ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 82

[EPA–HQ–OAR–2013–0748; FRL–9922–26–OAR]

RIN 2060–AS04

Protection of Stratospheric Ozone: Listing of Substitutes for Refrigeration and Air Conditioning and Revision of the Venting Prohibition for Certain Refrigerant Substitutes

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: Pursuant to the U.S. Environmental Protection Agency's (EPA) Significant New Alternatives Policy program, this action lists five flammable refrigerants as acceptable substitutes, subject to use conditions, in several end-uses: Household refrigerators and freezers, stand-alone retail food refrigeration equipment, very low temperature refrigeration, non-mechanical heat transfer, vending machines, and room air conditioning units. This action also exempts from Clean Air Act Section 608's prohibition on venting, release, or disposal the four hydrocarbon refrigerant substitutes listed in this action as acceptable, subject to use conditions, in specific end-uses. We are finalizing this exemption for those substitutes, subject to those use conditions and in those end-uses, on the basis of current evidence that their venting, release, or disposal does not pose a threat to the environment.

DATES: This rule is effective on May 11, 2015. The incorporation by reference of certain publications listed in the rule is approved by the Director of the Federal Register as of May 11, 2015.

ADDRESSES: EPA has established a docket for this action under Docket ID No. EPA–HQ–OAR–2013–0748. All documents in the docket are listed on the *www.regulations.gov* index. Although listed in the index, some information is not publicly available, *i.e.,* Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, is not placed on the Internet and will be publicly available only in hard copy form. Publicly available docket materials are available either electronically in *www.regulations.gov* or in hard copy at the Air and Radiation Docket, EPA/DC, EPA West, Room 3334, 1301 Constitution Avenue NW., Washington, DC. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566–1744, and the telephone number for the Air and Radiation Docket is (202) 566–1742.

FOR FURTHER INFORMATION CONTACT: Margaret Sheppard, Stratospheric Protection Division, Office of Atmospheric Programs, Mail Code 6205T, Environmental Protection Agency, 1200 Pennsylvania Avenue NW., Washington, DC 20460; telephone number (202) 343–9163; fax number (202) 343–2338, email address: *sheppard.margaret@epa.gov.* Notices and rulemakings under EPA's Significant New Alternatives Policy (SNAP) program are available on EPA's Stratospheric Ozone Web site at *www.epa.gov/ozone/snap/regs.*

SUPPLEMENTARY INFORMATION:

Table of Contents

I. General Information

A. Executive Summary

Pursuant to the SNAP program under Clean Air Act (CAA) Section 612, this final rule lists five flammable refrigerant substitutes as acceptable, subject to use conditions, in several refrigeration and air conditioning end-uses: Household refrigerators and freezers; retail food refrigeration, stand-alone equipment only; very low temperature refrigeration; non-mechanical heat transfer; vending machines; and room air conditioning (AC) units. The five refrigerant substitutes are: Difluoromethane (also known as hydrofluorocarbon (HFC)-32), ethane, isobutane, propane, and the hydrocarbon blend R–441A. The use conditions address safe use of flammable refrigerants and include incorporation by reference of portions of certain safety standards from Underwriters Laboratories (UL), refrigerant charge size limits, and requirements for markings on equipment using these refrigerants. This action also exempts from CAA Section 608's prohibition on venting, release, or disposal the hydrocarbon refrigerant substitutes ethane, isobutane, propane, and R–441A in specific end-uses for which they are being listed in this rulemaking. We are finalizing this exemption for those substitutes on the basis of current evidence that their venting, release, or disposal from these specific end-uses does not pose a threat to the environment.

This final rule lists all five refrigerants as acceptable, subject to use conditions, in the same end-uses as in the proposed

rule. This final rule retains the same use conditions as proposed for household refrigerators and freezers; retail food refrigeration, stand-alone equipment only; very low temperature refrigeration; non-mechanical heat transfer; and vending machines. For room AC units, EPA is retaining the same use conditions as proposed, with one exception. For portable AC units, EPA is not applying the proposed charge limits for packaged terminal AC (PTAC) units, packaged terminal heat pumps (PTHP), and other floor mounted AC units, which are set forth in Table D. In this final rule, Table E (new) establishes charge limits for portable AC units, consistent with the requirements in Appendix F of UL 484, ''Room Air Conditioners,'' 8th Edition, dated August 2, 2012. EPA is making this change because we agree with commenters that the final rule should incorporate specific provisions for charge limits for portable units in UL 484, which is the standard that is the basis of EPA's other charge limits, as well. This final rule exempts the four hydrocarbon refrigerants for the end-uses addressed in the proposed rule from the venting prohibition under CAA Section 608. HFC–32 remains prohibited from being knowingly vented or otherwise knowingly released or disposed of by any person maintaining, servicing, repairing, or disposing appliances containing HFC–32.

EPA received a total of 37 comments from 35 commenters. Major topics raised by commenters included: The acceptability of each refrigerant; the environmental, flammability, and toxicity characteristics of the proposed refrigerants; the cost impacts of using the proposed refrigerants; the proposed use conditions; EPA's recommendations for safe handling of the refrigerants; technician training; the relationship between this proposed rule and the proposed rule *Protection of Stratospheric Ozone: Change of Listing Status for Certain Substitutes under the Significant New Alternatives Policy Program* (August 6, 2014, 79 FR 46126); and the proposed exemption from CAA Section 608's prohibition on venting, release, or disposal of the four hydrocarbon refrigerant substitutes.

B. Background

Consistent with the Climate Action Plan announced June 2013, which calls on EPA to ''use its authority through the Significant New Alternatives Policy Program to encourage private sector investment in low-emissions technology by identifying and approving climate-friendly chemicals'' (Climate Action Plan, 2013), this final rule approves a number of climate-friendly alternatives for various kinds of refrigeration and AC equipment. Using low-GWP alternatives instead of high-GWP HFCs reduces climate-damaging emissions. Use and emissions of HFCs are rapidly increasing because they are the primary substitutes for ozone-depleting substances, especially in many of the largest end-uses. Though they represent a small fraction of current total greenhouse gas (GHG) emissions, their warming impact is hundreds to thousands of times higher than that of CO_2 and other GHGs. Further, if left unregulated, emissions of HFCs in the United States are expected to double from current levels of 1.5 percent of GHG emissions to 3 percent by 2020 and nearly triple by 2030.[1]

This action lists as acceptable, subject to use conditions, five flammable refrigerant substitutes that EPA believes present overall lower risk to human health and the environment compared to other available or potentially available alternatives in the same end-uses. The refrigerants include one HFC refrigerant—HFC–32—and four hydrocarbon refrigerants—ethane, isobutane, propane, and R–441A. We are listing these substitutes as acceptable, subject to use conditions, in a number of stationary AC and refrigeration end-uses under the SNAP program, including: Household refrigerators and freezers, retail food refrigeration, very low temperature refrigeration, non-mechanical heat transfer, vending machines, and residential and light commercial AC and heat pumps. The use conditions set requirements to ensure that these substitutes do not present significantly greater risk in the end-use than other substitutes that are currently or potentially available for that same end-use. This action is another regular update to EPA's lists of acceptable substitutes through the SNAP program under the authority of CAA Section 612.

This action responds to a number of SNAP submissions for four hydrocarbon refrigerants and HFC–32. Additionally, this action exempts from the prohibition under CAA Section 608 on venting, release, or disposal, the four hydrocarbon refrigerant substitutes that are listed as acceptable, subject to use conditions, in specific end-uses, on the basis of current evidence that their venting, release, or disposal does not pose a threat to the environment. Note, however, that other applicable environmental regulatory requirements still apply. For example, for those refrigerant substitutes listed in this action that contain volatile organic compounds (VOC) as defined in 40 CFR 50.100(s), *i.e.,* isobutane, propane, and R–441A,[2] a state might adopt additional control strategies if necessary for an ozone nonattainment area to attain the National Ambient Air Quality Standard (NAAQS) for ozone.

With the exception of HFC–32, the refrigerants listed as acceptable, subject to use conditions, in this action are hydrocarbons or blends consisting solely of hydrocarbons. Hydrocarbon refrigerants have been in use for over 15 years in countries such as Germany, the United Kingdom, Australia, and Japan in household and commercial refrigerators and freezers. To a lesser extent, hydrocarbon refrigerants have also been used internationally in small AC units such as portable room air conditioners.

Because hydrocarbon refrigerants have zero ozone depletion potential (ODP) and very low global warming potentials (GWPs) compared to most other refrigerants, many companies recently have expressed interest in using hydrocarbons in the United States. Also, some companies have reported improved energy efficiency with hydrocarbon refrigerants (A.S. Trust & Holdings, 2012; A/S Vestfrost, 2012; CHEAA, 2013).

In a final rule published in the **Federal Register** (FR) on December 20, 2011, at 76 FR 78832, EPA's SNAP program listed isobutane and R–441A as acceptable, subject to use conditions, in household refrigerators, freezers, and combination refrigerators and freezers, and listed propane as acceptable, subject to use conditions, in retail food refrigerators and freezers (stand-alone units only). In this action, EPA is listing isobutane, propane, and R–441A as acceptable, subject to use conditions, in additional end-uses.

This final action lists HFC–32 (difluoromethane, Chemical Abstracts Service Registry Number [CAS Reg. No.] 75–10–5) as acceptable, subject to use conditions, in room air conditioners for residential and light commercial AC and heat pumps end-use. There appears to be interest in using HFC–32 for many reasons, including its GWP of 675, which is considerably lower than the GWPs of hydrochlorofluorocarbon (HCFC)-22 (1,810) and most other HFC-based refrigerants (approximately 1,500 to 4,000) currently used in this end-use. It also has mild flammability compared to hydrocarbon refrigerants. Mini-split

[1] Climate Change and President Obama's Action Plan. June, 2013. Available in the docket and online at *www.whitehouse.gov/share/climate-action-plan.*

[2] Neither ethane nor HFC–32 are VOC under the definition at 40 CFR 51.100(s).

systems using HFC–32 are now being sold in Japan and are being introduced in India and Indonesia.

All of the end-uses in this final rule are for stationary refrigeration or AC. EPA previously issued several final rules addressing the use of flammable refrigerants in motor vehicle air conditioning (MVAC). On June 13, 1995, at 60 FR 31092, the Agency found all flammable substitutes to be unacceptable for use in MVAC unless specifically listed as acceptable, subject to use conditions, because of flammability risks and the lack of sufficient risk assessment and other relevant information to demonstrate safe use in that end-use at that time. Some of these risks are unique to motor vehicles. In recent years, EPA has listed three low-GWP refrigerants as acceptable, subject to use conditions, for MVAC systems (*i.e.,* R–152a, R–1234yf, and R–744). Two of these refrigerants are flammable, although less flammable than hydrocarbons. Under 40 CFR part 82, subpart G, Appendix B, all other flammable substitutes remain unacceptable for use in MVAC because EPA has not taken action to specifically list them as acceptable, subject to use conditions.

As stated above, this action is being taken under the President's Climate Action Plan. HFCs are accumulating rapidly in the atmosphere. For example, the atmospheric concentration of HFC–134a, the most abundant HFC, has increased by about 10% per year from 2006 to 2012, and concentrations of HFC–143a and HFC–125 have risen over 13% and 16% per year from 2007–2011, respectively (Montzka, 2012; NOAA, 2013).

The alternatives addressed in this action have GWPs significantly lower than both the ozone-depleting substances (ODS) and HFC substitute refrigerants in the end-uses in which they are being listed. ODS in the end-uses in this final rule include chlorofluorocarbon (CFC)-12 (ODP [3] of 1 and GWP of 10,900), R–13B1 (also known as bromotrifluoromethane or halon 1301, with ODP of 10 and GWP of 7,140), CFC–113 (ODP of 0.8 and GWP of 6,130), R–502 (a blend of CFC–115 and HCFC–22, with ODP of 0.334 and GWP of 4,660), and HCFC–22 (ODP of 0.055 and GWP of 1,810). The GWPs [4] of the hydrocarbon refrigerants we are adding to the SNAP lists in this rule are less than 10, while HFCs listed as acceptable in the end-uses in this rule have GWPs ranging from 1,430 to 3,920. Thus, the listed refrigerants provide industry additional options with lower atmospheric impacts. In this rulemaking, however, EPA did not limit its review to atmospheric impacts, but evaluated each of the SNAP criteria for each substitute in each end-use addressed by this action. EPA then considered overall risk to human health and the environment for each substitute in comparison to other available or potentially available alternatives in the same end-uses.

