would elevate HFC demand, cause allowance shortages, and shift allowances away from newer technologies to legacy refrigerants. Commenters also pointed to the impacts of heightened demand and decreased supply on the costs of refrigerants. They stated that the impacts caused by higher demand would cause higher prices for all HFC refrigerants and affect other sectors outside of commercial refrigeration, and that these costs would get passed on to American consumers.

Response: The EPA acknowledges these comments. The EPA understands that amending the compliance date to January 1, 2032, means it is after the 70 percent reduction step of the HFC phasedown in 2029, which will constrain HFC production and import and could result in an overall price increase for HFCs. However, as stated in response to similar comments on the amended compliance date for supermarket systems, the HFC phasedown schedule established by subsection (e) of the AIM Act and the factors in subsection (i)(4) are wholly separate. While subsection (i)(4) requires the EPA to factor in, to the extent practicable, the remaining phasedown period, that is one factor, like availability of substitutes, that the Agency considers. In addition, the phasedown itself is expected to be a market driver for the transition of remote condensing units that use refrigerants that are below the 2032 limits. As noted, overall prices could increase for HFCs as the statutory HFC phasedown continues. Since the phasedown is based on the exchange values listed in AIM Act subsection (c), it disincentivizes the use of regulated substances that are close to, or above, the interim limit, while incentivizing those that are below the 150 or 300 limit, as applicable, including new options provided by U.S. chemical companies.

Comment: Many commenters stated that there are substitutes and technologies available for remote condensing units. One commenter stated that many distributors are currently selling remote condensing unit systems using refrigerants below the limit of 150 or 300, as applicable,

and that such systems using A2L refrigerants like R-454A and R-454C are already being sold to customers. Other commenters similarly stated that there are multiple SNAP listings of available substitutes for remote condensing units with safety standards incorporating UL 60335-2-89 and ASHRAE 15-2022. Commenters stated that the EPA already demonstrated that there are substitutes available for the remote condensing units subsector, and that the Agency has already met the statutory test for demonstrating that there are available substitutes. One commenter further stated that they use multiple available substitutes for commercial refrigeration categories addressed in this rulemaking in their standard product offerings, including R–454A, R–454C, R–455A, and CO_2. They commented that they provide a product line that is currently manufactured and sold that meets the 150 or 300 limits, as applicable, including remote condensing units and unit coolers, remote condensers, and refrigerant rack systems. Another commenter stated that refrigerant suppliers have been supplying the remote condensing unit market with A2Ls and that several national convenience stores have confirmed that they are in the process of converting to such systems with A2L refrigerants. One commenter stated that they have moved forward with A2L refrigerants (specifically, R-454A) with their vendors and will continue that path forward. They commented that all of their vendors are aligned and have moved forward with equipment using R-454A.

Response: The EPA appreciates the information provided by commenters on the available remote condensing units that use refrigerants that are compliant with the limits of 150 or 300. The EPA agrees that there are substitutes available for remote condensing units that comply with the 2023 Final Rule compliance timelines and indicated in the 2023 Final Rule that several substitutes, including CO_2 and some A1 and A2L HFC blends, were available or would soon be available in time for the remote condensing units subsector compliance date of 2026.[128] This was based partly on the understanding that SNAP Rule 26 would list several of these identified substitutes as acceptable for the subsectors, subject to use conditions, soon after finalization of the

[128] *See* 88 FR 73098 (October 24, 2023).

2023 Final Rule. The EPA finalized SNAP Rule 26 and listed seven A2L substitutes as acceptable, subject to use conditions, for use in new remote condensing units.[129] Two are non-HFC refrigerants (HFO-1234yf and HFO-1234ze(E)) and thus are not subject to subsection (i) rules. Five are HFC/HFO blends (R-457A, R-516A, R-454C, R-455A, and R-454A), which, except for R-454A, satisfy the 150 limit for installation in new remote condensing units that have a charge size of 200 pounds or more. All of these refrigerants may also be installed in such systems that have a charge size less than 200 pounds, or as part of the high temperature side of a cascade system. While increasing the number of refrigerants listed as acceptable under the SNAP program can provide more options in the long term, more time is needed for chemical suppliers to produce them in sufficient quantities. The EPA is seeking to avoid supply chain issues similar to those that arose with the deployment of the new refrigerant blend, R-454B, in the residential and light commercial AC/HP subsector. In that situation, while the refrigerant was being manufactured in sufficient quantities, it was not available in the field for equipment installation and servicing.[130]

Moreover, as noted elsewhere in this section, the EPA is factoring in the availability of substitutes, to the extent practicable, and reaffirms it is not the sole factor the Agency considers. The EPA finds that a graduated schedule is more appropriate for remote condensing units for reasons other than availability of alternatives. The record reflects that additional alternatives and system configurations, including those using A1 or A2L refrigerants, are becoming more widely deployable as equipment listings and product safety standards are implemented, supply chains mature, and field experience expands. This approach also recognizes that other factors, such as building codes, are not a universal constraint in this subsector; however, there may be situations where they remain a near-term barrier.

[129] *See* 89 FR 50410 (June 13, 2024).
[130] *See* Memorandum – Overview of R-454B Refrigerant Shortage and Current Status, in the docket for this action.

Comment: Some commenters provided similar information and comments for remote condensing units as they did on supermarket systems on the challenges of availability and using substitutes. One commenter stated that many refrigerants that meet the 150 or 300 limit, as applicable, are either unavailable or withdrawn from the market, and that equipment manufacturers have not yet scaled to demand. One commenter noted that they have experienced issues deploying A2L refrigeration systems. They stated that manufacturers currently only offer a handful of A2L systems and most are small remote condensing units that are not suitable for large grocery stores. One commenter stated that even where A2L equipment is installed, many installation companies are having issues with sourcing A2L refrigerants in a reliable or timely manner.

Response: The EPA acknowledges the comments that there may be some challenges with the adoption of A2L technologies in some cases, including related to availability of equipment on the market. The EPA agrees that additional time is necessary for remote condensing units to transition. The EPA agrees that existing challenges for adoption of A2L refrigerants warrant amending the schedule and providing an interim limit. Retailers may need additional time to become familiar with these technologies. Further, technicians may need additional training to safely handle equipment using flammable refrigerants. The amended provisions will also provide sufficient time for newer refrigerants and the equipment using them to become more widely available and have proper supply chains established.

Comment: One commenter stated that A2L systems have already been developed for the 2026 compliance date, and they are expected to be comparable in cost to HFC systems. Another commenter compared price quotes from a distributor for a walk-in cooler, one with R-449A and one with R-454A. The commenter stated the price difference was largely based on the indoor evaporator component with installed refrigerant detection and solenoid shut-offs; however, the refrigerant saved by detecting and stopping leaks early offset the cost difference between systems over the lifetime of the system. Another commenter stated that certain refrigerants below the limit

of 150 or 300 provide cost savings, including reduced operating costs through greater energy efficiency.

Response: The EPA acknowledges comments provided on the costs of remote condensing units that use A2L refrigerants, particularly how they compare to systems using legacy refrigerants. Comments suggest refrigerant costs will be similar, there will be higher capital costs and lower operating costs, and note equipment design features that are outside the scope of this rulemaking. The EPA also understands that consistent with certain updated safety standards that equipment is certified as meeting, A2L remote condensing units may have design requirements, such as refrigerant leak detection devices, which may add to the capital costs.

The EPA acknowledges that in some instances, equipment using refrigerants below the 150 or 300 limit can provide energy efficiency benefits and reduced operating costs. The Agency notes that there are many factors that retailers may consider based on the individual needs for a particular application at their store. As noted by commenters in section IV.C of this preamble, retailers on average have slim profit margins, which may cause challenges in absorbing the higher capital costs of equipment using newer refrigerants. Further, commenters have noted that there may be challenges related to installing equipment with refrigerants with flammability characteristics. Thus, the EPA is establishing the graduated schedule for the retail food remote condensing units subsector with consideration of these and other factors.

As described in other comments in this section, many retailers have made announcements and commitments to transition and build new stores using available substitutes such as CO_2 or A2L refrigerants. Thus, the EPA expects a portion of the market will transition prior to 2032 to available substitutes that meet the limit of 150 or 300, as applicable. Further, as described elsewhere in this section, the EPA expects market forces and the HFC phasedown to cause other retailers also to transition ahead of 2032.

Comment: Commenters stated that building code updates have occurred rapidly across the country to allow the use of A2L refrigerants. They note that 49 states have recognized A2L

use either through code updates, legislation, or interpretive letter and that the remaining codes are being updated on timelines to allow compliance with the compliance dates finalized in the 2023 Final Rule. One commenter stated that home rule structures do not alter the assessment of building code readiness, as statewide adoption of the 2024 model codes or equivalent statutory authorization does not default to a prohibition on A2L use. Other commenters stated that the revised compliance schedule would allow local jurisdictions the time necessary to adopt local building and fire safety codes to allow the deployment of A2L refrigerants. Some commenters argued that local building code processes and approvals would present hurdles to the adoption of equipment using A2L refrigerants. They state that local jurisdictions may prohibit the use of A2L refrigerants due to safety concerns.

Some commenters provided more specific information in their comments on building codes as they relate to remote condensing units. One commenter stated that due to the relatively lower refrigeration capacities of remote condensing units compared to supermarkets systems, it is relatively easier to comply with the charge size restrictions for A2L refrigerants. They note that, considering the lower charge size, many manufacturers have launched remote condensing unit equipment using A2L refrigerants. Another commenter similarly stated that remote condensing units do not face the same building code challenges for adopting A2Ls as supermarket systems. They note that remote condensing units are less complex and are often installed outdoors, which would present fewer challenges regarding approval by local building code officials.

Response: The EPA appreciates the comments and information provided on the status of updated building codes across the country and acknowledges that rapid adoption has taken place. The EPA also recognizes that building codes updates have not been completed uniformly throughout all states and local jurisdictions throughout the country. As noted in response to other comments, the majority of remote condensing units are under typical charge size thresholds that would otherwise present challenges related to using refrigerants with lower flammability characteristics (*i.e.*, A2Ls) in the equipment. The EPA recognized this when establishing limits in

the 2023 Final Rule where a distinction was made at a charge size of 200 pounds for the limits of 150 or 300 for remote condensing units. This cut-off was established with consideration of building codes to allow a wider range of refrigerant choices for smaller remote condensing units to manage safety and other factors. In other cases, as commenters noted, remote condensing units may be installed outside, further limiting challenges for installation based on building codes.

As the EPA acknowledged, not all jurisdictions have fully completed adoption of updated building codes. The EPA is amending the compliance date for the limits of 150 or 300, as applicable, for remote condensing units, to allow retailers and building code officials more time to become more familiar with remote condensing units that use refrigerants with flammability characteristics (*e.g.*, A2Ls). Even though building codes may pose less of a barrier to adopting remote condensing units that use A2Ls than for other equipment, including supermarkets systems, the Agency still finds it appropriate to provide an interim limit and extend the deadline for the lower limit of 150 or 300, as applicable.

Comment: Some commenters stated that the EPA should provide specific relief where a discrete sub-category demonstrates a near-term constraint. Commenters provided examples of certain wine cellar coolers or milk coolers and niche laboratory cooling applications and noted that the relief should be minimal in volume, time-limited, and sunset no later than January 1, 2029. One commenter stated that a sector-wide raised limit is not the least disruptive option and would be arbitrary where narrower tools suffice (*i.e.*, targeted relief). They commented further that potential barriers in certain sub-categories could include recertification testing timing at labs for specific capacity classes and cabinet or coil configurations and component availability issues in low-temperature applications for retail food remote condensing units. Some commenters also suggested that an alternative could be to authorize the use of certified reclaimed refrigerant for first fill in lieu of compliance with limits. One commenter stated that any needed relief after 2029 should only be available through a formal variance mechanism with public notice, annual review, hardship criteria, and cumulative impact evaluation against the allowance balance. The

commenter also stated that such a targeted relied process would be a logical outgrowth of the proposed rule.