C. Does this action apply to me?

This action lists the following refrigerants as acceptable, subject to use conditions, for use in specific end-uses within the refrigeration and AC sector: Ethane (R–170), HFC–32 (R–32), isobutane (R–600a), propane (R–290), and the hydrocarbon blend R–441A. Types of residential and light commercial AC equipment addressed in this action include window AC units; packaged terminal AC units and heat pumps; and portable room AC units. Types of refrigeration equipment include stand-alone retail food refrigeration equipment, very low temperature freezers, thermosiphons (non-mechanical heat transfer equipment), household refrigerators and freezers, and vending machines.

Table 1 identifies industry subsectors that may wish to explore the use of ethane, HFC–32, R–441A, isobutane, and propane in these end-uses or that may work with equipment using these refrigerants in the future.

TABLE 1—POTENTIALLY REGULATED ENTITIES BY NORTH AMERICAN INDUSTRIAL CLASSIFICATION SYSTEM (NAICS) CODE OR SUBSECTOR

Category	NAICS code or subsector	Description of regulated entities
Industry	325412	Pharmaceutical Preparations (e.g., Capsules, Liniments, Ointments, Tablets) Manufacturing.
Industry	333415	Manufacturers of Refrigerators, Freezers, and Other Refrigerating or Freezing Equipment, Electric or Other; Heat Pumps Not Elsewhere Specified or Included (NESOI); and Parts Thereof.
Industry	333415	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing.
Industry	443111	Appliance Stores: Household-type.
Industry	445120	Convenience Stores.
Industry	445110	Supermarkets and Other Grocery (except Convenience) Stores.
Industry	722211	Limited-Service Restaurants.
Industry	238220	Plumbing, Heating, and Air Conditioning Contractors.
Industry	811412	Appliance Repair and Maintenance.
Industry	423930	Recyclable Material Merchant Wholesalers.
Industry	423620	Household Appliances, Electric Housewares, and Consumer Electronics Merchant Wholesalers.
Industry	423740	Refrigeration Equipment and Supplies Merchant Wholesalers.

This table is not intended to be exhaustive, but rather a guide regarding entities likely to adopt, service or dispose of the substitutes that are being listed in this action. If you have any questions about whether this action

[3] Unless otherwise stated, the ODP values used in this document are those published in Appendices A and B to Subpart A of 40 CFR part 82. For refrigerant blends, EPA has taken the ODPs for the component compounds and multiplied them by the weight fraction of each component in the blend to obtain an approximate ODP.

[4] GWPs for HFC–134a, HFC–32, the component HFCs comprising R–404A and R–410A, propane and ethane are listed in IPCC, 2007: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. This document is accessible at *www.ipcc.ch/publications_and_data/ar4/wg1/en/contents.html.* GWPs for isobutane and R–441A were provided by the submitters to EPA and they are consistent with available information for their components and the range of GWPs found for other hydrocarbons in IPCC, 2007. For refrigerant blends, EPA has taken the 100-year integrated time horizon GWP from IPCC, 2007 for the component compounds and multiplied them by the weight fraction of each component in the blend to obtain an approximate GWP. Unless otherwise stated, GWPs stated in this document are 100-year integrated time horizon values taken from IPCC, 2007.

applies to a particular entity, consult the person listed in the preceding section, **FOR FURTHER INFORMATION CONTACT**.

D. What acronyms and abbreviations are used in the preamble?

Below is a list of acronyms and abbreviations used in this preamble.

AC—air conditioning
ACGIH—American Conference of Governmental Industrial Hygienists
ACH—air changes per hour
AEGL—acute exposure guideline level
AHAM—Association of Home Appliance Manufacturers
AHRI—Air Conditioning, Heating and Refrigeration Institute
AIRAH—Australian Institute of Refrigeration, Air Conditioning and Heating
ANSI—American National Standards Institute
ARA—Australian Refrigeration Association
ASHRAE—American Society of Heating, Refrigerating and Air-Conditioning Engineers
BTU—British thermal unit
CAA—Clean Air Act
CAS Reg. No.—Chemical Abstracts Service Registry Number
CARB—California Air Resources Board
CBI—Confidential Business Information
CFC—chlorofluorocarbon
CFR—Code of Federal Regulations
CHEAA—Chinese Household Electrical Appliance Association
CMAQ—Community Multiscale Air Quality
CRA—Congressional Review Act
DOE—the United States Department of Energy
EIA—Environmental Investigation Agency-U.S.
EO—Executive Order
EPA—the United States Environmental Protection Agency
EU—European Union
FR—Federal Register
ft—foot
g—gram
GHG—greenhouse gas
GWP—global warming potential
HCFC—hydrochlorofluorocarbon
HF—hydrogen fluoride
HFC—hydrofluorocarbon
HVACR—heating, ventilation, air conditioning and refrigeration
ICF—ICF International, Inc.
ICOR—ICOR International, Inc.
IEC—International Electrotechnical Commission
in.Hg—inches of mercury
IPCC—Intergovernmental Panel on Climate Change
IPR—industrial process refrigeration
ISRI—Institute of Scrap Recycling Industries
JTG—Joint Task Group
kg—kilogram
kJ—kilojoule
kPa—kilopascal
lb—pound
LFL—lower flammability limit
m—meter
mm—millimeter
MMTCO$_2$eq—million metric tons of carbon dioxide equivalents
MSDS—Material Safety Data Sheet
MVAC—motor vehicle air conditioning
NAAQS—National Ambient Air Quality Standard
NAFEM—North American Association of Food Equipment Manufacturers
NAICS—North American Industrial Classification System
NIOSH—the United States National Institute for Occupational Safety and Health
NOAA—the United States National Oceanic and Atmospheric Administration
NOAEL—No Observed Adverse Effect Level
NTTAA—National Technology Transfer and Advancement Act
OEM—original equipment manufacturer
ODP—ozone depletion potential
ODS—ozone-depleting substances
OHA—Office of Hearing and Appeals
OMB—the United States Office of Management and Budget
OSHA—the United States Occupational Safety and Health Administration
oz—ounce
PPE—personal protective equipment
PEL—permissible exposure limit
PFC—perfluorocarbon
PMS—Pantone Matching System
ppb—parts per billion
ppm—parts per million
ppmv—parts per million by volume
PRA—Paperwork Reduction Act
psi—pounds per square inch
PTAC—packaged terminal air conditioner
PTHP—packaged terminal heat pump
RCRA—Resource Conservation and Recovery Act
REL—Recommended Exposure Limit
RFA—Regulatory Flexibility Act
RSES—Refrigeration Service Engineers Society
SIP—State Implementation Plan
SNAP—Significant New Alternatives Policy
STEL—short-term exposure limit
STP—Standards Technical Panels
TFA—trifluoroacetic acid
The Alliance—The Alliance for Responsible Atmospheric Policy
TLV—threshold limit value
TWA—time-weighted average
UL—Underwriters Laboratories Inc.
UMRA—Unfunded Mandates Reform Act
U.S.C.—United States Code
VOC—volatile organic compounds

II. How does the Significant New Alternatives Policy (SNAP) program work?

A. What are the statutory requirements and authority for the SNAP program?

Section 612 of the CAA requires EPA to develop a program for evaluating alternatives to ozone depleting substances (ODS). EPA refers to this program as the Significant New Alternatives Policy (SNAP) program. The major provisions of Section 612 are the following:

1. Rulemaking

Section 612(c) requires EPA to promulgate rules making it unlawful to replace any class I substance (chlorofluorocarbon (CFC), halon, carbon tetrachloride, methyl chloroform, and hydrobromofluorocarbon) or class II substance (HCFC) with any substitute that the Administrator determines may present adverse effects to human health or the environment where the Administrator has identified an alternative that (1) reduces the overall risk to human health and the environment and (2) is currently or potentially available.

2. Listing of Unacceptable/Acceptable Substitutes

Section 612(c) requires EPA to publish a list of the substitutes unacceptable for specific uses and to publish a corresponding list of acceptable alternatives for specific uses. The list of acceptable substitutes may be found at *www.epa.gov/ozone/snap/lists,* and the lists of ''unacceptable,'' ''acceptable subject to use conditions,'' and ''acceptable subject to narrowed use limits'' substitutes are found in the appendices to Subpart G of 40 CFR part 82 as well as at *www.epa.gov/ozone/snap/lists.*

3. Petition Process

Section 612(d) grants the right to any person to petition EPA to add a substance to, or delete a substance from, the lists published in accordance with Section 612(c). The Agency has 90 days to grant or deny a petition. Where the Agency grants the petition, EPA must publish the revised lists within an additional six months.

4. 90-Day Notification

Section 612(e) directs EPA to require any person who produces a chemical substitute for a class I substance to notify the Agency not less than 90 days before new or existing chemicals are introduced into interstate commerce for significant new uses as substitutes for a class I substance. The producer must also provide the Agency with the producer's unpublished health and safety studies on such substitutes.

5. Outreach

Section 612(b)(1) states that the Administrator shall seek to maximize the use of federal research facilities and resources to assist users of class I and II substances in identifying and developing alternatives to the use of such substances in key commercial applications.

6. Clearinghouse

Section 612(b)(4) requires the Agency to set up a public clearinghouse of alternative chemicals, product substitutes, and alternative manufacturing processes that are

available for products and manufacturing processes which use class I and II substances.

B. What is EPA's regulation implementing Section 612?

On March 18, 1994, EPA published the original rulemaking (59 FR 13044) which established the process for administering the SNAP program and issued EPA's first lists identifying acceptable and unacceptable substitutes in the major industrial use sectors (Subpart G of 40 CFR part 82). These eight sectors—refrigeration and AC; foam blowing; cleaning solvents; fire suppression and explosion protection; sterilants; aerosols; adhesives, coatings and inks; and tobacco expansion—are the principal industrial sectors that historically consumed the largest volumes of ODS.

Section 612 of the CAA instructs EPA to list as acceptable those substitutes that present a lower overall risk to human health and the environment as compared with other substitutes that are currently or potentially available for a specific use.

C. How do the regulations for the SNAP program work?

Under the SNAP regulations, anyone who plans to market or produce a substitute in one of the eight major industrial use sectors where class I or class II substances have been used must provide notice to the Agency, including health and safety information on the substitute, at least 90 days before introducing it into interstate commerce for significant new use as an alternative (40 CFR 82.176(a)). This requirement applies to the persons planning to introduce the substitute into interstate commerce,[5] who typically are chemical manufacturers but may include importers, formulators, equipment manufacturers, and end users when they are responsible for introducing a substitute into commerce.[6] The CAA and the SNAP regulations, 40 CFR 82.174(a), prohibit use of a substitute earlier than 90 days after notice has been provided to the Agency. EPA considers that notice has been received once EPA receives the submission and determines that the submission includes complete and adequate data (40 CFR 82.180(a)). At that point, the SNAP review begins.

The Agency has identified four possible decision categories for substitutes that are submitted for evaluation: Acceptable; acceptable subject to use conditions; acceptable subject to narrowed use limits; and unacceptable[7] (40 CFR 82.180(b)). Use conditions and narrowed use limits are both considered ''use restrictions'' and are explained below. Substitutes that are deemed acceptable with no use restrictions (no use conditions or narrowed use limits) can be used for all applications in the relevant end-uses within the sector. Substitutes that are acceptable, subject to use conditions, may be used only in accordance with those restrictions.

After reviewing a substitute, the Agency may make a determination that a substitute is acceptable only if certain conditions are met in the way that the substitute is used to minimize risks to human health and the environment. EPA describes such substitutes as ''acceptable subject to use conditions.'' Entities that use these substitutes without meeting the associated use conditions are in violation of Section 612 of the CAA and EPA's SNAP regulations (40 CFR 82.174(c)).