Response: The EPA appreciates comments seeking targeted relief for certain remote condensing units. While the EPA is concerned about impacts to certain wine cellar coolers or milk coolers and niche laboratory cooling applications, the Agency did not propose and thus is not establishing provisions for remote condensing units that would be applicable to a subset of equipment in this rulemaking. These considerations are outside the scope of this rule and would require additional analysis by the Agency as well as additional notice. Nonetheless, the EPA is finalizing an interim limit of 1,400 and extending the compliance date for the lower limit of 150 or 300, as applicable, until January 1, 2032, thus providing relief for all remote condensing units, including these applications.

E. Cold Storage Warehouses

Comment: Multiple commenters supported the proposed limit of 700 for cold storage warehouses noting they are comparable to other subsectors like data centers and IPR. They asserted that categories of subsectors are defined by certain limits, and that the cold storage warehouse subsector was placed in the incorrect category with the limits of 150 or 300 as applied in the 2023 Final Rule.

Response: The EPA acknowledges the support for raising the limit to 700 for regulated substances used in cold storage warehouses. The concerns provided in comments are similar to those that were brought to the EPA's attention in advance of the proposal. The EPA established the requirements in the 2023 Final Rule based on the information available at the time for this subsector. The Agency received additional information after finalization of that rule and during the comment period for this rule. The graduated schedule established in this rule is based on consideration of information now available to the Agency. The EPA anticipates that the graduated schedule for cold storage warehouses will provide sufficient time for many of the concerns identified by commenters to be addressed, including broader building code adoption that may

enable additional lower flammability refrigerant options and more uniform deployment of complex systems.

The EPA disagrees with the assertion that categories of subsectors are defined by certain limits, and that the cold storage warehouse subsector was placed in the incorrect category. In the 2023 Final Rule, the EPA established certain limits for each subsector based on the evaluation of the AIM Act (i)(4) factors independently for each subsector at the time of that rulemaking. The EPA has considered these factors and the new information provided in establishing the appropriate graduated schedule for the cold storage warehouses subsector. For additional discussion, refer to the Response to Comments document found in the docket for this rule.

Comment: Many commenters stated that the EPA has already listed multiple substitutes below the 150 or 300 limit, as applicable, with safety standards incorporating UL 60335-2-89 and ASHRAE 15-2022. However, one commenter stated there is no indication that acceptable A1 refrigerants below the 150 limit are available or have received SNAP approval. They also note that SNAP approval of a substitute does not equate to commercially available, citing R-410B as an example. Some commenters noted that the U.S. cold storage industry has long used low-charge ammonia systems and is rapidly expanding its use of CO_2, with 380 industrial sites having installed CO_2. Other commenters cited the 2023 GCCA Productivity and Benchmarking Survey report that showed 91 percent of responding cold storage warehouses currently use ammonia as their refrigerant, 10 percent use synthetic F-gas refrigerant, and five percent use carbon dioxide as their refrigerant.[131]

Response: The EPA agrees that substitutes previously identified as available to meet the upcoming January 1, 2026, restriction for this subsector may need additional time to become commercially available. In particular, the revisions to the compliance dates in this rulemaking address concerns about safety considerations in densely populated areas and availability of

[131] This comment highlighted that the numbers do not add up to 100% due to the fact that some cold storage facilities use multiple refrigerants.

sufficient compliant refrigerant options across the subsector in the near term. The EPA reiterates that nothing in this final rule will prevent use of refrigerants below the limits of 150 or 300 prior to 2032. The Agency anticipates that many cold storage warehouses will continue to use ammonia and other substitutes where appropriate.

As stated previously, SNAP Rule 26 listed seven non-toxic, lower flammability (*i.e.*, A2L) substitutes as acceptable, subject to use conditions, for use in new cold storage warehouses.[132] These are HFO-1234yf, HFO-1234ze(E), R-457A, R-516A, R-454C, R-455A, and R-454A. All except one (e.g., R-454A) are below the limit of 150 for the installation in new cold storage warehouses that have a charge size of 200 pounds or more. All of these refrigerants could also be installed in new systems that have a charge size less than 200 pounds, or as part of the high temperature side of a cascade system. While increasing the number of refrigerants listed as acceptable under the SNAP program can provide more options in the long term, more time is needed for chemical suppliers to produce them in sufficient quantities. The EPA is seeking to avoid supply chain issues similar to those that arose with the deployment of the new refrigerant blend, R-454B, in the residential and light commercial AC/HP subsector. In that situation, while the refrigerant was being manufactured in sufficient quantities, it was not available in the field for equipment installation and servicing.[133] Some of these substitutes are currently commercially available, including HFO-1234yf, HFO-1234ze(E), R-454C, and R-454A; however, others will take time to become commercially available.

Comment: One commenter stated that the refrigerant highlighted in the March 6, 2025, request from the Coalition for the Use of Safe and Efficient Refrigerants (CUSER) to the EPA, R-513A, is not suitable for low-temperature applications needed for frozen foods due to its normal boiling point of -20.5°F. They stated the same is true for R-450A. They also stated that a

[132] *See* 89 FR 50410 (June 13, 2024).
[133] *See* Memorandum – Overview of R-454B Refrigerant Shortage and Current Status, in the docket for this action.

refrigerant such as R-448A is much more compatible for low-temperature cold storage applications with its normal boiling point of approximately -45°F.

Response: The EPA appreciates the technical information this commenter shared. The EPA notes that one reason for raising the limit for cold storage warehouses is to provide additional options, like R-513A, to be used in densely populated areas in the interim period while other options, including several A2L substitutes that were listed in SNAP Rule 26, can be commercially developed. This will allow warehouse developers and operators to use other refrigerants that would comply with the limit of 150 or 300, as applicable, beginning in 2032. The EPA notes that R-448A would not be allowable as a refrigerant for cold storage warehouses under the graduated schedule in this rulemaking, as it is above the limit of 700. As described in this section, there are other options for cold storage warehouses that meet the needs of low-temperature cold storage applications.

Comment: Many commenters opposed the proposal for adjusting the limits and schedule for cold storage warehouses. One commenter noted that the EPA has never previously proposed or referred to a limit of 700 for these systems, and it is inappropriate since the EPA already justified the lower limits in the 2023 Final Rule. Multiple commenters stated that sector-wide deferrals for cold storage warehouses are not warranted—particularly after January 1, 2029, when the AIM Act reduces supply of HFCs to 30 percent of the baseline period. Multiple commenters stated that delaying the implementation until 2032 will negate emission reductions and go against the AIM Act's requirement for a rapid transition to safer alternatives. Multiple commenters stated that there are enough alternatives in use to justify the original deadlines established in 2023. One commenter stated that allowing a limit of 700 would not reduce costs, and it could disrupt the market. One commenter stated that the EPA must maintain pre-existing timelines and limits for commercial refrigeration equipment for reasons that include avoiding duplicative costs for manufacturers and stranded assets, minimizing costs to consumers, preserving American jobs and leadership, and preventing refrigerant shortages and price spikes.

Response: The EPA disagrees with commenters that there are enough alternatives to justify the original deadlines established in 2023 for the reasons discussed within this section. The EPA also acknowledges these commenters' opposition to altering the limits and compliance date for cold storage warehouses and preference for retaining the requirements in the 2023 Final Rule; however, the EPA is finalizing a graduated schedule based on the totality of the record for this subsector.

The EPA understands that any delay in the compliance dates as compared to the 2023 Final Rule for cold storage warehouses could allow the continued use of and demand for certain refrigerants. However, as stated above, cold storage warehouses have historically and widely used ammonia, a refrigerant that is not impacted by the HFC phasedown. There is nothing in this final rule that precludes the continued use of ammonia, or other refrigerants below the 150 or 300 limits, as applicable. In addition, based on information provided prior to the proposal and in comments, the EPA understands that over 90 percent of cold storage warehouse refrigeration systems in the United States used either ammonia or CO_2.[134] The EPA anticipates that this trend will generally continue for new installations of cold storage warehouses, while the graduated schedule in this rulemaking allows flexibility for continued use of HFC refrigerants below the 700 limit in the interim period.

With regards to commenters' assertions of duplicative costs for manufacturers and stranded assets, the Agency reiterates that nothing in this rule prevents manufacturers from continuing to manufacture and sell equipment before the effective date of the 150 or 300 limits, as applicable. The EPA does not anticipate a significant shift away from the current use of refrigerants that are below those limits. The EPA agrees that prices and demand for HFC refrigerants will likely increase in the interim period. The Agency discusses this in more detail in another response in this section. In general, the EPA expects that these price increases will be market drivers to shift industry towards refrigerants below the 150 or 300 limits for cold storage

[134] *See* letter provided by IIAR, dated June 9, 2025, in the docket for this action.

warehouses. Commenters noted the potential for the final rule to impact costs to consumers as well as jobs; however, for this subsector, the Agency did not receive information to sufficiently support these claims.

Comment: Multiple commenters requested keeping the limit at 700 permanently instead of lowering it in 2032 to 150 or 300. They asserted that it is inappropriate to assume that additional compliant substitutes would be available after seven years. Another commenter recommended that the limit could be removed entirely for cold storage warehouses.

Response: The EPA disagrees with commenters' assertions that it is inappropriate to adopt a 150 or 300 limit permanently. The EPA also disagrees that the limits for cold storage warehouses should be removed entirely. The 2023 Final Rule responded to petitions to restrict fully, partially, or with a graduated schedule the use of HFCs in cold storage warehouses. This rule reconsiders the limits and timing based on the totality of the record which includes identified viable substitutes. The SNAP program listed several additional lower toxicity alternative refrigerants for cold storage warehouses that would meet the 150 or 300 limit requirements, as applicable, in June 2024. The graduated schedule provides additional time to adopt these more recently listed compliant refrigerants. The EPA intends to continue to monitor the transition. If at a later date, the EPA becomes aware of information that suggests six additional years was insufficient, at that time, the Agency can decide to revisit the 2032 compliance date. It is unlikely such an assessment could be made for several years.

Comment: Multiple commenters requested aligning the limits for retail food subsectors with cold storage warehouses, and to apply a limit of 1,400 to allow for the use of R-448A and R-449A. Some indicated that this would allow an organic transition to A2L refrigerants as they become more widely available. One commenter mentioned there are still many warehouses that require a non-toxic refrigerant. Another commenter agreed with aligning the limit of retail food subsectors with cold storage warehouses, however disagreed with the proposed increased limit and delayed date.

Response: The EPA appreciates the comments to adjust the limits to align across retail food subsectors and cold storage warehouses, or remove them entirely. However, the Agency's limits are based on assessment of the specific subsector. In the 2023 Final Rule, the Agency often used the same numerical limits (*e.g.,* 150 and 700) since often the same refrigerants where being considered for multiple applications. Based on the information provided ahead of the proposed rule and during the comment period, the Agency concludes that a 700 limit as part of a graduated schedule is appropriate for cold storage warehouses. Refrigerants, including but not limited to R-513A, were identified as interim solutions and these refrigerants are below the 700 limit. The EPA recognizes that in some cases, a non-toxic refrigerant is required for a cold storage warehouse application. In this case, the EPA again notes that there are available substitutes, such as R-513A, that are below the interim limit of 700 and have lower toxicity characteristics (*i.e.*, ASHRAE safety classification "A").

Comment: Multiple commenters noted that the proposed delays to 2032 and interim limits would elevate near-term HFC demand while supply tightens, misaligning the AIM Act's intended ability to guide an orderly transition and the phasedown schedule. One commenter stated that if compliance dates are delayed and limits are relaxed, they anticipate refrigerant shortages from 2027 onward. Based on the EPA's own modeling, this will create a future shortage of the supply of refrigerants with higher limits, including refrigerants originally intended for use in servicing legacy equipment. Multiple other commenters recommended adjusting the compliance date to January 1, 2029, to synchronize with the allocation phasedown schedule.

Response: As a general matter, the EPA does not agree that limits set under the Technology Transitions subsection of the AIM Act need to align with the dates Congress established for the phasedown schedule under subsection (e). These are two distinct subsections, each with their own clear direction. While the additional time until 2029 would provide limited flexibility for cold storage warehouses, the EPA concludes that it is not enough time to address concerns for this subsector. Congress' direction under subsection (i) are to the extent practicable,

factor in "the remaining phase-down period for regulated substances," among other factors. In addition, the phasedown itself is a separate and key market driver for all refrigerant users. The EPA has considered the remaining phasedown period as well as the other factors listed in subsection (i)(4) of the AIM Act and factored them in to the extent practicable, consistent with Congressional direction.

The EPA acknowledges concerns with increased costs of HFC refrigerants if there is an increase in demand resulting from delayed compliance dates. The prices of HFCs will likely increase as the phasedown continues notably around the seventy percent stepdown in 2029, irrespective of whether the EPA amends the compliance date or limit for the cold storage warehouse subsector. The EPA expects that if there are price increases, companies may choose to transition to refrigerants that are below the limits of 150 or 300, as applicable, prior to January 1, 2032. Thus, the phasedown itself is expected to be a market driver for the transition of cold storage warehouses to substitutes that are below the 2032 limits, consistent with the statutory HFC phasedown under the AIM Act.

Comment: Multiple commenters stated that the record does not support claims that substitutes are unavailable or that building codes require sector-wide deferrals. Another commenter noted that since 2021, nearly every U.S. jurisdiction has acted to authorize the use of A2L refrigerants through adoption of the 2024 model codes or interim measures consistent with those provisions. They also noted that 49 states have formally recognized A2L use either through adoption of updated model codes, enactment of state legislation, or issuance of letters of approval by the state fire marshal or building authority. 29 states have passed legislation explicitly allowing alternative refrigerants, and several others, including Idaho, Kentucky, Michigan, Nevada, and the District of Columbia, have issued interpretive letters confirming that A2L products listed and labeled to UL standards and installed in accordance with ASHRAE 15 are permissible under existing codes. Another commenter noted that the International Code Council (ICC) has confirmed commercial and residential use of A2L refrigerants is allowed following

code changes in the 2024 IBC, 2024 International Residential Code (IRC), IFC, and IMC. One commenter states that cold storage warehouses do not face the same challenges with local building codes as described above for supermarkets because they are not consumer-facing facilities.

Response: The EPA acknowledges commenters who stated that the record does not support claims that substitutes are unavailable or that building codes require sector-wide deferrals. The Agency also acknowledges information provided by commenters indicating that nearly all U.S. jurisdictions have taken action to authorize the use of A2L refrigerants through adoption of the 2024 model codes or equivalent interim measures, that most states have formally recognized A2L use through code adoption, legislation, or letters of approval, and that the ICC has confirmed A2L use in commercial and residential applications following changes in the 2024 IBC, IRC, IFC, and IMC. In light of these developments, the EPA agrees that building code adoption is not a sector-wide barrier for cold storage warehouses.

At the same time, the EPA finds that a graduated schedule is more appropriate for cold storage warehouses for reasons other than availability of alternatives. The record reflects that additional alternatives and system configurations, including those using A1 or A2L refrigerants, are becoming more widely deployable as equipment listings and product safety standards are implemented, supply chains mature, and field experience expands. This approach also recognizes that codes are not a universal constraint in this subsector; however, there may be situations where codes remain a near term barrier. It also addresses the complexity of deploying systems designed for new refrigerants and the need to align with capital planning and workforce training.

Given that the vast percentage of this subsector does not currently use and are not expected to suddenly begin using HFCs, the EPA expects that the impact of this change to a gradated schedule will likely have a minimal impact on the products manufacturers offer. The EPA expects a strong portion of the market to choose a refrigerant below the limits of 150 or 300,

as applicable, for new cold storage warehouse installations prior to 2032. Similarly, the EPA notes the limited use of HFCs will likely result in a limited change in demand.

F. *Replacement Condensing Units in the Residential and Light Commercial Air Conditioning and Heat Pump Subsector*

Comment: Most commenters were opposed to continuing to allow the manufacture and import of R-410A condensing units and allowing their sale or use as a replacement in an existing system. Commenters reiterated the points made in the manufacturer's administrative petition, including that they considered the current approach to be a loophole that allows for the infinite replacement of condensing units and allows for the complete replacement of existing systems over time. One commenter commented that allowing the manufacture, import, sale, distribution, and utilization of "specified components" (particularly condensing units) would maintain reliance on old technology systems and refrigerants that exceed the limit for this subsector for many years, and certainly through the upcoming 2029 stepdown.

Response: What commenters describe as a loophole instead is the intended effect of the 2023 Technology Transition Rule. Allowing a continued market (*i.e.*, manufacture, import, export, sale, or distribution) for specified components enables end-users to maintain their existing systems, even if those systems use legacy HFC refrigerants. The EPA did not intend for the Proposed 2023 Rule to prohibit the market for all "components and subcomponents" using legacy HFC refrigerants, thereby preventing the repair of existing HFC refrigeration and AC/HP equipment.[135] Based on comments on the Proposed 2023 Rule, the EPA made changes intended to address this concern for the entire refrigeration and AC/HP sector. Petitioners subsequently stated their preference in their administrative petitions for reconsideration and reiterated in comments to this rule that residential and light commercial AC/HP systems are not repaired by replacing a failed condensing unit. In reconsidering this issue more narrowly in this rulemaking

[135] This would have also perversely favored the repair of older systems using R-22 and other ozone-depleting refrigerants because components of such systems are not subject to restrictions under the AIM Act.

for only condensing units (not other components or subcomponents) and only in the residential and light commercial AC/HP subsector (not chillers or commercial refrigeration systems), the EPA now affirms that by making no changes to the current regulations, a homeowner can choose to replace their failed condensing unit rather than purchase a whole new system. This policy is consistent with that taken during the phaseout of R-22, where the Agency allowed for the replacement of condensing units. Such repairs provide a lower-cost option for homeowners who might not be able to afford or would rather not purchase a whole new system.

The EPA disagrees with commenters that the EPA is allowing for either the "infinite" or "complete" replacement of the whole system over time. The EPA has consistently stated that replacing all components over time constitutes the installation of a new system.[136] While replacing the condensing unit without replacing the indoor coil would not be considered the installation of a new system under this approach, the subsequent replacement of the indoor coil would be considered the installation of a new system which cannot use a refrigerant that exceeds the limit system. Alternatively, if the indoor evaporator coil is replaced, the subsequent replacement of the condensing unit would also be considered the installation of a new system which cannot use a refrigerant that exceeds the limit.

Comment: Some commenters were concerned that allowing condensing unit replacement will increase consumer costs. Commenters stated that one way in which costs may increase is by replacing only the condensing unit without replacing the inside coil, which results in an unmatched system. The new condensing unit will not have been designed to be used with the existing indoor coil, resulting in lower energy efficiency, and may require more repairs over its lifetime. Another way that commenters stated costs could increase is through continued use of R-410A. Commenters noted that R-410A needed to recharge legacy systems will increase in price and cost more relative to refrigerants below the limit for the subsector, and R-410A may become unavailable as the phasedown continues.

[136] *See* 88 FR 73121 (October 24, 2023).

Response: The EPA recognizes that extending the life of existing residential AC/HP systems could mean continued demand for the refrigerant used in those systems. The EPA acknowledges that the 2029 phasedown step will decrease production and import of HFCs. However, the EPA disagrees that continued repair of residential and light commercial AC/HP systems will increase demand beyond what can be met with virgin and reclaimed HFCs going forward. The EPA also recognizes that the price of refrigerant using legacy HFCs may rise as the phasedown continues, and the EPA expects that demand for these refrigerants, such as R-410A, will respond to these price signals. However, the cost of refrigerant is only one factor a homeowner considers when deciding to repair their existing system or move to a new system. This approach allows a consumer to weigh their options and make an informed decision. The EPA also recognizes that in systems where a condensing unit or indoor coil was replaced, the unmatched components may work though they were not specifically designed to operate with one another. In such cases, the energy efficiency of the system may not be as high as if the components were designed to operate with one another, but energy efficiency would still be better than the older coil and condensing unit's Seasonal Energy Efficiency Ratio.

Comment: One commenter provided data about uncharged condensing units designed to use R-22 after the 2010 restriction on manufacture and import of charged units. The commenter said the industry took advantage of a loophole allowing "dry-shipped" units that allowed contractors to continue installing outdoor condensing units rather than replacing old systems at the end of their useful life. The commenter noted its Market Intelligence Report began in 2013 and showed significant sales of R-22 outdoor condensing units until 2016 (R-22 unit sales decreased from over 22,000 units in 2017 to just a few thousand per year in 2022 when the commenter stopped tracking those units). The commenter stated that this extended demand for R-22 for several years and estimated that over 15 percent of the current installed base of AC/HP are R-22 units. The commenter argued that had new systems been installed rather than having the service life extended by replacing outdoor condensing units, the installed base would be near zero

after 15 years. One state commented that stakeholders to their rulemakings described this as a critical weakness of the EPA's prior phasedown of ozone-depleting substances that greatly prolonged their use.

Response: The R-22 phaseout informed the 2023 Final Rule including the policy of allowing for the replacement of condensing units. Two rules issued December 15, 2009[137] restricted the sale, distribution, and installation of AC and refrigeration products charged with R-22 as follows. Sale and distribution of appliances pre-charged with R–22 was not allowed for self-contained, factory-charged appliances such as pre-charged window units, packaged terminal air conditioners, and some commercial refrigeration units, if manufactured on or after January 1, 2010. Sale and distribution of appliance components pre-charged with R-22 was allowed if the components (*e.g.*, condensing units, line sets, and coils that are charged with refrigerant) were manufactured before January 1, 2010. Pre-charged components manufactured before January 1, 2010, may be used to service appliances manufactured before January 1, 2010,[138] but may not be assembled to create new appliances.[139]

The data provided by the commenter support the EPA's policy of providing flexibility to the homeowner, even if the commenter prefers a different policy outcome. The data demonstrate to the Agency that consumers may choose to replace a failed condensing unit when faced with the choice of purchasing a new system that uses a different refrigerant. The data also show that the market gradually transitioned from R-22 to the point that the commenter stopped tracking R-22 unit sales in 2022. The ability to repair R-22 systems did not prevent the transition from R-22 to R-410A and the EPA anticipates the current transition from R-410A will continue without the

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[137] "Protection of Stratospheric Ozone: Adjustments to the Allowance System for Controlling HCFC Production, Import, and Export," 74 FR 66412 (December. 15, 2009); "Protection of Stratospheric Ozone: Ban on the Sale or Distribution of Pre-Charged Appliances," 74 FR 66450 (December. 15, 2009).

[138] Under 40 CFR 82.3, "manufactured, for an appliance, means the date upon which the appliance's refrigerant circuit is complete, the appliance can function, the appliance holds a full refrigerant charge, and the appliance is ready for use for its intended purposes." This definition applied to appliances both manufactured in a factory or in the field. This is the basis for the comparable definition of "install" at 40 CFR 84.52 which 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."