For some substitutes, the Agency may permit a narrowed range of use within an end-use or sector. For example, the Agency may limit the use of a substitute to certain end-uses or specific applications within an industry sector. EPA describes these substitutes as ''acceptable subject to narrowed use limits.'' A person using a substitute that is acceptable subject to narrowed use limits in applications and end-uses that are not consistent with the narrowed use limit is using the substitute in an unacceptable manner and is in violation of Section 612 of the CAA and EPA's SNAP regulations (40 CFR 82.174(c)).

The Agency publishes its SNAP program decisions in the **Federal Register**. EPA publishes proposed decisions concerning substitutes that are deemed acceptable subject to use restrictions (use conditions and/or narrowed use limits), or substitutes deemed unacceptable, as proposed rulemakings to provide the public an opportunity to comment, before publishing final decisions.

In contrast, EPA publishes decisions concerning substitutes that are deemed acceptable with no restrictions as ''notices of acceptability'' or ''determinations of acceptability,'' rather than as proposed and final rules. As described in the preamble to the rule initially implementing the SNAP program in the **Federal Register** at 59 FR 13044 on March 18, 1994, EPA does not believe that rulemaking procedures are necessary to list alternatives that are acceptable without restrictions because such listings neither impose any sanction nor prevent anyone from using a substitute.

Many SNAP listings include ''Comments'' or ''Further Information'' to provide additional information on substitutes. Since this additional information is not part of the regulatory decision, these statements are not binding for use of the substitute under the SNAP program. However, regulatory requirements so listed may be binding under other regulatory programs (*e.g.,* worker protection regulations promulgated by the Occupational Safety and Health Administration (OSHA)). The ''Further Information'' identified in the listing does not necessarily include all other legal obligations pertaining to the use of the substitute. While the items listed are not legally binding under the SNAP program, EPA encourages users of substitutes to apply all statements in the ''Further Information'' column in their use of these substitutes. In many instances, the information simply refers to sound operating practices that have already been identified in existing industry and/or building codes or standards. Thus many of the statements, if adopted, would not require the affected user to make significant changes in existing operating practices.

D. Where do I find additional information about the SNAP program?

For copies of the comprehensive SNAP lists of substitutes or additional information on SNAP, refer to EPA's Ozone Depletion Web site at: *www.epa.gov/ozone/snap.* For more information on the Agency's process for administering the SNAP program or criteria for evaluation of substitutes, refer to the SNAP final rulemaking in the **Federal Register** at 59 FR 13044 on March 18, 1994, codified at 40 CFR part 82, Subpart G. A complete chronology of SNAP decisions and the appropriate citations are found at: *www.epa.gov/ozone/snap/chron.html.*

[5] As defined at 40 CFR 82.104, ''interstate commerce'' means the distribution or transportation of any product between one state, territory, possession or the District of Columbia, and another state, territory, possession or the District of Columbia, or the sale, use or manufacture of any product in more than one state, territory, possession or District of Columbia. The entry points for which a product is introduced into interstate commerce are the release of a product from the facility in which the product was manufactured, the entry into a warehouse from which the domestic manufacturer releases the product for sale or distribution, and at the site of United States Customs clearance.

[6] As defined at 40 CFR 82.172, ''end-use'' means processes or classes of specific applications within major industrial sectors where a substitute is used to replace an ODS.

[7] The SNAP regulations also include ''pending,'' referring to submissions for which EPA has not reached a determination under this provision.

III. What action is the Agency taking?

A. Listing Decisions: Substitutes and End-Uses

In this action, EPA is listing the following refrigerants as acceptable, subject to use conditions, in the identified end-uses.

1. Retail food refrigeration. EPA finds isobutane (also referred to as R–600a) and the hydrocarbon blend R–441A acceptable, subject to use conditions, as substitutes in retail food refrigeration (new stand-alone retail food refrigeration equipment only). The use conditions require the following:

i. The quantity of the substitute refrigerant (*i.e.,* ''charge size'') must not exceed 150 g (5.29 oz);

ii. These refrigerants may be used only in new equipment designed specifically and clearly identified for the refrigerant—*i.e.,* none of these substitutes may be used as a conversion or ''retrofit'' [8] refrigerant for existing equipment;

iii. These refrigerants may be used only in stand-alone retail food refrigeration equipment that meets all requirements listed in Supplement SB to the 10th edition of UL Standard 471, dated November 24, 2010. In cases where this final rule includes requirements more stringent than those of the 10th edition of UL Standard 471, the appliance would need to meet the requirements of the final rule in place of the requirements in the UL Standard;

iv. The refrigerator or freezer must have red Pantone Matching System (PMS) #185 marked pipes, hoses, or other devices through which the refrigerant passes, to indicate the use of a flammable refrigerant. This color must be present at all service ports and other parts of the system where service puncturing or other actions creating an opening from the refrigerant circuit to the atmosphere might be expected and must extend a minimum of one (1) inch in both directions from such locations.

v. The following markings, or the equivalent, must be provided and must be permanent:

(a) ''DANGER—Risk of Fire or Explosion. Flammable Refrigerant Used. Do Not Use Mechanical Devices To Defrost Refrigerator. Do Not Puncture Refrigerant Tubing.'' This marking must be provided on or near any evaporators that can be contacted by the consumer.

(b) ''DANGER—Risk of Fire or Explosion. Flammable Refrigerant Used. To Be Repaired Only By Trained Service Personnel. Do Not Puncture Refrigerant Tubing.'' This marking must be located near the machine compartment.

(c) ''CAUTION—Risk of Fire or Explosion. Flammable Refrigerant Used. Consult Repair Manual/Owner's Guide Before Attempting To Service This Product. All Safety Precautions Must be Followed.'' This marking must be located near the machine compartment.

(d) ''CAUTION—Risk of Fire or Explosion. Dispose of Properly In Accordance With Federal Or Local Regulations. Flammable Refrigerant Used.'' This marking must be provided on the exterior of the refrigeration equipment.

(e) ''CAUTION—Risk of Fire or Explosion Due To Puncture Of Refrigerant Tubing; Follow Handling Instructions Carefully. Flammable Refrigerant Used.'' This marking must be provided near all exposed refrigerant tubing.

All of these markings must be in letters no less than 6.4 mm (¼ inch) high.

Retail food refrigeration includes the refrigeration systems, including cold storage cases, designed to chill food or keep it at a cold temperature for commercial sale. Stand-alone retail food refrigeration equipment includes appliances that use a sealed hermetic compressor and for which all refrigerant-containing components, including but not limited to the compressor, condenser, and evaporator, are assembled into a single piece of equipment before delivery to the ultimate consumer or user. Such equipment does not require the addition or removal of refrigerant when placed into initial operation. Stand-alone equipment is used to chill or to store chilled beverages or frozen products (*e.g.,* reach-in beverage coolers, stand-alone ice cream cabinets, and wine coolers in commercial settings).

This acceptability decision does not apply to large commercial refrigeration systems such as, but not limited to, remote direct expansion refrigeration systems typically found in supermarkets. This acceptability decision also does not apply to walk-in coolers. The SNAP submission did not apply to these types of systems. Moreover, these types of equipment typically require larger charges than those established in this use condition for the end-use addressed in this rule and are sufficiently different that we would need additional information before making a listing decision.

2. Very low temperature refrigeration and non-mechanical heat transfer. EPA finds ethane (also referred to as R–170) acceptable, subject to use conditions, in very low temperature refrigeration equipment and in non-mechanical heat transfer, subject to the same use conditions described above for isobutane and R–441A in stand-alone retail food refrigeration equipment.

Very low temperature refrigeration equipment is intended to maintain temperatures considerably lower than for refrigeration of food—for example, −80 °C (−170 °F) or lower. Examples of very low temperature refrigeration equipment include medical freezers and freeze-dryers, which generally require extremely reliable refrigeration cycles to maintain low temperatures and must meet stringent technical standards. In some cases, very low temperature refrigeration equipment may use a refrigeration system with two refrigerant loops or with a direct expansion refrigeration loop coupled with an alternative refrigeration technology (*e.g.,* Stirling cycle). This allows a greater range of temperatures and may reduce the overall refrigerant charge.

There is no U.S. standard that we are aware of that applies specifically to very low temperature refrigeration or non-mechanical heat transfer. The submitter of information for use of ethane in very low temperature refrigeration has indicated that UL has tested their equipment for compliance with the UL 471 Standard for commercial refrigeration equipment, which addresses stand-alone commercial refrigerators and freezers. In this final rule, we are requiring compliance with the UL 471 Standard as one of the conditions for use of ethane in very low temperature refrigeration equipment.

This submission also addressed the use of ethane in a type of non-mechanical heat transfer equipment called a thermosiphon. Non-mechanical heat transfer involves cooling systems that rely on convection to remove heat from an area, rather than mechanical refrigeration. A thermosiphon is a type of heat transfer system that relies on natural convection currents, as opposed to using a mechanical pump. This final rule lists ethane as acceptable, subject to use conditions, for use in non-mechanical heat transfer. The use conditions include a requirement to meet Supplement B to the UL 471 Standard and a charge limit of 150 g. We note that some other types of non-mechanical heat transfer equipment would be expected to present different technical issues than a thermosiphon in a freezer and are not part of this decision, *e.g.,* equipment designed for cooling the engine compartment of heavy duty vehicles, organic Rankine cycle equipment, or geothermal systems.

3. Household refrigerators and freezers. EPA finds propane (also

[8] Sometimes conversion refrigerant substitutes are inaccurately referred to as ''drop in'' replacements.

referred to as R–290) acceptable, subject to use conditions, as a substitute in household refrigerators and freezers and combination refrigerator/freezers. The use conditions require the following:

i. The charge size for any household refrigerator, freezer, or combination refrigerator and freezer for each circuit using R–290 must not exceed 57 g (2.01 oz);

ii. This refrigerant may be used only in new equipment specifically designed and clearly identified for the refrigerant—*i.e.,* none of these substitutes may be used as a conversion or ''retrofit'' refrigerant for existing equipment;

iii. This substitute may be used only in equipment that meets all requirements in Supplement SA to the 10th edition of UL Standard 250, dated August 25, 2000. In cases where this final rule includes requirements more stringent than those of the 10th edition of UL Standard 250, the appliance would need to meet the requirements of the final rule in place of the requirements in the UL Standard;

iv. The refrigerator or freezer must have red PMS #185 marked pipes, hoses, and other devices through which the refrigerant passes to indicate the use of a flammable refrigerant;

v. Permanent markings must be provided on the equipment, as described above for stand-alone commercial refrigerators and freezers. All of these markings must be in letters no less than 6.4 mm (¼ inch) high.

Household refrigerators, freezers, and combination refrigerator/freezers are intended primarily for residential use, although they may be used outside the home. Household freezers only offer storage space at freezing temperatures, unlike household refrigerators. Products with both a refrigerator and freezer in a single unit are most common. Wine coolers used in residential settings are considered part of this end-use. EPA previously found the flammable hydrocarbon refrigerants isobutane and R–441A acceptable, subject to use conditions, in this end-use (December 20, 2011, at 76 FR 78832, codified at Appendix R of Subpart G of 40 CFR part 82).

4. Vending machines. EPA finds R–441A, isobutane, and propane as acceptable substitutes in vending machines, subject to the same use conditions described above for stand-alone retail food refrigeration equipment, except that paragraph iii. reads as follows:

Equipment must meet all requirements of Supplement SA to the 7th edition of UL Standard 541, ''Refrigerated Vending Machines,'' dated December 30, 2011 (instead of Supplement SB to the 10th edition of UL 471). Supplement SA specifically addressing flammable refrigerants is very similar to the Supplement SB in the UL 471 Standard for commercial refrigerators and freezers, and thus, similar requirements apply to these types of refrigeration equipment. In UL 541, the relevant references on equipment markings for flammable refrigerants in Supplement A are Sections SA 6.1.2–SA 6.1.5.