[139] *See* 74 FR 66419 (December 15, 2009).

need for the Agency to restrict the repair of R-410A systems. The estimate that over 15 percent of the current installed base of residential AC use R-22 indicates a healthy hydrochlorofluorocarbon (HCFC) reclamation market as production and import of virgin R-22 ended in 2020. The EPA anticipates that R-410A equipment will follow a similar pattern and it may be many years until the installed base is zero. The Agency notes that the AIM Act's HFC phasedown under subsection (e) allows for production and import of HFCs starting in 2036 at the level of 15 percent of baseline and continues indefinitely. The Agency has previously stated that HFCs will continue to be available including to service existing equipment.[140]

Comment: Many commenters argued that allowing continued imports of R-410A units will undermine the investments made by domestic manufacturers of refrigerants and equipment that use new refrigerants.

Response: The Agency acknowledges commenters' concerns about prior investments. The EPA notes that there is nothing in this final rule that prevents companies from marketing their new systems using new refrigerants. The EPA finds it is important to allow homeowners to weigh their options regarding whether to replace an AC/HP system or to repair it with a replacement component. As noted in response to the previous comment, the transition from R-22 systems provides a historical example of how a similar approach has worked successfully in previous transitions.

Comment: One commenter noted that the quick rollout to R-454B and prohibition on R-410A left manufacturers, technicians, and contractors with little time to adequately prepare. Some organizations commented that the 2023 Final Rule benefits "rent seeking" special interests (refrigerant producers and equipment manufacturers) while raising costs for consumers. They commented in support of the proposal for this rulemaking as it reduces the incentive to engage in rent seeking and thus increases aggregate national wealth. Faced with a "cost of living crisis," the commenters urged the EPA to minimize the burden to homeowners of its discretionary regulatory

[140] *See* 89 FR 82771 (October 11, 2024).

requirements. These commenters recommended that all restrictions on residential AC be removed and allow for the continued installation of new R-410A residential AC. Many commenters commented that the EPA should remove all restrictions on R-410A, raise the limit to allow the use of R-410A, or extend the deadline for installation.

Response: These commenters did not address the question of whether the EPA should prohibit the manufacture and import of R-410A components for repair and replacement. Commenters' requests to fully remove all restrictions on R-410A, raise the limit to allow use of R-410A, and/or extend the installation deadline for residential AC systems are outside the scope of this rulemaking. With regards to the comments on the rollout of R-454B, the Agency directs readers to section IV.H of this preamble where we discuss the continued installation of residential and light commercial AC/HP components that were domestically manufactured or imported before January 1, 2025.

Comment: One chemical manufacturer commented that the EPA is wrongly allowing pre-charged components to be imported into the United States without the expenditure of domestic production or consumption allowances for the refrigerant they contain. They argue that this undermines the consumption limits in the AIM Act and subjects U.S. manufacturers to constraints on HFC supply that foreign manufacturers do not face. The commenter argued that allowing the importation of pre-charged components without expending allowances is contrary to the text and legislative intent of the AIM Act. The commenter stated that "consumption" is defined to mean the difference between "a quantity equal to the sum of . . . the quantity of that regulated substance produced in the United States; and . . . the quantity of the regulated substance imported into the United States" and argued that since these statutory provisions are in no way qualified, they clearly express that the EPA is to address all consumption of HFCs, based on the full quantity of HFCs imported into the United States. The commenter also stated that the EPA's sole justification in the HFC Framework Rule to exempt imported products that contain HFCs from requiring consumption allowances because there was "insufficient data."

Response: The EPA disagrees that consumption allowances are needed to import equipment containing regulated substances. The EPA addressed treatment of HFCs in products in the HFC Framework Rule.[141] Further, while this comment is made only with the aim of restricting the importation of residential and light commercial AC/HP condensing units containing R-410A, there is no clear way to limit their statutory argument to only a specific type of product containing that specific HFC blend.

Comment: A few commenters expressed concern that allowing continued manufacture and import of R-410A condensing units could become an avenue for illegal activity in the long term. Commenters stated that this will make it more difficult to enforce the restriction on the installation of new systems, that enforcement will rely on proper labeling of components as being for replacement only, and that it shifts responsibility for ensuring compliance down the supply chain to technicians and consumers.

Response: The EPA notes these concerns and states, as discussed in the 2023 Final Rule, that the current restrictions are sufficient for the Agency and the relevant stakeholders to ensure compliance with these restrictions. As finalized previously, a technician needs only to confirm the age of the condensing unit before installing a new system, which can be done by viewing the label. After January 1, 2025, all specified components that are designed to use a regulated substance above the limit must have a label that states "For servicing existing equipment only." Taken together, this provides the technician with sufficient information to determine whether or not a new R-410A condensing unit may be installed.

The 2023 Final Rule describes the EPA's choice to regulate the installation of new refrigeration and AC/HP systems.[142] The EPA chose not to regulate the "use" of an HFC as the utilization of equipment or the repair of that equipment.

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[141] *See* 86 FR 55116 (October 5, 2021).
[142] *See* 88 FR 73098 (October 24, 2023).

The EPA's decision to not change the treatment of condensing units aligns with subsection (i)(7)(B) of the AIM Act and consistent with the Agency's historical practice of allowing repair of legacy equipment throughout its useful life. This final decision is also consistent with the Presidential Memorandum titled *Delivering Emergency Price Relief for American Families and Defeating the Cost-of-Living Crisis,* which directs "the heads of all executive departments and agencies to deliver emergency price relief, consistent with applicable law, to the American people and increase the prosperity of the American worker," including by "pursuing appropriate actions to . . . eliminate counterproductive requirements that raise the costs of home appliances[.]"[143]

G. Industrial Process Refrigeration in Certain Laboratory Equipment

Comment: Commenters requested that the final rule include additional laboratory equipment beyond the two applications in the proposal. One commenter requested that the EPA include laboratory sample preparation equipment that does not shake because that equipment faces identical technical and safety challenges as shakers. The commenter stated that both systems use refrigerated modules to maintain temperature sensitive (0 °C to 25 °C) reagents and samples during benchtop automated sample preparation. Another commenter supported including other niche laboratory cooling applications distinct from those already addressed that demonstrate a near-term constraint. Other commenters recommended that the EPA expand the extension to exclude any laboratory and pharmaceutical processing equipment listed to standards UL 61010-2-011, UL 61010-2-020, or UL 60335-2-89 from transition requirements until January 1, 2028, or a year after refrigerants using these standards have been listed by the SNAP program. These commenters shared that they appreciate the proposed extension for refrigerated centrifuges and laboratory shakers but have identified other niche laboratory and pharmaceutical processing equipment that also require relief to ensure continued market access during transition because the

[143] *See* Delivering Emergency Price Relief for American Families and Defeating the Cost of Living Crisis, January 20, 2025, in the docket for this action.

safety standards have yet to be updated to accommodate the use of flammable refrigerants. The two commenters stated that this modification would ensure consistent treatment across equipment that serves comparable functions and avoid unnecessary market disruptions. One other commenter representing a company that domestically manufactures temperature-controlled plant growth chambers stated that they have transitioned to R-454C and do not support an extension for all refrigerated laboratory equipment.

Response: Comments suggesting other laboratory equipment receive similar extended compliance dates are outside the scope of this rulemaking. The EPA is not broadening this final rule to other laboratory equipment than what was proposed. The extensions provided in this final rule are based on technical information that demonstrates the infeasibility for specific equipment to transition from the current refrigerant to ones that would meet the requirements of the 2023 Final Rule. The EPA has confirmed that the challenges faced by the manufacturers of refrigerated centrifuges and shakers are barriers to all manufacturers making such equipment. The EPA does not have sufficient information from commenters' general requests to include other laboratory equipment in the final rule. There was only one commenter who stated that non-shaking systems face identical challenges to shaking systems and they provided no information to support that claim. Additionally, without a separate proposal and opportunity for comment, the EPA would have difficulty identifying all of the laboratory equipment listed to standards UL 61010-2-011, UL 61010-2-020, and UL 60335-2-89 given the breadth of equipment potentially subject to those standards. UL 60335-2-89 applies to a wide variety of commercial and industrial refrigeration equipment, including retail food, commercial ice machines, IPR, cold storage warehouses, and ice rinks. The EPA also acknowledges that we received one comment requesting the Agency not include equipment outside the scope of the proposal as they have already transitioned their growth chambers. Other companies could be adversely affected by broadening the final rule or would have comments concerning the types of equipment to include or not include, further warranting the Agency's conclusion to not expand the scope of this final rule. The Agency will

continue to monitor transition and if appropriate, could consider additional changes in a separate rulemaking.

Comment: Many commenters expressed support for extending the compliance date for refrigerated centrifuges and refrigerated laboratory shakers to January 1, 2028. Some of these commenters expressed general support for limited, targeted relief given to applications such as laboratory equipment, where additional time is necessary to address implementation challenges. They reasoned that extending the compliance date to January 1, 2028, acknowledges reasonable lead times for engineering and safety certification for this equipment, is appropriate for these discrete applications that demonstrate a near-term constraint, and is supported by data provided that were not available during the drafting of the original 2023 Final Rule. Another commenter, a laboratory equipment manufacturer, shared that extension of the compliance date to January 1, 2028, would provide sufficient time to continue a robust development process, maintain capacity and headcount to fulfill backorders, and continue preparation for manufacturing of laboratory shaker designs with new refrigerant. This commenter also shared that the extension to January 1, 2028, would enable additional development timelines to complete their portfolio of refrigerated centrifuges with new refrigerant currently under development.

Many laboratory equipment manufacturers requested that the EPA extend the compliance date by another year – to January 1, 2029 – so that it aligns with the transition date of a similar HFC restriction in the European Union (EU). Commenters noted that the alignment would provide global regulatory certainty and consistency and stated that a single date would be easier to administer product re-design, testing, and certification to international safety standards. Two such commenters stated that aligning with the EU's compliance date would minimize disruption to the availability of refrigerated laboratory centrifuges and reduce the potential for supply chain disruptions and patient impacts. Commenters also noted that an additional year would provide more time to develop non-flammable technologies.

Many commenters generally reiterated that UL/IEC/EN 61010-2-020 is not yet updated to address the risk of flammable refrigerants in refrigerated centrifuges. Two of these commenters noted that after this standard is updated, it will take time to redesign, test, and recertify using the alternative refrigerants. Another commenter stated that forcing a premature transition before the relevant safety standards and engineering solutions are in place could increase costs while reducing the availability of essential medical and scientific tools.

Response: The EPA is finalizing a compliance date of January 1, 2028, as proposed. While a few commenters requested extending the compliance date to January 1, 2029, none stated that they could not meet the January 1, 2028, date. Their rationale appears to be based on aligning with another government's compliance schedule. The EPA's decisions are based on the criteria identified in subsection (i)(4) of the AIM Act, and while another government's schedule could be considered under "other relevant factors," the Agency does not agree with basing its decision on aligning with another government that had their own reasoning for selecting January 1, 2029. Moreover, unlike the United States, the EPA understands that the EU limits the use of some HFO and HFC/HFO refrigerant blends in this application, and there could be other differences between the U.S. and EU markets. Further, none of these commenters provided data to support their claims that a compliance date of January 1, 2029, is needed to meet the HFC restrictions for IPR by that date. One of the manufacturers who supported a compliance date of January 1, 2029, explicitly stated that a compliance date of January 1, 2028, would still enable updating standards and redesigning, testing, and certifying refrigerated centrifuges with alternative refrigerants. The EPA finds that there will be sufficient substitute refrigerants before that time, and this was reinforced by multiple commenters that were or represented OEMs.

Comment: One commenter suggested that certain laboratory equipment should not be categorized as IPR and that the EPA modify the 2023 Final Rule subsector framework to simplify subsectors with broader limits. This commenter stated that bundling laboratory equipment used

for research and development with large industrial processes systems creates a competitive disadvantage for smaller segments of the industry that do not fit well into the category.

Response: The EPA is finalizing laboratory equipment under the IPR subsector. The EPA did not propose a recategorization for certain laboratory equipment and considers such a change to be outside the scope of this rulemaking.

H. *Preventing Stranded Inventory of Residential and Light Commercial Air Conditioning and Heat Pump Equipment*

Comment: Numerous technicians and contractors commented in favor of removing the installation deadline for legacy components. Distributors and contractors commented that they still have a significant amount of manufactured R-410A equipment in their inventories, which was confirmed by a trade association that surveyed its members. The trade association commented that remaining R-410A inventory was not due to distributors' poor planning but rather factors outside of distributors' control. Commenters noted that 2025 sales were lower than forecast when they made purchasing decisions about how many R-410A units to order. They also commented that the transition to R-454B happened quicker than anticipated. They stated this left R-410A units unsold and resulted in shortages of R-454B needed to install those systems. One commenter succinctly summarized the difficulty faced at every stage of the distribution chain making complicated inventory management decisions based on predictions of future production and sales of R-410A and R-454B equipment. Many commenters found the switch to A2L refrigerant was faster than expected, which led to lots of problems, and ultimately resulted in higher costs.

Commenters affirmed the negative impact the installation deadline would have on their businesses. They commented that purchased stock would become unsellable and effectively worthless, creating widespread economic hardship throughout the heating, ventilation, and air conditioning (HVAC) industry, especially on small and mid-sized businesses. Other commenters stated that extending installation eligibility for existing R-410A equipment can help stabilize

pricing and give consumers an additional choice and lower costs to homeowners. Commenters said that it also would reduce costs to builders by enabling the completion of ongoing projects for which R-410A equipment has already been procured. Many commenters agreed with the EPA that allowing the installation of equipment that had already been manufactured and imported would not have an environmental impact. Commenters agreed that there would be no additional demand for HFCs beyond what the EPA had already estimated for the 2023 Final Rule. Other commenters said that there are environmental costs to scrapping inventory to consider, including the release of HFCs already charged in those units.

Response: The Agency agrees with commenters that amending this provision should avoid the costs associated with stranding inventory in this subsector.

Comment: Some commenters asked that the EPA delay or remove the 700 limit for residential and light commercial AC/HP and allow for the continued use of R-410A. These commenters stated that R-410A provides a more affordable, nonflammable, and reliable option for consumers. One commenter pointed out that allowing R-410A is more in line with statements made by the EPA Administrator about increasing refrigerant choice and lowering costs to consumers.

Response: The EPA did not propose to reconsider the limit for installing new residential and light commercial AC/HP systems using equipment domestically manufactured or imported after January 1, 2025, and as such these comments are out of scope for the rulemaking. The EPA is also aware that the U.S. manufacturers of equipment in this subsector already are providing equipment using R-32 or R-454B, both of which are below the 700 limit. Installing new R-410A systems using equipment domestically manufactured or imported after January 1, 2025, remains prohibited. This rule provides flexibility to allow the installation of equipment in U.S. inventories before January 1, 2025.

Comment: A couple of commenters doubted that much inventory of pre-2025 R-410A equipment still exists. One commenter referenced a statement made by the Plumbing-Heating-

Cooling Contractors Association that, based on conversations with supply houses, there is not a large amount of inventory at risk of being stranded. Similarly, the commenter noted that Air Conditioning Contractors of America has advised contractors to clear their R-410A inventory by year-end 2025. Another commenter noted that any inventory could still be used as warranty replacement.

Response: The Agency acknowledges a lack of concrete data on the number of R-410A units that remain in inventory. The EPA has heard from numerous contractors and HVAC companies that they still have inventory of R-410A units. One commenter commented in favor of the proposal and did not indicate that inventories were small, which contrasts with a description of a discussion provided by another commenter. The Agency notes that the provision is intended to provide flexibility to avoid stranding equipment and does not allow for additional manufacture or import of units using refrigerant above the 700 limit, thus inherently resulting in a finite and decreasing inventory of equipment. If the inventory is smaller than perhaps assumed, the Agency views that as aligning with the goal of avoiding stranded inventory for this subsector. The EPA did not receive comments that technicians were caught unawares by the restriction; instead, they described the challenge of managing this inventory in light of factors outside their control.

Comment: One commenter expressed concern that completely removing the installation deadline for components that were manufactured in the United States or imported into the United States before January 1, 2025, could be used as cover by unscrupulous companies to continue installing R-410A components manufactured or imported after January 1, 2025, that may only be used for repair and replacement. This commenter preferred a five-year extension so that it is not open-ended. Another commenter noted that removing the compliance date is likely to complicate enforcement and may incentivize the smuggling of R-410A equipment. A few technicians also stated that an extension to install equipment through the end of 2026 would be sufficient.

Response: The EPA acknowledges the potential challenges this poses to enforcing the restrictions against a few bad actors. The Agency limited amending the regulations in

acknowledgement of specific challenges that this subsector was facing. Given the manufacture and import compliance date for components that may be used to install new systems went into effect on January 1, 2025, the Agency acknowledges the affected stock of equipment is finite and decreasing. While the EPA notes the potential for bad actors, the totality of the record supports the Agency's decision.

Comment: One commenter requested that the EPA confirm that legacy equipment manufactured before January 1, 2025, may be installed if it enters U.S. commerce consistent with AIM Act and import rules, including inventory transferred from Canada or Mexico, so long as the unit's manufacture or import date proves compliance.

Response: Legacy equipment must have been manufactured in the United States or imported into the United States before January 1, 2025. Equipment manufactured in Mexico or Canada before January 1, 2025, and imported into the United States after that date may not be installed as components of a new system. Note that as described in section IV.F of this preamble, the replacement of a condensing unit on an existing system is allowed and is not considered the installation of a new system.

Comment: Many commenters requested that the EPA remove the installation date for VRF systems that use components manufactured domestically or imported into the United States before January 1, 2026. In addition to the benefits described above, commenters also stated that treating the installation like the rest of the residential and light commercial AC/HP subsector would simplify logistics for commercial projects. Commenters noted that the same distributors and installers serve household and light commercial end users. Other commenters noted that VRF installations are highly capital intensive.

Response: The EPA did not propose and is not extending the installation date for VRF equipment manufactured domestically or imported into the United States before January 1, 2026. The Agency views these comments as out of scope for this rulemaking. The EPA has previously responded to concerns by delaying the installation date for all VRF systems by one year, until

January 1, 2027, and by two years, until January 1, 2028, for certain projects that received an approved building permit before October 5, 2023.[144] The number of VRF units is much smaller than the number of non-variable condensing units being granted flexibility in this rule and thus the amount of equipment needing to be sold and/or currently held in inventory is similarly less.

Comment: Many commenters questioned the value of an installation deadline and recommended that the EPA instead restrict the manufacture and import of the components. One commenter stated that compliance dates tied to installation require manufacturers, distributors, and end users to plan orders and projects with unreasonable precision, creating significant operational and economic burdens by requiring unreasonable planning for inventory, orders, and projects. In contrast, compliance dates based on the date of manufacture provide regulatory certainty, allow for efficient inventory management, and avoid equipment obsolescence. Other commenters requested that the EPA remove installation deadlines for installing "pre-compliance date" components in retail food refrigeration or all refrigeration subsectors, not just in the residential and light commercial AC/HP subsector.

Response: Comments about manufacturing and installation compliance dates are addressed in section IV.F of this preamble. Regarding exempting all pre-compliance date components regardless of subsector, the EPA responds that such equipment can continue to be sold and used to service existing refrigeration equipment. Thus, the concern about stranded inventory of residential and light commercial AC/HP equipment and the specific supply chain challenges that occurred in 2025, are not applicable to other subsectors.

I. Labeling Correction

Comment: One commenter supported the EPA's proposal to correct the labeling citation at 40 CFR 84.58(b). This commenter supported this provision because it is narrowly tailored, technically justified, and administratively sound. This commenter also said this correction provides regulatory clarity with no new obligations.

[144] S*ee* 89 FR 100381 (December. 12, 2024).

Response: The EPA acknowledges this commenter's support for this provision and is finalizing as proposed.

J. Effective Date of Rules under Paragraph (i)(6)

There were a variety of comments that supported and opposed the EPA's proposed interpretation of subsection (i)(6), which the Agency is finalizing as proposed.

Comment: One commenter stated that due process of law has generally been understood as requiring that regulated parties be given time to comply with new legal requirements. The Administrative Procedure Act (APA) sets a general requirement of 30 days before which published final rules can take effect, but also contains an exception for "a substantive rule which grants or recognizes an exemption or relieves a restriction."[145] The commenter argued that subsection (i)(6) should be understood within that context; the one-year delay provides regulated industries with enhanced due process rights – compared to 30 days provided under the APA – but the one-year delay should not be used to deny stakeholders the rights to regulatory relief that the APA would otherwise provide them.

Response: The EPA agrees that due process principles further support its interpretation that the best reading of the statute is that the one-year delay begins upon the promulgation of the "applicable" rule, which is the rule that created the relevant restrictions.

Comment: One commenter argued that an action that repeals or relaxes an existing restriction is not a rule issued under subsection (i)(1) authority and instead falls under the EPA's general rulemaking authorities in the APA and subsection (k)(1)(A) of the AIM Act. As such, the one-year delay under subsection (i)(6) does not apply. In contrast, the commenter stated that a rule creating or tightening an HFC use restriction would be issued under subsection (i) and thus is subject to the statutory factors in subsection (i)(4) and the one-year delay under subsection (i)(6). This commenter also noted that even if a rule is issued under the authority of the APA or

[145] *See* 5 U.S.C. 553(d)(1).

subsection (k)(1)(A) of the AIM Act, it must still meet at least one criterion of subsection (i)(4) to avoid being arbitrary and capricious.

Several commenters supported in part and opposed in part the EPA's proposed interpretation. They commented that only a rule that removes a requirement can be effective within 30 days. A rule that modifies, relaxes, or adjusts an existing restriction must observe the one-year delay, similar to any rule establishing a new restriction. These commenters interpreted the AIM Act such that the removal of a requirement does not restrict "fully, partially, or on a graduated schedule" and no longer imposes a "rule under this subsection." On the other hand, any rule that modifies, relaxes, or adjusts an existing restriction still remains a rule "restricting use" under subsection (i)(1) and therefore must observe the one-year delay.

Response: The authority to promulgate this rule arises out of the Agency's subsection (i) authority and is not solely derived from general rulemaking authority under subsection (k)(1)(A). However, as is discussed above, the one-year effective date delay clock begins when a rule is promulgated containing new restrictions. A rule, like this action, that modifies, relaxes, removes, or adjusts existing restrictions so they are unambiguously less stringent than the current restrictions is not subject to the one-year delay.[146] The EPA does not agree with the distinctions that commenters draw between rules they argue are covered under subsection (i) (*i.e.* rules that "modif[y], relax[], or adjust[]" existing restrictions) and rules they state are promulgated under subsection (k)(1)(A). This rule, which modifies, relaxes, adjusts, and removes certain requirements originally promulgated under the 2023 Final Rule, is less stringent than the previous restrictions and is not subject to the one-year delay.

Comment: Some commenters commented that a 30-day effective date for any action is contrary to the plain language of the AIM Act, which states that "[n]o rule" may take effect without the one-year delay. These commenters argued that the EPA is not free to replace the plain

[146] Examples of adjustments that are unambiguously less stringent include but are not limited to extending a compliance deadline or modifying a limit so that it is more permissive.

meaning of a statute with its own policy preferences. Specifically, there is no text distinguishing between a rule that imposes a restriction from one that relaxes a restriction. One of these commenters interpreted the EPA's proposal as meaning that a deregulatory action is not a rule. The commenter disagreed, saying that the proposed rule falls within the APA's definition of a rule and that courts applying that statute do not distinguish between regulatory restrictions and regulatory relief.