Vending machines are self-contained units for refrigerating beverages or food which dispense goods that must be kept cold or frozen. This end-use differs from other retail food refrigeration because goods are dispensed, rather than allowing the consumer to reach in to grab a beverage or food product. The design of the refrigeration system of a vending machine is similar to that of a self-contained commercial refrigerator or freezer. Typically the difference lies in how payment for goods is made and in the selection mechanisms found in vending machines but not in self-contained commercial refrigerator-freezers, and possibly the outer casing (*e.g.,* glass doors and open, reach-in designs are generally used in self-contained commercial refrigerator-freezers whereas glass wall and other types of casings are used for vending machines). We are aware that for vending machines, it is possible to detach easily and replace the refrigeration circuit from the outer casing of the equipment. In such a situation, replacing the old refrigeration circuit with a new one within the old casing would be considered ''new'' equipment and not a retrofit of the old, existing equipment.

5. Residential and light commercial AC and heat pumps. EPA finds propane (also known as R–290), difluoromethane (also known as HFC–32 or R–32), and R–441A acceptable, subject to use conditions, as substitutes in residential and light commercial AC for self-contained room air conditioners, including PTAC units and PTHPs, window AC units, and portable AC units designed for use in a single room. The use conditions require the following:

i. These refrigerants may be used only in new equipment designed specifically, and clearly identified, for the refrigerant—*i.e.,* none of these substitutes may be used as a conversion or ''retrofit'' refrigerant for existing equipment;

ii. These refrigerants may be used only in air conditioners that meet all requirements listed in Supplement SA to the 8th edition, dated August 2, 2012, of UL Standard 484, ''Room Air Conditioners.'' In cases where this final rule includes requirements more stringent than those of the 8th edition of UL Standard 484, the appliance would need to meet the requirements of the final rule in place of the requirements in the UL Standard;

iii. UL 484 includes charge limits for room air conditioners and adherence to those charge limits would normally be confirmed by the installer. In addition to requiring the charge limits in the UL 484 Standard, EPA is requiring the following charge size limits, adherence to which must be confirmed by the original equipment manufacturer (OEM). In cases where the charge size limit listed is different from those determined by UL 484, the smaller of the two charge sizes would apply. For a review of how these charge size limits were derived, see ''Derivation of Charge Limits for Room Air Conditioners,'' (EPA, 2015) in the docket. The charge size limit must be determined based on the type of equipment, the alternative refrigerant used, and the normal rated capacity of the unit. The limits are presented in Tables 2 through 6 below in Section III.C.3, ''Charge size,'' and in Tables A, B, C, D and E of the regulatory text at the end of this preamble.

iv. The air conditioner must have red PMS #185 marked pipes, hoses, or other devices through which the refrigerant passes to indicate the use of a flammable refrigerant. This color must be present at all service ports and other parts of the system where service puncturing or other actions creating an opening from the refrigerant circuit to the atmosphere might be expected and must extend a minimum of one (1) inch in both directions from such locations;

v. The following markings, or the equivalent, must be provided and must be permanent:

(a) On the outside of the air conditioner: ''DANGER—Risk of Fire or Explosion. Flammable Refrigerant Used. To Be Repaired Only By Trained Service Personnel. Do Not Puncture Refrigerant Tubing.''

(b) On the outside of the air conditioner: ''CAUTION—Risk of Fire or Explosion. Dispose of Properly In Accordance With Federal Or Local Regulations. Flammable Refrigerant Used.''

(c) On the inside of the air conditioner near the compressor: ''CAUTION—Risk of Fire or Explosion. Flammable Refrigerant Used. Consult Repair Manual/Owner's Guide Before Attempting To Service This Product. All Safety Precautions Must be Followed.''

(d) For portable air conditioners, PTAC and PTHP, on the outside of the

product: ''WARNING: Appliance shall be installed, operated and stored in a room with a floor area larger than ''X'' m^2 (Y ft^2).'' The value ''X'' must be determined using the minimum room size in m^2 calculated using Appendix F of UL 484. The evaporator must remain no higher than 0.6 m above the floor.

(e) For window air conditioners, on the outside of the product: ''WARNING: Appliance shall be installed, operated and stored in a room with a floor area larger than ''X'' m^2 (Y ft^2).'' The value ''X'' must be determined using the minimum room size in m^2 calculated using Appendix F of UL 484. The evaporator must remain no higher than 1.06 m above the floor. All of these markings must be in letters no less than 6.4 mm (¼ inch) high.

The residential and light commercial AC and heat pumps end-use includes equipment for cooling air in individual rooms, in single-family homes, and sometimes in small commercial buildings. This end-use differs from commercial comfort AC, which uses chillers that cool water that is then used to cool air throughout a large commercial building, such as an office building or hotel. Examples of equipment for residential and light commercial AC and heat pumps include:

- Central air conditioners, also called unitary AC or unitary split systems. These systems include an outdoor unit with a condenser and a compressor, refrigerant lines, an indoor unit with an evaporator, and ducts to carry cooled air throughout a building. Central heat pumps are similar but offer the choice to either heat or cool the indoor space. These systems are not addressed in this rule.[9]
- Multi-split air conditioners. These systems include one or more outdoor unit(s) with a condenser and a compressor and multiple indoor units, each of which is connected to the outdoor unit by refrigerant lines. These systems are not addressed in this rule.
- Mini-split air conditioners. These systems include an outdoor unit with a condenser and a compressor and a single indoor unit that is connected to the outdoor unit by refrigerant lines. Cooled air exits directly from the indoor unit rather than being carried through ducts. These systems are not addressed in this rule.
- Window air conditioners. These are self-contained units that fit in a window with the condenser extending outside the window. These types of units are regulated under this rule.
- PTAC and PTHP. These are self-contained units that consist of a separate, un-encased combination of heating and cooling assemblies mounted through a wall.[10] These types of units are regulated under this rule.
- Portable room air conditioners. These are self-contained, factory-sealed, single package units that are designed to be moved easily from room to room and are intended to provide supplemental cooling within a room. These units typically have wheels or casters for portability and, under the UL 484 Standard for room air conditioners, must have a fan which operates continuously when the unit is on. Portable room air conditioners may contain an exhaust hose that can be placed through a window or door to eject heat to the outside. These types of units are regulated under this rule.

Of these types of equipment, window air conditioners, PTAC, PTHP, and portable room air conditioners are self-contained equipment with the condenser, compressor, evaporator, and tubing all within casing in a single unit. These units all fall under the scope of the UL 484 Standard for room air conditioners. In contrast, unitary split systems, multi-split systems and mini-split systems have an outdoor condenser that is separated from an indoor unit. Compared to split systems, self-contained equipment typically has smaller charge sizes, has fewer locations that are prone to leak, and is less likely to require servicing by a technician, thereby causing refrigerant releases. A lower risk of refrigerant releases and a potential for smaller releases and lower concentration releases results in lower risk that flammable refrigerant could be ignited. Thus, self-contained air conditioners and heat pumps using a flammable refrigerant have lower risk for fire than split systems using a flammable refrigerant. EPA notes that split system AC systems present different technical challenges than self-contained room AC equipment and are not part of this decision.

6. Summary. In summary, EPA is listing ethane, isobutane, propane, HFC–32, and R–441A as acceptable, subject to use conditions, as substitute refrigerants in certain refrigeration and AC end-uses. It is legal to use those refrigerants in the specified types of equipment under the conditions identified above. Use in the specified types of equipment that is not consistent with the use conditions is a violation of CAA Section 612 and EPA's implementing regulations for the SNAP program. Both the equipment manufacturers and the end users must comply with these use conditions.

The regulatory text of our decisions for the end-uses discussed above appears in tables at the end of this preamble. This text will be codified at 40 CFR part 82 Subpart G. We note that there may be other legal obligations pertaining to the manufacture, use, handling, and disposal of hydrocarbons that are not included in the information listed in the tables (*e.g.,* Section 608 prohibition on venting, releasing, or disposing of refrigerant substitutes or Department of Transportation requirements for transport of flammable gases).

B. What are ethane, isobutane, propane, HFC–32, R–441A, and the ASHRAE classifications for refrigerant flammability?

Ethane, isobutane, and propane are hydrocarbons and R–441A is a hydrocarbon blend. Hydrocarbons are highly flammable organic compounds made up of hydrogen and carbon. Ethane has two carbons, the chemical formula of C_2H_6, and the CAS Reg. No. 74–84–0. Propane has three carbons, the formula C_3H_8, and the CAS Reg. No. 74–98–6. Isobutane has four carbons, the formula C_4H_{10}, also written as $CH(CH_3)_2CH_3$ to distinguish it from n-butane, and the CAS Reg. No. 75–28–5. As refrigerants, ethane, propane, and isobutane can be referred to by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) designations R–170, R–290, and R–600a, respectively. R–441A, also known by the trade name ''HCR–188C,'' is a hydrocarbon blend[11] consisting of 55% propane, 36% n-butane, 6% isobutane, and 3% ethane by weight.

HFC–32 is a mildly flammable organic compound made up of hydrogen,

[9] EPA has received submissions for HFC–32 and the hydrocarbon blends R–441A and R–443A, and no other flammable refrigerants, in new unitary central air conditioners.This action does not address flammable refrigerants in unitary central air conditioners. Introduction into interstate commerce of refrigerants without giving timely and adequate notice to EPA is in violation of Section 612(e) of the CAA and the SNAP regulations at 40 CFR part 82, subpart G.

[10] Packaged terminal air conditioners are intended for use in a single room, or potentially for two rooms next to each other, and use no external refrigerant lines. Typical applications include motel or dormitory air conditioners.

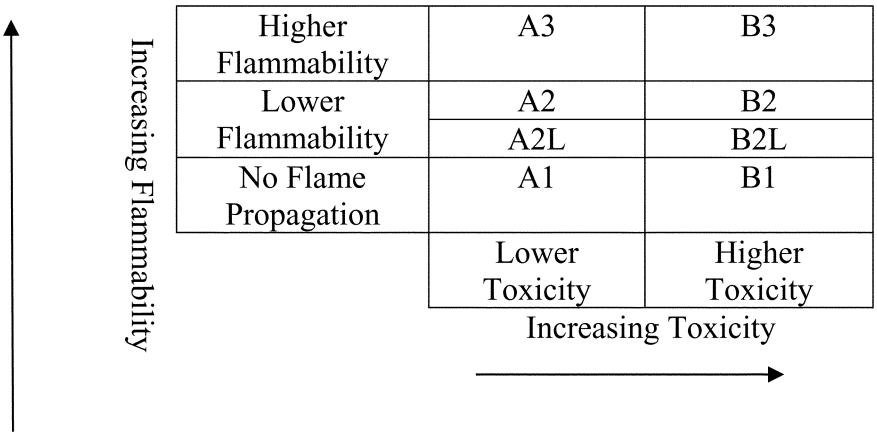
[11] EPA notes that under the SNAP program, we review and list refrigerants with specific compositions (59 FR 13044; March 18, 1994). To the extent possible, we follow ASHRAE's designations for refrigerants. Blends of refrigerants must be reviewed separately. For example, we consider each blend of propane with isobutane to be a different and unique refrigerant, and each would require separate submission, review and listing. Thus, blends of the refrigerants that we are listing as acceptable, subject to use conditions, in this rule are not acceptable.

carbon, and fluorine with the chemical formula CF_2H_2 (CAS Reg. No. 75–10–5).

The American National Standards Institute (ANSI)/ASHRAE Standard 34–2010 assigns a safety group classification for each refrigerant which consists of two alphanumeric characters (*e.g.,* A2 or B1). The capital letter indicates the toxicity and the numeral denotes the flammability. ASHRAE classifies Class A refrigerants as refrigerants for which toxicity has not been identified at concentrations less than or equal to 400 parts per million (ppm) by volume, based on data used to determine threshold limit value-time-weighted average (TLV–TWA) or consistent indices. Class B signifies refrigerants for which there is evidence of toxicity at concentrations below 400 ppm by volume, based on data used to determine TLV–TWA or consistent indices. The refrigerants are also assigned a flammability classification of 1, 2, or 3. Tests are conducted in accordance with ASTM E681 using a spark ignition source at 60 °C and 101.3 kPa (ASHRAE, 2010). Figure 1 in ANSI/ASHRAE Standard 15–2007 uses the same safety group but limits its concentration to 3,400 ppm.

The flammability classification ''1'' is given to refrigerants that, when tested, show no flame propagation. The flammability classification ''2'' is given to refrigerants that, when tested, exhibit flame propagation, have a heat of combustion less than 19,000 kJ/kg (8,174 British thermal units (BTU)/lb), and have a lower flammability limit (LFL) greater than 0.10 kg/m^3. Refrigerants within flammability classification 2 may optionally be designated in the LFL subclass ''2L'' if they have a maximum burning velocity of 10 cm/s or lower when tested at 23.0 °C and 101.3 kPa. The flammability classification ''3'' is given to refrigerants that, when tested, exhibit flame propagation and that either have a heat of combustion of 19,000 kJ/kg (8,174 BTU/lb) or greater or an LFL of 0.10 kg/m^3 or lower. Thus, refrigerants with flammability classification ''3'' are highly flammable, while those with flammability classification ''2'' are less flammable and those with flammability classification ''2L'' are mildly flammable. For both toxicity and flammability classifications, refrigerant blends are designated based on the worst-case of fractionation determined for the blend (which may be different when evaluating toxicity than when evaluating flammability).

Figure 1. Refrigerant Safety Group Classification



Using these safety group classifications, ANSI/ASHRAE Standard 34–2010 categorizes ethane, isobutane, propane, and R–441A in the A3 Safety Group and categorizes HFC–32 in the A2L Safety Group.

C. Use Conditions

EPA is listing ethane, isobutane, propane, HFC–32, and R–441A as acceptable, subject to use conditions, in the specified end-uses. The use conditions include conditions consistent with industry standards, limits on charge size, and requirements for warnings and markings on equipment to inform consumers and technicians of potential flammability hazards. The listings with specific use conditions are intended to allow for the use of these flammable refrigerants in a manner that will ensure they do not pose a greater risk to human health or the environment than other substitutes that are currently or potentially available.

1. New Equipment Only; Not Intended for Use as a Retrofit Alternative

The refrigerants listed in this final rule may be used only in new equipment [12] designed to address concerns unique to flammable refrigerants—*i.e.,* none of these substitutes may be used as a conversion or ''retrofit'' refrigerant for existing equipment. The flammable refrigerants were not submitted under the SNAP program to be used in retrofitted equipment, and no information was provided on how to address hazards of flammable refrigerants when used in equipment that was designed for non-flammable refrigerants. Introduction into interstate commerce of these refrigerants for use in existing equipment, or for other end-uses, without giving timely and adequate notice to EPA is in violation of Section 612(e) of the CAA and the SNAP regulations at 40 CFR part 82, subpart G. In addition, use of these refrigerants in existing equipment is in violation of Section 612(c) of the CAA and the corresponding SNAP regulations at 40 CFR part 82, subpart G.

2. Standards

The flammable refrigerants may be used only in equipment that meets all requirements in the relevant supplements for flammable refrigerants in certain applicable UL standards for refrigeration and AC equipment. Specifically, the cited supplements include Supplement SB to UL 471 10th edition for commercial refrigerators and freezers (including stand-alone freezers

[12] This is intended to mean a completely new refrigeration circuit containing a new evaporator, condenser and refrigerant tubing.

for very low temperature refrigeration), Supplement SA to UL 250 10th edition (for household refrigerators and freezers), Supplement SA to UL 541 7th edition for refrigerated vending machines, and Supplement SA to UL 484 8th edition for room air conditioners.

UL has tested equipment for flammability risk in household and retail food refrigeration, vending machines, and room AC. Further, UL has developed acceptable safety standards including requirements for construction, for markings, and for performance tests concerning refrigerant leakage, ignition of switching components, surface temperature of parts, and component strength after being scratched. These standards were developed in an open and consensus-based approach, with the assistance of experts in the refrigeration and AC industry as well as experts involved in assessing the safety of products. While similar standards exist from other bodies such as the International Electrotechnical Commission (IEC), this rule relies on UL standards because they are most applicable and recognized by the U.S. market.

i. Incorporation by Reference

This approach is the same as that in our previous rule on flammable refrigerants (December 20, 2011 at 76 FR 78832), through which EPA incorporated by reference to 40 CFR part 82, appendix R to subpart G, Supplement SA to UL 250 10th edition and Supplement SB to UL 471 10th edition. Through this action the EPA is incorporating by reference relevant supplements from two additional UL standards: Supplement SA to UL 541 7th edition and Supplement SA to UL 484 8th edition. These supplements are summarized elsewhere in this document.

The UL Standards are available for purchase by mail at: COMM 2000; 151 Eastern Avenue; Bensenville, IL 60106; Email: *orders@comm-2000.com;* Telephone: 1–888–853–3503 in the U.S. or Canada (other countries dial +1–415–352–2168); Internet address: *http://ulstandardsinfonet.ul.com/* or *www.comm-2000.com.* The cost of a single standard is $400–$500 for electronic and $500-$630 for hardcopy. An outline of UL 484 may be purchased for $150 electronically or $175 for a hardcopy. UL also offers a subscription service to the Standards Certification Customer Library (SCCL) that allows unlimited access to their standards and related documents. The cost of obtaining these standards is not a significant financial burden for equipment manufacturers and purchase is not required for those selling, installing and servicing the equipment. Therefore, EPA concludes that the UL standards being incorporated by reference are reasonably available.

3. Charge Size

The refrigerants listed in this final rule are subject to use conditions that limit the amount of refrigerant allowed in each type of appliance. Consistent with previous actions, EPA believes it is necessary to set limits on charge size in order for these refrigerants not to pose a risk to human health or the environment that is greater than the risk posed by other available substitutes. These limits will reduce the risk to workers and consumers since under worst-case scenario analyses, a leak of the maximum charge sizes allowed under the use conditions did not result in concentrations of the refrigerant that met or exceeded the LFL, as explained below in Section IV.B, ''Flammability.''

The limitations on refrigerant charge size for household and stand-alone retail food refrigeration equipment, vending machines, and room AC units reflect the UL 250, UL 471, UL 541 and UL 484 Standards. As discussed above in Section III.C.2, ''Standards,'' we believe UL standards are most applicable to the U.S. market and offer requirements developed by a consensus of experts. EPA is requiring a charge size not to exceed 57 g (2.01 oz) for household refrigerators and freezers, not to exceed 150 g (5.29 oz) for retail food refrigeration in stand-alone units, and not to exceed 150 g (5.29 oz) for vending machines. The maximum charge size limit for room AC units varies, as discussed below. To place these quantities in context, the charge size of a disposable lighter is approximately 30 g (1.06 oz).

The UL 250 Standard for household refrigerators and freezers limits the amount of refrigerant that may leak to no more than 50 g (1.76 oz). EPA is requiring a charge size of 57 g (2.01 oz) to allow for up to 7 g (0.25 oz) of refrigerant that might be solubilized in the oil (and assumed not to leak or immediately vaporize with the refrigerant in case of a leak). EPA bases this estimate on information received from a manufacturer of hydrocarbon-based refrigerator-freezers (see EPA–HQ–OAR–2009–0286–0033 on *www.regulations.gov*).

UL Standards 471 (retail food refrigeration) and 541 (vending machines) limit the amount of refrigerant leaked to 150 g (5.29 oz). Furthermore, the charge size limit for A3 refrigerants (for retail food refrigeration) is in line with the IEC 60335–2–89 Standard for commercial appliances, which has a charge size limit of 150 g (5.29 oz).

As noted above, EPA is requiring a varying charge size for room AC units. The maximum charge must be no greater than the amount calculated for a given sized space according to Appendix F to Supplement SA of UL Standard 484. This section of the UL standard uses a formula for the charge of a fixed room air conditioner based upon the size of the space where the refrigerant may escape and the LFL of the refrigerant. Height of the mounting of the unit is also a variable, because empirical studies have found that leaked refrigerant is more likely to mix thoroughly with the surrounding air, rather than pooling, when the AC unit is mounted higher. The formula is as follows:

$$m_{max} = 2.5\ (LFL)^{\frac{5}{4}}\ h_o\sqrt{A}$$

Where,

M_{max} is the maximum charge size allowed for the space, in kg,

LFL is the lower flammability limit of the refrigerant in kg/m^3,

h_0 is the installation height of the indoor unit in m (0.6 m for an AC unit on the floor, 1.0 m for an AC unit in a window, 1.8 m for a wall-mounted AC unit, and 2.2 m for a ceiling-mounted AC unit), and

A is the floor area of the room, in m^2.

The equipment manufacturer would then design AC units to be used in rooms with a minimum size and would label the minimum room size on the equipment.

In addition to the formula above, UL 484 has a requirement that the maximum charge for a fixed room air conditioner may not exceed the amount calculated using the following formula:

$$m_2 = (26\ m^3) \times LFL$$

Where,

m_2 is the maximum charge size allowed, in kg,

26 m^3 is a constant, and

LFL is the lower flammability limit of the refrigerant in kg/m^3.

That formula sets maximum limits on refrigerant in a room air conditioner. With the A3 refrigerants, the maximum value is 1 kg.

In addition, Appendix F of UL 484 sets alternative requirements for non-fixed units such as portable air conditioners. Portable air conditioners are usually located on the floor of a room, and thus, if they followed the formula for fixed appliances, they would be assumed to have a height of 0.6 m, and would have relatively low charge sizes. However, Sections F.1.7 uses a different formula that allows for

a potentially larger charge size for non-fixed units. Sections F.1.8 through F.1.14 of UL 484 set additional requirements for non-fixed units to further reduce flammability risk. Among these provisions are requirements for a drop test, a vibration test, and a continuously operating fan, which would ensure that any leaked refrigerant is rapidly mixed and its concentration reduced. Thus, a different approach is used in the formula for determining charge sizes of non-fixed units; for example, the height of 0.6 m that might otherwise be assumed for PTACs is not used for a portable unit.

Although using a formula to determine the maximum charge size and minimum room size is appropriate from an engineering perspective, it does not ensure that a consumer will select an appropriate AC unit for the size of their room. It is likely that some consumers may be unaware of the exact size of the room to be cooled and thus may select an inappropriately sized AC unit that increases the flammability risk. Or, a consumer may believe that a larger, more powerful AC unit will provide better, faster cooling and therefore may select an inappropriately sized AC unit that increases the flammability risk. To address these concerns, EPA is supplementing the charge size guidelines in Appendix F of UL 484 with a use condition that restricts the maximum refrigerant charge of equipment based upon the cooling capacity needed, in BTU/hour. Equipment manufacturers are responsible for designing equipment below a maximum charge size consistent with the intended cooling capacity. This will allow the manufacturer, who is better positioned than the consumer, to address these challenges. Placing the responsibility on the manufacturer to design equipment that restricts the maximum refrigerant charge based upon the cooling capacity needed also provides a better means for EPA to ensure compliance with the use conditions, and thus to ensure that the risk to human health will not be greater than that posed by other available substitutes. We believe that these requirements, in combination with the other use conditions and commonly found informational materials, provide sufficient safeguards against instances of consumers selecting inappropriately-sized equipment.

EPA has based its charge limits upon appropriate capacity needs for an area to be cooled and the requirements for refrigerant charge relative to room size in Appendix F of UL 484, discussed above. A document in the docket describes this relationship in tables in a spreadsheet (EPA, 2015). The charge limits for each refrigerant by equipment type and mounting location are as follows:

TABLE 2—WINDOW AC UNITS *

[Maximum charge size by unit capacity and refrigerant used]

Refrigerant	Charge size in kg (by associated capacity in BTU/hr)													
	5,000	6,000	7,000	8,000	9,000	10,000	12,000	14,000	18,000	21,000	23,000	24,000	30,000	34,000
R–32	1.73	2.12	2.74	3.00	3.24	3.47	3.68	4.07	4.59	5.48	6.01	6.49	6.72	7.76
R–290	0.13	0.16	0.20	0.22	0.24	0.26	0.27	0.30	0.34	0.40	0.44	0.48	0.50	0.57
R–441A	0.14	0.17	0.22	0.24	0.26	0.28	0.30	0.33	0.37	0.44	0.49	0.53	0.54	0.63

* Assumes the evaporator is at least 1 m, but not more than 1.8 m, above the floor. Cooling capacities between those in the table are to be linearly interpolated between the next smaller and larger capacities listed in the table.