Response: As discussed in response to the previous comment, this action meets the definition of a rule under the APA and is considered a rule for the purposes of AIM Act subsection (i)(6). However, the "applicable" rule that began the clock for the one-year effective date delay was the 2023 Final Rule, which was promulgated significantly more than one year ago, so subsection (i)(6) does not prevent this rule from becoming effective in a shorter period of time. The effective date of this rule is 60 days after publication in the *Federal Register*.

Comment: One commenter also pointed to the structure and legislative history of the AIM Act. This commenter argued that the structure of subsection (i) promotes regulatory stability and points to the provisions related to negotiated rulemaking as an example. The commenter also looked at how versions of the draft AIM Act changed over time to include the current one-year effective-date delay as support for its importance.

Response: The EPA disagrees that the legislative history of the AIM Act indicates Congress's intent in subsection (i)(6). The mere fact that the original version of the bill that would become the AIM Act did not include a one-year effective date delay has no bearing on the actual meaning of the statutory text. Commenters did not include, nor is the EPA aware of, any legislative history opining on the word "applicable" or on how Congress meant for the one-year delay to be understood. As such, relying on the text of the provision itself and the relevant canons of construction are a more reliable indicator of Congress's intent, and help elucidate the best reading of the provision.

The EPA also disagrees that the negotiated rulemaking provisions of the AIM Act have any utility in discerning the meaning of subsection (i)(6). Even if they were relevant, a one-year effective date delay that applies to rules that loosen restrictions would not promote regulatory stability. Our read is that it could create even more regulatory uncertainty. For example, if subsection (i)(6) of the AIM Act were written such that providing relief from a January 1, 2027, compliance deadline, required the EPA to delay such relief by a year, the standard would become much more stringent and then decrease back to its original level again over the course of several months, creating regulatory confusion and difficulties in product planning. Congress cannot have intended that consequence.

Comment: Some commenters argue that the EPA's past practice in issuing rules to extend the compliance dates for residential and light commercial AC/HP and VRF demonstrate the Agency had correctly understood subsection (i)(6) and has provided no rationale for the change in interpretation.

Response: EPA disagrees that the previous rules provided a particular interpretation of subsection (i)(6). However, as is discussed in more detail above, to the extent those previous rules took a position to the contrary, the Agency has reconsidered its position and finds that the best reading of subsection (i)(6) is that the one-year clock begins upon promulgation of the "applicable rule" at issue, and does not begin again upon promulgation of a rule modifying existing restrictions that were originally promulgated under subsection (i) if those modifications provide relief from a restriction.

Comment: A couple of commenters also noted that the policy preference of providing relief is factually flawed given that it actually imposes substantial harms on many other parties that relied on the existing restriction.

Companies stated that a new graduated schedule would require time to be implemented, just like any other new rule. Companies stated that they benefit from the stability provided by this provision and are harmed by the immediate relaxation or removal of existing restrictions.

Preserving the one-year delay for all rules that continue to regulate use ensures an orderly transition, giving manufacturers, distributors, and contractors adequate time to adjust production, certification, and inventory management.

Response: As an initial matter, and as discussed in other responses, the Agency's interpretation in this rule is the best reading of subsection (i)(6) based on the text and structure of the AIM Act; the EPA and stakeholder policy preferences are not a basis for the interpretation. Nonetheless, the EPA acknowledges the comments that expressed concern about an effective date shorter than one year. The EPA acknowledges that companies can benefit from the stability provided when regulations take up to a year to take effect and that they could be harmed by quick changes in the restrictions. The EPA notes that this rulemaking provides relief from regulatory requirements and that, as noted in a different response to a comment in this section, delaying such relief by a year could cause additional confusion and uncertainty as requirements may change within a year based on previously finalized requirements before this rule takes effect. The EPA also acknowledges the commenters who indicated they are relying on the restrictions from the 2023 Final Rule. The EPA notes throughout this preamble that this rule does not prevent the continued manufacture, import, sale, or distribution of equipment that would have met the prior requirements. To the extent this comment addresses reliance interests, please see section IV.K.2 f of this preamble or more extensive responses.

K. Other Comments and Responses

1. Assessment of Economic and Environmental Impacts

Comment: One commenter recommended that the EPA revisit the methodology and broader regulatory framework for restricting HFCs in the context of rescinding the 2009 endangerment finding. Without a finding that HFCs endanger public health and welfare through their effect on the climate, the commenter argues that the EPA has no legal or scientific basis for this rule. Another commenter stated that the central purpose of the AIM Act is

enhancing American innovation and manufacturing, not ulterior policies like climate policy that are never mentioned in the legislation.

Response: The EPA disagrees with the commenters drawing conclusions about the relationship of this rule to the 2009 endangerment finding. The repeal of the 2009 endangerment finding does not affect the HFC Allocation Program, Emissions Reduction & Reclamation, or Technology Transitions rulemakings regarding HFCs. These regulations are promulgated under the AIM Act which provides explicit authority for the EPA to regulate HFCs. AIM Act subsection (i) grants the EPA authority to restrict the use of HFCs, fully, partially, or on a graduated schedule. To the extent this comment is seeking further changes to the overall approach that the EPA uses in executing its responsibilities under the AIM Act, it is out of scope for this rulemaking. The EPA evaluated the environmental impacts of this rule, specifically the increase in HFC demand and emissions, as is described in the Economic and Environmental Impacts Memo.

Comment: Commenters stated that extending compliance deadlines past 2030 will cause prices of HFCs to increase due to an imbalance of supply and demand given the phasedown. Some commenters stated that given their own models and analyses, demand is likely to exceed the total available allowances with the next HFC stepdown in 2029, resulting in increased prices across the industry and for consumers. Others claim that demand will not be able to be met beginning in 2030. Two commenters relied partly on the EPA's data to model this change and argued that HFC prices will increase dramatically around 2030. They explain that annual demand would have to be cut by 15-20 percent given the tightening cap.

Response: The EPA agrees with commenters that a greater demand for HFCs in the affected subsectors likely will have indirect effects on HFC prices; however, it is unclear to what extent this rule would impact prices relative to price impacts from the AIM Act's required phasedown overall. The EPA also agrees that demand will need to be reduced due to the AIM Act phasedown, which governs the production and import of bulk HFCs. In the EPA's

analysis, both the current rule (baseline) and policy scenarios project total virgin HFC demand to exceed cap levels around the 2029 statutory stepdown. The EPA notes that the scenarios are based on these restrictions without accounting for additional measures that may be needed in order to keep consumption and production of virgin HFCs below the statutory caps or that may result from HFC price increases. Such measures could include transitions in subsectors not covered, use of lower EVe alternatives, reliance on stockpiled HFCs produced before 2029, additional recovery and re-use, improved leak detection and repair practices, and/or forgoing or delaying the repair and recharging of existing HFC systems. For further discussion on expected indirect market impacts, including increased HFC demand and prices, see section 4 of the Economic and Environmental Impacts Memo.

Comment: Commenters expressed concern about climate damages as a result of this rule and argued that the EPA failed to meet procedural requirements by not monetizing climate impacts using the social cost of greenhouse gases (SC-GHG). One commenter stated that the flexibility of extending compliance deadlines will significantly reduce near-term climate benefits. Another commenter stated that the increase in HFC consumption relative to the 2023 Final Rule means increased emissions and therefore increased climate impacts. Other commenters stated that this rule overlooks climate damages that would come from weakening earlier requirements and destroy any climate benefits from the AIM Act. Other commenters expressed concern that the EPA did not monetize climate damages with a SC-GHG calculation as had been done in the RIA Addendum for the 2023 rule and cited to a 9th Circuit case remanding a rule to another agency due to a lack of greenhouse gas (GHG) monetization. One commenter stated that the reasons given by the EPA on why no SC-GHG estimates were provided is not consistent with underlying economic estimates of the SC-GHG, which already accounts for uncertainties that the EPA identifies. Commenters argued that by not including monetized climate impacts, the EPA failed to weigh overall economic costs and environmental impacts and failed to use best available data. Commenters argued that uncertainty

points towards higher, not lower, SC-GHG values. Commenters asserted that under the requirements of the APA, the EPA must provide additional information, including projected increase in climate harms in terms of the social cost of carbon, and must provide the public with an opportunity to comment.

Response: The EPA disagrees with commenters asserting that the EPA must utilize the SC-GHG as the EPA is finalizing this action based on its authority under AIM Act subsection (i). The issues raised by commenters are not applicable to the arguments in this final action.

On January 20, 2025, President Trump issued Executive Order 14154, "Unleashing American Energy," which, along with other actions, withdrew earlier guidance on calculating the social cost of carbon (*i.e.*, the monetized impacts of emissions of GHGs), and directed the EPA to issue guidance on assessing the impacts of GHG emission in regulatory analysis.[147] In response to that direction, OMB issued Memorandum M-25-27, providing current guidance on the consideration of GHGs in regulatory decision-making.[148] That Memorandum directed agencies not to quantify or monetize the impacts of GHG emissions, except to the extent required by law, "because the uncertainties in performing monetized impacts quantifications are too great." The EPA uses the latest recommendations for analyses in rulemaking packages.

The AIM Act does not require the quantification or monetization of GHG impacts. Accordingly, the EPA will not monetize such impacts while Memorandum M-25-27 remains in effect.

Additionally, the EPA disagrees with commenters who state that this rule will necessarily result in increased GHG emissions. The limits and compliance dates amended by this final rule concern the use of HFCs in certain subsectors; they do not change overall HFC production or consumption, and thus emissions. AIM Act subsection (e) establishes the statutory phasedown of HFC production and consumption with caps that cannot be exceeded. Therefore, the upper bound

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[147] 90 FR 8353 (January 29, 2025).

[148] https://www.whitehouse.gov/wp-content/uploads/2025/02/M-25-27-Guidance-Implementing-Section-6-of-Executive-Order-14154-Entitled-Unleashing-American-Energy.pdf, and posted in the docket for this rule.

of new HFC production and consumption remains unchanged. Finally, the purpose of AIM Act subsection (i) was to ensure that the statutory HFC requirements are met and not to decrease HFCs overall more or faster than the statutory phasedown requirements in AIM Act subsection (e).

In response to comments citing to *Center for Biological Diversity v. NHTSA,* 538 F.3d 1172 (9th Cir. 2008), the court in that case faulted the relevant agency for refusing to quantify carbon emissions. In that case, the court found that the agency inappropriately set the value of carbon emissions reduction at zero. Here, while the EPA is not assigning a monetary value to GHG emissions, the Agency has factored in emissions impacts, to the extent practicable in the Economic and Environmental Impacts Memo sections ES.6 and Appendix A.).

Comment: Commenters argued that the EPA's analysis of the economic and emissions impacts of the proposed rule is underexplained and incomplete such that it prevents interested parties from meaningfully understanding and commenting on the rule in the comment period provided. Commenters argued that the EPA must provide additional information and an additional comment period to fulfill procedural requirements under the APA. Commenters argued that the EPA did not adequately analyze the overall economic costs and environmental impacts of the proposed rule. One stated that the EPA failed to adequately consider costs and broader impacts of the proposed rule on other industries subject to the HFC phasedown.

Response: The EPA notes that these comments and the Agency's response below relate to the specific claims that insufficient information and analysis was provided with the proposed rule. Regarding the separate claims (in some cases made by the same commenters) that the EPA failed to adequately consider factors for determination specific in AIM Act subsection (i)(4), see comment and response summary below.

The EPA disagrees with the assertion that its analysis for the proposed rule did not provide sufficient information for stakeholders to react to or provide comment. At

proposal, the EPA provided information available at the time in its analysis of economic and environmental impacts. As explained in the preamble to the proposed rule and in the economic and environmental impacts analysis of the proposed rule, the EPA lacked sufficient information regarding a variety of factors to estimate cost savings and other impacts associated with the proposed changes. The EPA requested that stakeholders provide additional information for the analysis. In response, the EPA received additional information in comments, much of which has in turn been relied upon to improve previous estimates. However, this information was not "critical" to the Agency's decision-making and merely expanded on and confirmed data, information, and reasoning made available for public comment in the docket for this rulemaking.[149]

For the Economic and Environmental Impacts Memo associated with this final rule, the EPA incorporated additional information provided by stakeholders wherever possible and appropriate. Based on this, as well as additional review of publicly available data and information from stakeholders, the EPA made updates to its analytic approach in order to evaluate economic and environmental impacts. For more details on specific information received from commenters, updates made and results, see the Economic and Environmental Impacts Memo. The EPA further notes that for cases where it was unable to quantify particular impacts, they have been identified and discussed qualitatively, consistent with OMB guidance.[150] OMB guidance also recommends that if an agency has uncertainty about an action's effects due to a lack of data, then it should outline additional data collection that would be needed to fill in these gaps; the EPA did so in the proposed rule.

Comment: Commenters argued that the EPA has not satisfactorily considered factors for determination specified in AIM Act subsection (i)(4), specifically "(A) the best available data"

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[149] *See Competitive Enter. Inst. v. United States Dep't of Transportation*, 863 F.3d 911, 920 (D.C. Cir. 2017) (an agency may include for the first time in a final rule "new supplementary information that expands on and confirms data in the rulemaking record") (citations omitted).

[150] https://www.whitehouse.gov/wp-content/uploads/2025/08/CircularA-4.pdf.

and "(C) overall economic costs and environmental impact . . . ." Commenters state that the EPA has not placed sufficient weight on environmental impacts in its rationale for this rule, and did not use its own or anyone else's estimates of SC-GHGs. Commenters note that by contrast the EPA seems to have placed more weight on evaluating and monetizing engineering costs to regulated industry actors, whereas the Agency has not gone to the trouble of similarly monetizing and considering environmental benefits in its decision making. Commenters stated that the analysis in the proposed rule contradicts the EPA's prior evaluation of the environment impacts of the Technology Transitions provisions (which did include monetized environmental benefits), therefore understating the proposed rule's effect on the environment.

Response: The EPA disagrees with the commenter's assertion that the agency did not place appropriate weight on any statutory factor. Even when the EPA does not monetize impacts, the agency considers all impacts as required under the statute. The EPA factored in all relevant factors in AIM Act subsection (i)(4) to any changes made within this rulemaking. The EPA further notes that the 2023 Final Rule provided certain information, including information on SC-GHGs, only for informational purposes, and that the individual decisions on sectors and subsectors were made based on the criteria listed in subsection (i)(4). The EPA notes that it is not required to monetize benefits under subsection (i)(4) or any other place in the AIM Act; given the uncertainties, the Agency qualitatively weighed environmental benefits as opposed to quantifying them.

The EPA further notes that while the scenarios analyzed in the Economic and Environmental Impacts Memo projected increases in emissions based on the revised restrictions, these scenarios are focused on the engineering cost and emissions changes that result in affected subsectors and do not account for additional measures that may be needed to keep production and consumption of virgin HFCs below the statutory phasedown caps. Given a finite supply of virgin HFCs under the binding statutory caps, increases in HFC demand and resulting

emissions for certain end uses over time may be met with decreases in demand and resulting emissions through additional offsetting measures. The EPA has not endeavored to quantify such measures in its analysis, but notes that the binding HFC phasedown caps are expected to limit the overall environmental impacts of this rule. For further details and discussion of these impacts, see section 4 of the Economic and Environmental Impacts Memo.

2. Reliance Interests

Comment: Commenters stated that significant investments have already been made to comply with the requirements in the 2023 Final Rule. One commenter stated that any reversal or delay of compliance dates would disrupt ongoing investments planning, certification cycles, and long-term manufacturing contracts made in reliance of the existing Federal framework. The commenter said that when an agency changes course, it must offer a more detailed explanation of where the new policy would upset significant reliance interests or impose new burdens on regulated parties that acted in conformity with the prior rule. One commenter stated that maintaining the original limits and timelines ensures certainty, stability, and consistency across all sectors, including those that have already started to transition. They commented that they have committed tens of millions of dollars in engineering, project development, and capital investment to transition refrigeration market sectors to technologies below the 150 or 300 limit, as applicable. Another commenter stated that they already invested, developed, and commercialized full product lines for supermarket systems, which are being manufactured and sold today with refrigerants meeting the limits of 150 or 300. They commented that they have millions of dollars of raw materials on hand and on order to support the 2023 Final Rule limits for supermarket systems that will be stranded excess inventory if there are delays in compliance dates and interim limits.

Response: The EPA recognizes commenters' reliance interests and concerns that investments have been made for developing and designing supermarket systems that would meet the requirements under the 2023 Final Rule. The Agency has considered these prior investments and reliance interests in finalizing this rule. As described in other comments in this section, many

retailers have made announcements and commitments to transition and build new stores using available substitutes such as CO_2 or A2L refrigerants. Equipment manufacturers also made announcements and investments. Thus, the EPA expects that not an insignificant portion of the market will transition prior to 2032 to available substitutes that meet the limit of 150 or 300, as applicable. Further, as described in a response in this section, the EPA expects other market forces including but not limited to the HFC phasedown, and in particular, the seventy percent reduction step in 2029 will cause other retailers to transition before 2032 thereby potentially limiting the extent of reliance interests in this subsector. Prior investments made by equipment manufacturers support early adopters of these technologies and establishing an effective supply chain for distributing equipment leading up to 2032. The Agency further notes that supermarket systems by design are tailored to the supermarket footprint. While there are standard pieces, these are not off-the-shelf systems. Therefore, the customization of refrigeration systems in supermarkets suggests a certain amount of work with the retailers ahead of orders being placed.

Comment: Commenters, including trade groups, equipment manufacturers, states, and environmental associations, opposed the sector-wide delays for retail food remote condensing units and stated that the requirements established in the 2023 Final Rule should be maintained. Commenters generally made similar points in opposing delays for the remote condensing unit subsector as they did for the supermarket systems subsector. Such points include preserving the United States as an innovator and first mover on new technologies, avoiding continued use of outdated technologies, creating uncertainty in the market, impacting reliance interests, and allowing continued use of more environmentally harmful refrigerants.

Response: The EPA acknowledges comments opposing the delay in the compliance date and changes to the limits for remote condensing units. However, as discussed in section IV.D of this preamble, the EPA is finalizing a graduated schedule for remote condensing units with new compliance dates based on the totality of the record for this rule. The EPA understands that many U.S. equipment manufacturers have made significant commitments and investments to prepare

retailers to have available remote condensing units that would comply with the 150 or 300 limits by the compliance timelines in the 2023 Final Rule. The EPA recognizes that there are many equipment options available for retailers today that meet the 150 or 300 limits. However, the EPA is finalizing the graduated schedule for remote condensing units to allow retailers more time to fully evaluate the available options that work best in their scenarios. The EPA reiterates that nothing in this final rule would prevent a retailer from selecting a new remote condensing unit that complies with the 150 or 300 limit before the compliance date of January 1, 2032. In fact, retailers may consider the available remote condensing units and choose an option that complies with the 2032 limits. In addition and as discussed in other responses in this section, the EPA expects the phasedown itself to be a driver for the transition to refrigerants that comply with the 2032 limits, thus potentially limiting the impact of reliance interests in this subsector. Additional comments related to reliance interests are discussed in more detail in responses in this section.

Comment: Many commenters stated that investments have already been made to comply with the requirements in the 2023 Final Rule for remote condensing units. One commenter stated that any reversal or delay of compliance dates would disrupt ongoing investments planning, certification cycles, and long-term manufacturing contracts made in reliance of the existing Federal framework. The commenter said that when an agency changes course, it must offer a more detailed explanation of where the new policy would upset significant reliance interests or impose new burdens on regulated parties that acted in conformity with the prior rule. One commenter stated that maintaining the original limits and timelines ensures certainty, stability, and consistency across all sectors, including those that have already started to transition. They commented that they have already committed tens of millions of dollars in engineering, project development, and capital investment to transition refrigeration market sectors to technologies using refrigerants below the 150 or 300 limit, as applicable.

Another commenter also stated that they already made significant investments (tens of millions of dollars) to develop compliant products, retool factories, convert supply chains, and

prepare their customer base. They noted that they already experienced a significant drop in demand based on the proposal, leaving them with millions of dollars in purchased materials on hand and more on order that cannot be repurposed. They also ceased hiring of production workers and were planning to shut down production temporarily due to customer indecision. Further, they stated that a change in direction in the requirements would cost additional multimillion-dollars in investments by equipment manufacturers and supply chains, including costs for maintaining duplicative manufacturing lines and supplying legacy HFC equipment. One commenter noted specifically for remote condensing units that the industry has been relying on the 2023 Final Rule requirements for three years, and that substantial resources for planning, development, and investments in production and manufacturing would be stranded if there are changes to the compliance date and limit.

Response: The EPA acknowledges commenters' reliance interests and concerns that investments have been made to design and manufacture remote condensing units that would meet the requirements and timeline of the 2023 Final Rule. The Agency has considered these prior investments and reliance interests in finalizing this rule. The EPA recognizes equipment manufacturers and others who have provided comments that detail the types of equipment that are available on the market today and their views on how amending the limits and compliance dates impacts their profitability and manufacturing jobs. However, the EPA's decision to amend the requirements is based on the totality of the record for this rulemaking, and these changes do not prevent companies from selling these newly designed remote condensing units or force companies to offer units using refrigerants that exceed the 150 or 300 limits, as applicable. As noted throughout this section and in section IV.D of this preamble, the EPA factored in, to the extent practicable, information on technician training, building codes, and other relevant factors, including reliance interests. Further, based on comments on the proposed rulemaking, many companies have already made announcements or commitments to using remote condensing units

that use a refrigerant that complies with the 2032 limits. The EPA anticipates that these companies will continue to pursue refrigerant options that are below the 2032 limits.

Comment: Commenters stated they have millions of dollars of raw materials on hand and on order to support the current compliance date. Delaying compliance dates will open the door to laggards and foreign competitors who did not invest resources to manufacture and commercialize the new technology. The commenter stated they already have a complete product line launched in the marketplace, being actively manufactured and sold, with refrigerants that meet the 150 or 300 limits per current regulations.

Response: The EPA acknowledges commenters' reliance interests, including significant investments in tooling, production lines, and raw materials to support the current compliance date, as well as the launch of complete product lines that meet the 150 or 300 limits. The EPA also acknowledges concerns that a lengthy delay could disadvantage manufacturers that invested early and could enable laggards or competitors that did not make similar investments to gain market share, potentially stranding inventory and disrupting production planning. Prior investments made by equipment manufacturers support adopters of technologies using substitutes below the limit of 150 or 300 and establishing an effective supply chain for distributing equipment leading up to 2032. The EPA's decision to amend the requirements is based on the totality of the record for this rulemaking, and these changes do not prevent companies from selling cold storage warehouses with refrigerants below the limits of 150 or 300 or conversely force companies to offer units using refrigerants that exceed the 150 or 300 limits. For additional information on reliance interests, please see other responses in this section.

Comment: Commenters stated that the EPA did not adequately consider the reliance interests that manufacturers and producers reasonably placed in the 2023 Final Rule, including investments in redesign, certification, training, and retooling, within the analysis of economic and environmental impacts. They claimed the proposed rule would have stranded assets, duplicate production lines, and increase compliance uncertainty. For example, one commenter, a

manufacturer of supermarket systems, remote condensing units, and cold storage warehouse systems, commented that proposing to change restrictions has already led to market confusion. They ceased hiring production workers in a factory, attritted approximately 10% of their hourly workforce, and shut down operations for the last two weeks of 2025. They noted they have tens of millions of dollars invested in raw materials on hand and millions more on order to support the compliance date established in 2023. Another commenter also noted they have committed tens of millions of dollars in engineering, project development, and capital investment to transition refrigeration market sectors. Commenters indicated that they made capital investments and shifted supply chain logistics in reliance on the restrictions in the 2023 Final Rule and the HFC phasedown schedules stipulated in AIM Act subsection (e). Some commenters asserted that, in addition to industry, State and local governments enacted policies that relied on the 2023 restrictions.