TABLE 3—PACKAGED TERMINAL AC UNITS AND HEAT PUMPS *

[Maximum charge size by unit capacity and refrigerant used]

Refrigerant	Charge size in kg (by associated capacity in BTU/hr)													
	5,000	6,000	7,000	8,000	9,000	10,000	12,000	14,000	18,000	21,000	23,000	24,000	30,000	34,000
R–32	1.04	1.27	1.65	1.80	1.95	2.08	2.21	2.44	2.75	3.29	3.60	3.89	4.03	4.65
R–290	0.08	0.09	0.12	0.13	0.14	0.15	0.16	0.18	0.20	0.24	0.27	0.29	0.30	0.34
R–441A	0.08	0.10	0.13	0.15	0.16	0.17	0.18	0.20	0.22	0.27	0.29	0.32	0.33	0.38

* Assumes the evaporator is at least 0.6 m, but not more than 1.0 m, above the floor. Cooling capacities between those in the table are to be linearly interpolated between the next smaller and larger capacities listed in the table.

TABLE 4—WALL-MOUNTED AC UNITS * WITH COMPRESSOR 1.8 m ABOVE FLOOR LEVEL *

[Maximum charge size by unit capacity and refrigerant used]

Refrigerant	Charge size in kg (by associated capacity in BTU/hr)													
	5,000	6,000	7,000	8,000	9,000	10,000	12,000	14,000	18,000	21,000	23,000	24,000	30,000	34,000
R–32	3.12	3.82	4.94	5.41	5.84	6.24	6.62	7.32	7.96	7.96	7.96	7.96	7.96	7.96
R–290	0.23	0.28	0.36	0.40	0.43	0.46	0.49	0.54	0.61	0.73	0.80	0.86	0.89	1.00
R–441A	0.25	0.31	0.40	0.44	0.47	0.51	0.54	0.59	0.67	0.80	0.88	0.95	0.98	1.00

* Assumes the evaporator is at least 1.8 m, but not more than 2.2 m, above the floor. Cooling capacities between those in the table are to be linearly interpolated between the next smaller and larger capacities listed in the table.

TABLE 5—CEILING-MOUNTED AC UNITS *
[Maximum charge size by unit capacity and refrigerant used]

Refrigerant	Charge size in kg (by associated capacity in BTU/hr)													
	5,000	6,000	7,000	8,000	9,000	10,000	12,000	14,000	18,000	21,000	23,000	24,000	30,000	34,000
R–32	3.82	4.67	6.03	6.61	7.14	7.63	7.96	7.96	7.96	7.96	7.96	7.96	7.96	7.96
R–290	0.28	0.34	0.44	0.49	0.53	0.56	0.60	0.66	0.74	0.89	0.97	1.00	1.00	1.00
R–441A	0.31	0.38	0.49	0.54	0.58	0.62	0.66	0.73	0.82	0.98	1.00	1.00	1.00	1.00

* Assumes the evaporator is at least 2.2 m above the floor. Cooling capacities between those in the table are to be linearly interpolated between the next smaller and larger capacities listed in the table.

TABLE 6—PORTABLE ROOM AC UNITS *
[Maximum charge size by unit capacity and refrigerant used]

Refrigerant	Charge size in kg (by associated capacity in BTU/hr)													
	5,000	6,000	7,000	8,000	9,000	10,000	12,000	14,000	18,000	21,000	23,000	24,000	30,000	34,000
R–32	1.56	2.35	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45
R–290	0.19	0.29	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
R–441A	0.21	0.31	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33

* Assumes equipment meeting UL 484 requirements for non-fixed equipment. Cooling capacities between those in the table are to be linearly interpolated between the next smaller and larger capacities listed in the table.

In cases where the rated capacity exceeds the maximum shown on the table, the maximum charge size in the table for that refrigerant applies. In cases where the normal rated capacity lies between two values listed next to each other in the table, the maximum charge size should be determined based on a linear interpolation between the two respective charge sizes. We assume that room air conditioners will be at least 5,000 BTU/hr in capacity; this corresponds to cooling a floor area of roughly 100 square feet or 9.3 m^2 and it is the lowest value observed at a popular retailer's Web site (*www.homedepot.com*).

4. Color-Coded Hoses and Piping

Equipment must have distinguishing color-coded hoses and piping to indicate use of a flammable refrigerant. This will help alert technicians immediately to the use of a flammable refrigerant, thereby reducing the risk of using sparking equipment or otherwise having an ignition source nearby. The AC and refrigeration industry currently uses distinguishing colors as a means of identifying different refrigerants in containers, and so this approach is consistent with industry practice. Likewise, distinguishing coloring has been used elsewhere to indicate an unusual and potentially dangerous situation, for example in the use of orange-insulated wires in hybrid electric vehicles. Currently, no industry standard exists for color-coded hoses or pipes for ethane, HFC–32, isobutane, propane, or R–441A. The final use condition requires all such refrigerator tubing to be colored red PMS #185 to match the red band displayed on the container of flammable refrigerants under the Air Conditioning, Heating and Refrigeration Institute (AHRI) Guideline ''N'' 2012, ''2012 Guideline for Assignment of Refrigerant Container Colors.''

A cost-effective alternative to painting or dying the hose or pipe would be to instead add a colored plastic sleeve or cap to the service tube that is the same red color (PMS #185). The sleeve could also be boldly marked with a graphic to indicate that the refrigerant is flammable. The colored plastic sleeve or cap would have to be installed in such a way as to require that it be forcibly removed in order to access the service tube. This would alert the technician that the refrigeration circuit that she/he was about to access contained a flammable refrigerant, even if all warning labels were somehow removed. EPA is also concerned with ensuring adequate notification of the presence of flammable refrigerants for personnel disposing of appliances containing flammable refrigerants.

EPA believes the use of color-coded hoses or piping (including the use of sleeves), as well as the use of warning labels discussed below, is reasonable and consistent with other general industry practices. This approach is the same as that adopted in our previous rule on flammable refrigerants (December 20, 2011, at 76 FR 78832).

5. Labeling

As a use condition, EPA is requiring labeling of new household and retail refrigerators and freezers, vending machines, non-mechanical heat transfer equipment, very low temperature refrigeration equipment, and room air conditioners that are designed to use one of the refrigerants subject to the acceptability determinations in this action. EPA is requiring that the warning labels on the equipment contain letters at least ¼ inch high, and be permanently affixed to the equipment. Warning label language requirements are found in Section III.A of this rule, ''Listing decisions: substitutes and end-uses,'' as well as in the regulatory text. The warning label language is similar to or exactly the same as that required in the following UL standards: UL 250 in Section SA6.1 for household refrigerators and freezers; UL 541 in Section SA6.1 for vending machines; UL 471 in Section SB6.1 for commercial refrigerators and freezers; and UL 484 in Section SA6.1 for room AC units.

EPA believes that it would be difficult to see warning labels with the minimum lettering height requirement of ⅛ inch provided in these UL standards. Therefore, consistent with the use conditions in our previous hydrocarbon refrigerants rule (December 20, 2011 at 76 FR 78832), the minimum height for lettering must be ¼ inch as opposed to ⅛ inch, which will make it easier for technicians, consumers, retail storeowners, and emergency first responders to view the warning labels. We understand that UL is considering revising its standards to be consistent with this requirement.

D. Venting Prohibition

1. What are the statutory requirements concerning venting, release, or disposal of refrigerants and refrigerant substitutes under section 608 of the CAA?

The statutory requirements concerning venting, release, or disposal of refrigerants and refrigerant substitutes are under Section 608 of the CAA. Section 608 of the Act as amended, titled *National Recycling and Emission Reduction Program,* requires EPA to establish regulations governing the use and disposal of ODS used as refrigerants, such as certain CFCs and HCFCs, during the service, repair, or disposal of appliances and industrial process refrigeration (IPR). EPA's authority to promulgate the regulatory revisions in this action is based in part on Section 608 of the CAA. Section 608(c)(1) provides that it is unlawful for any person, in the course of maintaining, servicing, repairing, or disposing of an appliance (or IPR), to knowingly vent, or otherwise knowingly release or dispose of, any class I or class II substance used as a refrigerant in that appliance (or IPR) in a manner which permits the ODS to enter the environment.

Section 608(c)(1) further exempts from this self-effectuating prohibition *de minimis* releases associated with good faith attempts to recapture and recycle or safely dispose of such a substance. EPA, as set forth in its regulations, interprets releases to meet the criteria for exempted *de minimis* releases if they occur when the recycling and recovery requirements of regulations promulgated under sections 608 and 609 are followed. 40 CFR 82.154(a)(2).

Section 608(c)(2) extends the prohibition in Section 608(c)(1) to knowingly venting or otherwise knowingly releasing or disposing of any refrigerant substitute for class I or class II substances by any person maintaining, servicing, repairing, or disposing of appliances or IPR. This prohibition applies to any substitute unless the Administrator determines that such venting, releasing, or disposing does not pose a threat to the environment. Thus, section 608(c) provides EPA authority to promulgate regulations to interpret, implement, and enforce this prohibition on venting, releasing, or disposing of class I or class II substances and their refrigerant substitutes, which we refer to as the ''venting prohibition'' in this action. EPA's authority under Section 608(c) includes authority to implement Section 608(c)(2) by exempting certain substitutes for class I or class II substances from the venting prohibition when the Administrator determines that such venting, release, or disposal does not pose a threat to the environment.

2. What are EPA's regulations concerning venting, releasing, or disposing of refrigerant substitutes?

Regulations promulgated under Section 608 of the Act, published on May 14, 1993 (58 FR 28660), established a recycling program for ozone-depleting refrigerants recovered during the servicing and maintenance of refrigeration and AC appliances. In the same 1993 rule, EPA also promulgated regulations implementing the Section 608(c) prohibition on knowingly venting, releasing, or disposing of class I or class II controlled substances. These regulations were designed to substantially reduce the use and emissions of ozone-depleting refrigerants.

EPA issued a final rule on March 12, 2004, at 69 FR 11946, and a second rule on April 13, 2005, at 70 FR 19273, clarifying how the venting prohibition in Section 608(c) applies to substitutes for CFC and HCFC refrigerants (*e.g.,* HFCs and perfluorocarbons (PFCs)) during the maintenance, service, repair, or disposal of appliances. These regulations are codified at 40 CFR part 82, subpart F. In relevant part, they provide that no person maintaining, servicing, repairing, or disposing of appliances may knowingly vent or otherwise release into the environment any refrigerant or substitute from such appliances, with the exception of the following substitutes in the following end-uses, effective June 23, 2014:

(A) Isobutane and R–441A in household refrigerators, freezers, and combination refrigerators and freezers; or

(B) Propane in retail food refrigerators and freezers (stand-alone units only).

As explained in an earlier EPA rulemaking concerning refrigerant substitutes, EPA has not promulgated regulations requiring certification of refrigerant recycling/recovery equipment intended for use with substitutes to date (70 FR 19275; April 13, 2005). However, as EPA noted, the lack of a current regulatory provision should not be considered as an exemption from the venting prohibition for substitutes that are not expressly exempted in Section 82.154(a) (id.). EPA has also noted that, in accordance with Section 608(c) of the Act, the regulatory prohibition at Section 82.154(a) reflects the statutory references to *de minimis* releases of substitutes as they pertain to good faith attempts to recover and recycle or safely dispose of non-exempted substitutes (id.).

On May 23, 2014, at 79 FR 29682, EPA exempted from the venting prohibition three hydrocarbon refrigerant substitutes listed as acceptable, subject to use conditions, in the specified end-uses: isobutane and R–441A, as refrigerant substitutes in household refrigerators, freezers, and combination refrigerators and freezers; and propane as a refrigerant substitute in retail food refrigerators and freezers (stand-alone units only). That rule does not apply to blends of hydrocarbons with other refrigerants or containing any amount of any CFC, HCFC, HFC, or PFC.

In that action, EPA determined that for the purposes of CAA Section 608(c)(2), the venting, release, or disposal of such hydrocarbon refrigerant substitutes in the specified end-uses does not pose a threat to the environment, considering both the inherent characteristics of these substances and the limited quantities used in the relevant applications. EPA further concluded that other authorities, controls, or practices that apply to such refrigerant substitutes help to mitigate environmental risk from the release of those three hydrocarbon refrigerant substitutes. For example, state and local air quality agencies may include VOC emissions reduction strategies in State Implementation Plans (SIPs) developed to meet and maintain the NAAQS that would apply to hydrocarbon refrigerants.

3. What is EPA requiring regarding venting, release, or disposal of refrigerant substitutes, other than hydrocarbons, included in this action?

This rule regulates the use of HFC–32 in room AC units. All HFCs are currently subject to the venting prohibition. EPA is not extending the exemption to the venting prohibition in this action to HFC–32 or any refrigerant blends that contain HFC–32 or any other HFC. Further, the exemption to the venting prohibition in this action does not extend to blends containing hydrocarbons with other types of compounds, *e.g.,* blends of HFCs and hydrocarbons. Such refrigerant substitutes are still subject to the statutory and regulatory venting prohibition.

4. What is EPA's determination regarding whether venting of hydrocarbons listed as acceptable, subject to use conditions, in the end-uses in this action poses a threat to the environment?

For purposes of Section 608(c)(2) of the CAA, EPA considers two factors in determining whether or not venting, release, or disposal of a refrigerant

substitute during the maintenance, servicing, repairing, or disposing of appliances poses a threat to the environment. See 69 FR 11948 (March 12, 2004); 79 FR 29682 (May 23, 2014). First, EPA analyzes the threat to the environment due to inherent characteristics of the refrigerant substitute, such as GWP. Second, EPA determines whether and to what extent venting, release, or disposal actually takes place during the maintenance, servicing, repairing, or disposing of appliances, and to what extent such actions are controlled by other authorities, regulations, or practices. To the extent that such releases are adequately controlled by other authorities, EPA defers to those authorities. In addition, we considered the public comments we received on the proposed rule on this topic. We received no comments that caused us to change our proposed conclusion that venting, release, or disposal of the specified refrigerant substitutes in the specified end-uses does not pose a threat to the environment. Therefore, we are finalizing this portion of the rule as originally proposed.

i. Potential environmental impacts

EPA has evaluated the potential environmental impacts of releasing into the environment the four hydrocarbon refrigerant substitutes that we are listing under the SNAP program as acceptable, subject to use conditions, in the specified end-uses—*i.e.,* ethane in very low temperature refrigeration equipment and equipment for non-mechanical heat transfer; isobutane in retail food refrigerators and freezers (stand-alone equipment only) and vending machines; propane in household refrigerators and freezers and combination refrigerators and freezers, vending machines, and self-contained room air conditioners for residential and light commercial air conditioning and heat pumps; and R–441A in retail food refrigerators and freezers (stand-alone equipment only), vending machines, and self-contained room air conditioners for residential and light commercial air conditioning and heat pumps. In particular, we assessed the potential impact of the release of additional hydrocarbons on local air quality and their ability to decompose in the atmosphere, their ODP, their GWPs, and potential impacts on ecosystems.

As explained in Section IV.A, ''Effects on the environment,'' the ODP of these hydrocarbons is zero, the GWPs are less than 10, and effects on aquatic life are expected to be small. As to potential effects on local air quality, based on the analysis and modeling results described in the proposal and in Section IV.A of this preamble, EPA concludes that the four hydrocarbon refrigerant substitutes listed in this action for their specific end-uses are expected to have little impact on local air quality.

In addition, when examining all hydrocarbon substitute refrigerants in those uses for which UL currently has standards in place, for which the SNAP program has already listed the uses as acceptable subject to use conditions, or for which the SNAP program is reviewing a submission, including those in this rule, we found that even if all the refrigerant in appliances in end-uses addressed in this rule were to be emitted, there would be a worst-case impact of less than 0.15 ppb for ground-level ozone in the Los Angeles area. In light of its evaluation of potential environmental impacts, EPA concludes that the four hydrocarbon refrigerant substitutes in the end-uses at issue in this rule are not expected to pose a threat to the environment on the basis of the inherent characteristics of these substances and the limited quantities used in the relevant end-uses (ICF, 2014a).

ii. Toxicity and Flammability

As discussed in Sections IV.B, ''Flammability'' and IV.C., ''Toxicity and asphyxiation,'' EPA's SNAP program evaluated the flammability and toxicity risks from the substitute refrigerants in this rule. EPA is providing some of that information in this section as well.

Hydrocarbons, including ethane, propane, isobutane and the hydrocarbon blend R–441A, are classified as A3 refrigerants by ASHRAE Standard 34–2010, indicating that they have low toxicity and high flammability. Hydrocarbons in this rule have LFLs ranging from 1.8% to 3.0% (18,000 ppm to 30,000 ppm). To address flammability risks, this rule contains recommendations for their safe use (see Section III.E., ''Recommendations for the safe use of flammable substitute refrigerants'' below) and specified use conditions. The SNAP program's analysis suggests that the use conditions in this rule mitigate flammability risks.

Like most refrigerants, at high concentrations hydrocarbons can displace oxygen and cause asphyxiation. Various industry and regulatory standards exist to address asphyxiation and toxicity risks. The SNAP program's analysis of asphyxiation and toxicity risks suggests that the use conditions in this rule mitigate asphyxiation and toxicity risks. Furthermore, the Agency believes that the flammability risks and occupational exposures to hydrocarbons are adequately regulated by OSHA and building and fire codes at a local and national level.

iii. Authorities, Controls, or Practices

EPA believes that existing authorities, controls, or practices will mitigate environmental risk from the release of these hydrocarbon refrigerant substitutes. Analyses performed for both this rule and the SNAP rules issued in 1994 and 2011 (March 17, 1994, at 59 FR 13044 and December 20, 2011, at 76 FR 38832, respectively) indicate that existing regulatory requirements and industry practices designed to limit and control these substances adequately control the emission of the hydrocarbon refrigerant substitutes listed in this action. As explained below, EPA concludes that the limits and controls under other authorities, regulations, or practices adequately control the release of and exposure to the four hydrocarbon refrigerant substitutes and mitigate risks from any possible release.

As mentioned above, the determination of whether venting, release, or disposal of a substitute refrigerant poses a threat to the environment includes considering the extent that such venting, release, or disposal is adequately controlled by other authorities, regulations, or practices. As such, this conclusion is another part of the determination that the venting, release, or disposal of these four hydrocarbon refrigerant substitutes, in the specified end-uses and subject to the use conditions in this action, does not pose a threat to the environment.

Industry service practices and OSHA standards and guidelines that address hydrocarbon refrigeration equipment, include monitoring efforts, engineering controls, and operating procedures. OSHA requirements that apply during servicing include continuous monitoring of explosive gas concentrations and oxygen levels. In general, hydrocarbon emissions from refrigeration systems are likely to be significantly smaller than those emanating from the industrial process and storage systems, which are controlled for safety reasons. In the SNAP listings in Section III.A, ''Listing decisions: substitutes and end-uses,'' we note that the amount of refrigerant substitute from a refrigerant loop is limited: 57 g for household refrigerators and freezers; 150 g for commercial stand-alone refrigerators and freezers, very low temperature refrigeration equipment non-mechanical heat transfer equipment, and vending machines; with larger but still limited charges for room

air conditioners (1,000 g for hydrocarbon refrigerants). This indicates that hydrocarbon emissions from such uses are likely to be relatively small.

Hydrocarbons that are also VOC may be regulated as VOC under sections of the CAA that address nonattainment, attainment, and maintenance of the NAAQS for ground-level ozone, including those sections addressing development of SIPs and those addressing permitting of VOC sources.

The release and/or disposal of many refrigerant substitutes, including hydrocarbons, are controlled by other authorities including those established by OSHA and the National Institute for Occupational Safety and Health's (NIOSH) guidelines, various standards, and state and local building codes. To the extent that release during maintaining, repairing, servicing, or disposing of appliances is controlled by regulations and standards of other authorities, EPA believes these practices and controls for the use of hydrocarbons are sufficiently protective. These practices and controls mitigate the risk to the environment that may be posed by the venting, release, or disposal of these four hydrocarbon refrigerants during the maintaining, servicing, repairing, or disposing of appliances.

EPA is now aware of equipment that can be used to recover hydrocarbon refrigerants. While there are no relevant U.S. standards for such recovery equipment, to the extent that these hydrocarbons are recovered rather than vented in specific end-uses and equipment, EPA recommends the use of recovery equipment designed specifically for flammable refrigerants in accordance with applicable safe handling practices.

iv. Conclusion

EPA has reviewed the potential environmental impacts of the four hydrocarbon refrigerant substitutes in the end-uses in this action, as well as the authorities, controls, and practices in place for those hydrocarbon refrigerant substitutes. EPA also considered the public comments on the proposal for this action. Based on this review, EPA concludes that these four hydrocarbon refrigerant substitutes in these end-uses and subject to these use conditions are not expected to pose a threat to the environment based on the inherent characteristics of these substances and the limited quantities used in the relevant applications. EPA additionally concludes that existing authorities, controls, or practices help mitigate environmental risk from the release of those four hydrocarbons in these end-uses and subject to these use conditions. In light of these conclusions and those described or identified above in this section, EPA is determining that based on current evidence and risk analyses, the venting, release, or disposal of these four hydrocarbon refrigerant substitutes in these end-uses, and during the maintenance, servicing, repairing or disposing of the relevant appliances or equipment, does not pose a threat to the environment. Furthermore, EPA is exempting from the venting prohibition at 40 CFR 82.154(a)(1) these additional end-uses for which these hydrocarbons are being listed as acceptable, subject to use conditions, under the SNAP program.

This exemption does not mean that hydrocarbons can be vented in all situations at this time. Hydrocarbons being recovered, vented, or otherwise disposed of from commercial and industrial appliances are likely to be hazardous waste under the Resource Conservation and Recovery Act (RCRA) (see 40 CFR parts 261–270). As discussed in the final rule allowing for the venting of isobutane and R–441A as refrigerant substitutes in household refrigerators, freezers, and combination refrigerators and freezers, and propane as a refrigerant substitute in retail food refrigerators and freezers (stand-alone units only), incidental releases may occur during the maintenance, service, and repair of appliances. Nor would this activity be subject to RCRA requirements for the disposal of hazardous waste, as such releases would not constitute disposal of the refrigerant charge as a solid waste, *per se.* Disposal of hydrocarbons from household appliances is also not considered disposal of a hazardous waste under the existing RCRA regulations and could be vented under the household hazardous waste exemption. See 40 CFR 261.4(b)(1). However, for commercial and industrial appliances, it is likely that flammable hydrocarbon refrigerant substitutes would be classified as hazardous waste and would need to be managed as hazardous waste under the RCRA regulations (40 CFR parts 261–270).

E. Recommendations for the Safe use of Flammable Substitute Refrigerants

EPA recommends that only technicians specifically trained in handling flammable refrigerant substitutes dispose of or service refrigeration and AC equipment containing these substances. Technicians should know how to minimize the risk of fire and the procedures for using flammable refrigerant substitutes safely. Releases of large quantities of flammable refrigerants during servicing and manufacturing, especially in enclosed, poorly ventilated spaces or in areas where large amounts of refrigerant are stored, could cause an explosion if an ignition source exists nearby. For these reasons, it is important that only properly trained technicians handle flammable refrigerant substitutes when maintaining, servicing, repairing, or disposing of household and retail food refrigerators and freezers, very low temperature freezers, non-mechanical heat transfer equipment (*e.g.,* thermosiphons), and room air conditioners. In addition, EPA recommends that if hydrocarbon refrigerant substitutes are vented, released, or disposed of (rather than recovered), as would be allowed in most of the specified end-uses in this rule, the release should be in a well-ventilated area, such as outside of a building.