Response: The EPA disagrees with comments that the Agency did not appropriately consider reliance interests in this rulemaking. The EPA recognizes that recouping investments may be difficult for American manufacturers that have already prepared for these transitions and agrees that this potential impact should be considered in the economic analysis. The EPA does not have the data to fully quantify such costs; however, we provide a qualitative summary above and discuss this accordingly in section 3 of the Economic and Environmental Impacts Memo.

The EPA addresses reliance issues in section II.A of this preamble.

V. How do these final amendments impact the implementation of the Technology Transitions Provisions?

The EPA's final amendments discussed in section III of this preamble will not significantly impact the overall implementation of the Technology Transitions provisions of the AIM Act. Based on the EPA's reconsideration, we are finalizing amendments that revise specific aspects of the regulations at 40 CFR part 84 subpart B. This includes amending the intermodal refrigerated transport provision, as described in section III.A of this preamble; amending the

compliance date for certain chillers used for IPR and IPR equipment used to manufacture semiconductors, as described in section III.B of this preamble; amending the provisions for retail food – supermarket systems, as described in section III.C of this preamble; amending the provisions for retail food – remote condensing units, as described in section III.D of this preamble; amending the provisions for cold storage warehouses, as described in section III.E of this preamble; amending the provisions for refrigerated laboratory centrifuges and laboratory shakers, as described in section III.G of this preamble; and amending the provisions for certain residential and light commercial air conditioning and heat pump equipment, as described in section III.H of this preamble.

These final amendments also make one minor adjustment to the labeling requirements to correct an erroneous citation, as described in section III.I of this preamble, and otherwise do not alter the labeling requirements. In addition, these final amendments do not alter in any way the definitions, exemptions, reporting or recordkeeping requirements or petitions requirements at 40 CFR part 84 subpart B.

The full response to comments on the October 2025 Proposal is in the RTC document in the docket for this rule.

VI. Statutory and Executive Order Reviews

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 13563: Improving Regulation and Regulatory Review

This action is a significant regulatory action that was submitted to OMB for review. Any changes made in response to OMB recommendations have been documented in the docket. The EPA prepared an economic analysis of the potential costs and benefits associated with this action.[151]

[151] *See* Economic and Environmental Impacts Memo in the docket for this action.

Table 2 of this preamble below provides a summary of both monetized and non-monetized impacts. Monetized impacts include estimated engineering cost savings for equipment owners in affected subsectors. These cost savings arise from cases where additional flexibility provided by the rule allows for the use of refrigerant-containing equipment with lower capital and/or operating costs than equipment that would otherwise likely be chosen without additional flexibility. As part of fulfilling analytical guidance with respect to Executive Order 12866, the EPA presents estimates of the present value (PV) of the benefits and costs over the full time series included in this analysis (2026-2050). To calculate the PV of the cost savings of the rule, annual savings are discounted to 2025 at three percent and seven percent discount rates as directed by Office of Management and Budget (OMB) Circular A-4. The EPA also presents the equivalent annualized value (EAV), which represents a flow of constant annual values that, had they occurred in each year in the time series, would yield a sum equivalent to the PV, discounted at three percent and seven percent.

Table 2 – Summary of Monetized and Non-Monetized Economic Impacts, 2026-2050 (millions of 2024 dollars)

Monetized Impacts				
Engineering Cost Savings in Affected Subsectors	***3 Percent Discount Rate***		***7 Percent Discount Rate***	
	PV	EAV	PV	EAV
	$976	$56	$653	$56
Non-Monetized Impacts				
Benefits and Cost Savings: • Avoided loss of ability to produce semiconductor wafers within the United States • National security benefits Costs and Forgone Benefits: • Indirect costs via HFC market impacts • Costs to equipment manufacturers and suppliers related to incremental investments required • Forgone benefits from potential increased emissions of HFCs				

B. Executive Order 14192: Unleashing Prosperity Through Deregulation

This action is considered an Executive Order 14192 deregulatory action. For regulatory accounting purposes, the estimated present value and annualized value of the cost savings of this rule are $576 million and $40 million, respectively (seven percent discount rate, 2024$, 2024 present value year, perpetuity time horizon). Details on the estimated cost savings of this final rule can be found in the EPA's analysis of the potential costs and benefits associated with this action.

C. Paperwork Reduction Act (PRA)

This action does not impose an information collection burden under the PRA because it does not contain any information collection activities.

D. 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. In making this determination, the EPA concludes that the impact of concern for this rule is any significant adverse economic impact on small entities and that the Agency is certifying that this rule would not have a significant adverse economic impact on a substantial number of small entities because the rule relieves regulatory burden on the small entities subject to the rule. The EPA is making this determination because this rule is deregulatory in nature and results in cost savings for stakeholders as detailed in the Economic and Environmental Impacts Memo. Additionally, the small business screening analysis that was done for the 2023 Final Rule found that there was no significant impact on a substantial number of small entities (SISNOSE). The changes contained in this rulemaking are deregulatory in nature and therefore would not result in additional costs such that the previous determination would be altered. We therefore expect that this action would relieve regulatory burden for directly regulated small entities affected by this rule. We further note that the previous small business screening analysis identified approximately 50,000 small business entities (the majority of which are in the retail food subsector) that are affected by this rulemaking. It is expected that

these entities will experience a share of the cost savings resulting from this rule, although the EPA has not explicitly quantified small business savings.

E. Unfunded Mandates Reform Act (UMRA)

This action does not contain any unfunded mandate as described in UMRA, 2 U.S.C. 1531-1538, and does not significantly or uniquely affect small governments. The action imposes no enforceable duty on any state, local or Tribal governments or the private sector.

F. 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.

G. Executive Order 13175: Consultation and Coordination with Indian Tribal Governments

This action does not have Tribal implications as specified in Executive Order 13175. It 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.

H. Executive Order 13045: Protection of Children From Environmental Health and Safety Risks

The EPA interprets Executive Order 13045 as applying only to those regulatory actions that concern environmental health or safety risks that the EPA has reason to believe may disproportionately affect children, per the definition of "covered regulatory action" in section 2-202 of the Executive Order. This action is narrowly tailored to prevent the stranding of certain AC/HP equipment using variable refrigerant flow technology while not affecting the demand for HFCs. Therefore, this action is not subject to Executive Order 13045 because it does not concern an environmental health risk or safety risk. Since this action does not concern human health, the EPA's Policy on Children's Health also does not apply.

I. Executive Order 13211: Actions Concerning Regulations 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 to certain subsectors that use regulated substances, none of which are used to supply or distribute energy.

J. National Technology Transfer and Advancement Act (NTTAA)

This rule does not involve technical standards.

K. Congressional Review Act (CRA)

This action is subject to the CRA, and the EPA will submit a rule report to each House of the Congress and to the Comptroller General of the United States. This action meets the criteria for a "major rule" set forth in 5 U.S.C. 804(2).

List of Subjects in 40 CFR Part 84

Environmental protection, Administrative practice and procedure, Air pollution control, Chemicals, Imports.

Lee Zeldin,
Administrator.

For the reasons set forth in the preamble, the 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.

Subpart B-Restrictions on the Use of Hydrofluorocarbons

2. Amend § 84.54 by:

a. Revising paragraph (a)(6);

b. Adding the word "and" at the end of paragraph (a)(10)(iv);

c. Adding paragraphs (a)(10)(v) and (a)(12)(iv) and (v);

d. Revising paragraphs (c)(1), (5) through (7), and (9);

e. Adding the word "and" at the end of paragraph (c)(10)(iv);

f. Adding paragraph (c)(10)(v); and

g. Revising paragraphs (c)(11) and (12) and (e)(2).

The revisions and additions read as follows:

§ 84.54 Restrictions on the use of hydrofluorocarbons.

(a) * * *

(6) Effective [**INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER**], refrigerated transport—intermodal containers with a box temperature of -35 °C (-31 °F) or higher using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 700 or greater.

* * * * *

(10) * * *

(v) Chillers subject to paragraph (a)(10)(iii) or (iv) of this section with a refrigerant charge capacity of 100 pounds or less that are used in the manufacture of semiconductors must comply with the restrictions of paragraph (a)(10)(iii) or (iv) of this section by January 1, 2030.

* * * * *

(12) * * *

(iv) Products subject to paragraph (a)(12)(ii) or (iii) of this section with a refrigerant charge capacity of 100 pounds or less that are used in the manufacture of semiconductors must comply with the restrictions of paragraph (a)(12)(ii) or (iii) of this section by January 1, 2030; and

(v) Refrigerated centrifuges and laboratory shaker tables subject to paragraph (a)(12)(i) or (ii) of this section must comply with the restrictions of paragraphs (a)(12)(i) and (ii) of this section by January 1, 2028.

* * * * *

(c) * * *

(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. New residential and light commercial air-conditioning and heat pump systems using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 700 or greater may continue to be installed where all specified components of that system are manufactured or imported prior to January 1, 2025.

* * * * *

(5)(i) Effective January 1, 2026, chillers for industrial process refrigeration where the temperature of the fluid exiting the chiller is greater than -30 °C (-22 °F) using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 700 or greater; and

(ii) Chillers subject to paragraph (c)(5)(i) of this section with a refrigerant charge capacity of 100 pounds or less that are used in the manufacture of semiconductors must comply with the restriction of paragraph (c)(5)(i) of this section by January 1, 2030.

(6)(i) 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; and

(ii) Chillers subject to paragraph (c)(6)(i) of this section with a refrigerant charge capacity of 100 pounds or less that are used in the manufacture of semiconductors must comply with the restriction of paragraph (c)(6)(i) of this section by January 1, 2030.

(7) Effective [**INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER**], refrigerated transport—intermodal containers with a box temperature of -35 °C (-31 °F) or higher using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 700 or greater.

* * * * *

(9)(i) Effective [**INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER**], cold storage warehouse systems using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 700 or greater; and

(ii) Effective January 1, 2032, cold storage warehouse systems using a regulated substance, or a blend containing a regulated substance, as follows:

(A) 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;

(B) 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; and

(C) 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) * * *

(v) Systems used in the manufacture of semiconductors with a charge size of 100 pounds or less must comply with the restrictions of paragraphs (c)(10)(ii) through (iv) of this section, as applicable, by January 1, 2030.

(11)(i) Effective [**INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER**], remote condensing units in retail food refrigeration systems using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 1,400 or greater; and

(ii) Effective January 1, 2032, remote condensing units in retail food refrigeration systems using a regulated substance, or a blend containing a regulated substance, as follows:

(A) 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;

(B) 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; and

(C) 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)(i) Effective January 1, 2027, supermarket systems using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 1,400 or greater; and

(ii) Effective January 1, 2032, supermarket systems using a regulated substance, or a blend containing a regulated substance, as follows:

(A) 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;

(B) 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; and

(C) 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.

* * * * *

(e) * * *

(2) Increasing the cooling capacity, in BTU per hour, of an existing supermarket system by more than 15 percent or increasing the cooling capacity, in BTU per hour, of any other type of existing system; or

* * * * *

3. Amend § 84.58 by revising paragraph (b) to read as follows:

§ 84.58 Labeling.

* * * * *

(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 (d) of this section containing the information in paragraph (a)(1) of this section. 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.

* * * * *

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