We are aware that at least two organizations, Refrigeration Service Engineers Society (RSES) and the ESCO Institute, have developed technician training programs in collaboration with refrigeration equipment manufacturers and users that address safe use of flammable refrigerant substitutes. In addition, EPA has reviewed several training programs provided as part of SNAP submissions from persons interested in flammable refrigerant substitutes. The agency intends to update the test bank for technician certification under Section 608 of the CAA as we have done previously, and will consider including additional questions on flammable refrigerants. By adding such questions to the test bank, EPA would supplement but would not replace technician training programs currently provided by non-government entities. EPA will seek additional information and guidance on how best to incorporate this content through a separate process outside of this final rule.

IV. What criteria did EPA consider in determining whether to list the substitutes as acceptable and in determining the use conditions, and how does EPA consider those criteria?

As discussed above, Section 612(c) of the CAA directs EPA to publish lists of acceptable substitutes for specific uses. EPA considers whether the risks to human health and the environment of a substitute poses less risk than that posed by other substitutes that are currently or potentially available. EPA also considers whether the substitute for class I and class II ODS poses lower overall risk to human health and the

environment as compared to the ODS historically used in the end-use. The criteria we review are listed at 40 CFR 82.180(a)(7). These criteria are: (i) atmospheric effects and related health and environmental impacts; (ii) general population risks from ambient exposure to compounds with direct toxicity and to increased ground-level ozone; (iii) ecosystem risks; (iv) occupational risks; (v) consumer risks; (vi) flammability; and (vii) cost and availability of the substitute.

EPA evaluated each of the criteria for each substitute in each end-use in this action and then for each substitute, we considered overall risk to human health and the environment in comparison to other available or potentially available alternatives in the same end-uses. Based on our evaluations, we may reach different conclusions about the same substitute in different end-uses, because of different risk profiles (*e.g.,* different exposure levels and usage patterns) and different sets of available or potentially available substitutes for each end-use.

As we have noted previously, environmental and human health exposures can vary significantly depending on the particular application of a substitute—and over time, information available regarding a substitute can change. See 78 FR at 29035 (May 17, 2013). SNAP's comparative risk framework does not imply fundamental tradeoffs with respect to different types of risk, either to the environment or to human health. For example, in this rule, we considered all the human health and environmental criteria, and addressed the potential risks from flammability by imposing use conditions, rather than deciding that other criteria were more important. EPA recognizes that during the more than two-decade history of the SNAP program, new information about alternatives already found acceptable has become available and new alternatives have emerged. To the extent possible, for each SNAP review, EPA considers information current at the time of the review which has improved our understanding of the risk factors for the environment and human health in the context of the available or potentially available alternatives for a given use.

A. Effects on the Environment

The SNAP program considers a number of environmental criteria when evaluating substitutes: ODP; climate effects, primarily based on GWP; local air quality impacts, particularly potential impacts on smog formation from emissions of VOC; and ecosystem effects, particularly from negative impacts on aquatic life. These and other environmental and health risks are discussed below.

The ODP is the ratio of the impact on stratospheric ozone of a chemical compared to the impact of an identical mass of CFC–11. Thus, the ODP of CFC–11 is defined to be one (1.0). Other ODS have ODPs that range from 0.01 to ten (10.0).

All refrigerant substitutes in this final rule have an ODP of zero, lower than the ODP of ozone depleting refrigerants such as CFC–12 (ODP = 1.0); HCFC–22 (ODP = 0.055); R–13B1 (ODP = 10) and R–502 (ODP = 0.334). The most commonly used substitutes in the end-uses addressed in this final rule also have an ODP of zero (*e.g.,* R–404A, R–134a, R–410A, and R–407C).[13] Some less common alternatives for these end-uses, such as R–401A, R–414A, and other blends containing HCFC–22 or HCFC–142b,[14] have ODPs ranging from 0.01 to 0.047. Thus, the refrigerant substitutes in this rule have ODPs lower than or identical to the ODPs of other available substitutes and of ODS historically used in the end-uses addressed in this rule.

The GWP is a means of quantifying the potential integrated climate forcing of various GHGs relative to carbon dioxide. Each of the hydrocarbon refrigerants in this final rule has a relatively low 100-year integrated GWP of less than ten while HFC–32 has a GWP of 675. For comparison, some other commonly used refrigerants currently listed as acceptable in retail food refrigeration, vending machines, and household refrigerators and freezers end-uses are R–134a, R–404A, and R–407C, with GWPs of about 1,430, 3,920, and 1,770, respectively. In very low temperature refrigeration, a commonly-used substitute is R–508B, with a GWP of 13,400. An ODS in this end-use is R–13B1/halon 1301 with a GWP of 7,140. The GWPs of the substitutes in this final rule are significantly lower than those of other refrigerants currently being used in the residential and light commercial AC and heat pump end-use, such as the HFC blend substitute R–410A. In addition, the substitutes in this rule have lower GWPs than those of ODS in this end-use, CFC–12 (GWP = 10,900); HCFC–22 (GWP = 1,810); and R–502 (GWP = 4,660) (IPCC, 2007).

As stated above, EPA considers overall risk to human health and the environment compared to alternatives that are available and potentially available in a given end-use. Therefore, while the GWP of 675 for HFC–32 is considered low for the residential and light-commercial AC and heat pumps end-use, it may not be considered low in other end-uses that have a larger variety of substitutes with lower GWPs. Among the acceptable substitutes listed in the residential and light-commercial AC and heat pumps end-use, only ammonia absorption and the non-vapor compression technologies evaporative cooling and desiccant cooling have lower GWPs than the substitutes listed in this final rule in this end-use.

The total environmental effects impacts of these refrigerants also depend upon the energy use of appliances, since the ''indirect'' GHG emissions associated with electricity consumption typically exceed those from refrigerants over the full lifecycle of refrigerant-containing products. (ORNL, 1997). If appliances designed to use refrigerants listed as acceptable in this final rule are less energy efficient than the appliances they replace, then it is possible that these appliances would result in higher lifecycle GHG emissions than appliances using a higher GWP refrigerant or refrigerant substitute. Conversely, higher energy efficiency of these appliances would lead to even lower lifecycle GHG emissions.

While we have not undertaken a comprehensive assessment of all sources of GHG emissions associated with substituting ODS and other commonly used refrigerants with the refrigerants in this final rule, we note that energy efficiency standards exist for most of the types of equipment covered here.[15] Thus, total energy use with the substitute refrigerants we are finding acceptable in this action can be expected to be no higher than that required by the standards for those classes of equipment.[16] Further, testing

[13] We assume that substitutes containing no chlorine, bromine, or iodine have an ODP of zero.

[14] Under EPA's phaseout regulations, virgin HCFC–22, HCFC–142b, and blends containing HCFC–22 or HCFC–142b may only be used to service existing appliances. Consequently, virgin HCFC–22, HCFC–142b and blends containing HCFC–22 or HCFC–142b may not be used to manufacture new pre-charged appliances or appliance components or to charge new appliances assembled onsite.

[15] For example, Department of Energy (DOE) standards apply to portable air conditioners, room air conditioners, PTACs and PTHPs, household refrigerators and freezers, refrigerated beverage vending machines, and commercial refrigeration equipment. See *https://www1.eere.energy.gov/buildings/appliance_standards/standards_test_procedures.html.*

[16] Refrigeration or air conditioning equipment in the applicable covered equipment class would still be subject to DOE's standards, regardless of the refrigerant that the equipment uses. If a manufacturer believes that its design is subjected to undue hardship by DOE's regulations, the manufacturer may petition DOE's Office of Hearing and Appeals (OHA) for exception relief or

Continued

data, peer-reviewed journal articles, and other information provided by the submitters for these substitute refrigerants indicate that equipment using these refrigerants is likely to have a higher coefficient of performance and use less energy than equipment currently being manufactured that uses the most commonly used refrigerants that are listed as acceptable under SNAP. This indicates that equipment using the refrigerants listed will have the same or lower climate impacts than other available substitutes (Daikin, 2011; A.S. Trust & Holdings, 2012; A/S Vestfrost, 2012; CHEAA, 2013).

In addition to global impacts on the atmosphere, EPA evaluated potential impacts of the substitutes on local air quality. Ethane and HFC–32 are exempt from the definition of VOC under CAA regulations (see 40 CFR 51.100(s)) addressing the development of SIPs to attain and maintain the NAAQS. The other refrigerants, isobutane, propane, and components of R–441A, including isobutane, n-butane, and propane, are VOC. Potential emissions of VOC from all substitutes for all end-uses in the refrigeration and AC sector are addressed by the venting prohibition under Section 608 of the CAA. Under that prohibition, refrigerant substitutes (and thus the VOC they contain) may only be emitted where EPA issues a final determination exempting a refrigerant substitute from the venting prohibition on the basis that venting, releasing or disposing of such substance does not pose a threat to the environment. Based on an analysis described below, EPA estimates that potential emissions of hydrocarbons if used as refrigerant substitutes in all end-uses in the refrigeration and AC sector would have little impact on local air quality, with the possible exception of unsaturated hydrocarbons such as propylene (ICF, 2014a).

EPA analyzed a number of scenarios to consider the potential impacts on local air quality if hydrocarbon refrigerants were used widely. We used EPA's Vintaging Model to estimate the hydrocarbon emissions from these scenarios and EPA's Community Multiscale Air Quality (CMAQ) model to assess their potential incremental contributions to ground-level ozone concentrations (ICF, 2014a). That analysis was conservative in that it assumed that the most reactive hydrocarbon subject to this action—isobutane—was used in all refrigeration and AC uses even though isobutane was not proposed or listed as acceptable for use in all refrigeration and AC uses. In addition, the analysis assumed that all refrigerant used was emitted to the atmosphere. In that highly conservative scenario, the model predicted that the maximum increase in the 8-hour average ground-level ozone concentration would be 0.72 ppb in Los Angeles.

For further information on the potential impacts of this rule and other decisions we might make, EPA also performed a less conservative analysis, looking at a set of end-uses that would be more likely to use hydrocarbon refrigerants between now and 2030. The analysis assumed use of hydrocarbon refrigerants in those uses for which UL currently has standards in place, for which the SNAP program has already listed the uses as acceptable, subject to use conditions, or for which the SNAP program is reviewing a submission, including those in this rule.[17] In addition, the air quality analysis assumed several different hydrocarbons[18] would be used based upon those under review by the SNAP program in the end-uses for which they were submitted. For example, we assumed use of propane, R–441A, and another hydrocarbon refrigerant under review in room air conditioners; and isobutane, propane, and R–441A in vending machines, stand-alone retail food refrigeration equipment, and household refrigerators and freezers; but no use of hydrocarbons in chillers used for AC of large buildings. (For further information on the specific assumptions, see ICF, 2014a, in the docket for this rulemaking.)

Based on this still conservative but more probable assessment of refrigerant use, we found that even if all the refrigerant in appliances in end-uses addressed in this final rule were to be emitted, there would be a worst-case impact of 0.15 ppb ozone in the Los Angeles area, which is the area with the highest level of ozone pollution in the United States. In the other cities examined in the analysis, Houston and Atlanta, impacts were smaller (no more than 0.03 and 0.01 ppb, respectively) (ICF, 2014a). Because both the highly conservative as well as the conservative but more probable assessments indicated there would be relatively low air quality impacts of these refrigerants if they are released to the atmosphere in limited amounts, EPA believes that these refrigerants would not have a substantially greater impact on local air quality than other refrigerants listed as acceptable in the end-uses in this final rule.

Effects on aquatic life of the substitutes are expected to be small and pose no greater risk of aquatic or ecosystem effects than those of other available substitutes for these uses. The refrigerant substitutes in this rule are all highly volatile and would evaporate or partition to air, rather than contaminate surface waters.

B. Flammability

The flammability risks of the substitutes are of concern because household and retail food refrigerators and freezers and room AC units have traditionally used refrigerants that are not flammable. Without appropriate use conditions, the flammability risk posed by these refrigerants could be higher than non-flammable refrigerants because individuals may not be aware that their actions could potentially cause a fire, and because without the requirements of this rule, these refrigerants could be used in existing equipment that has not been designed specifically to minimize flammable risks. In this section, we discuss the flammability risks posed by the refrigerants in this rule and explain the use conditions we believe are necessary to mitigate those risks to ensure that the overall risk to human health and the environment posed by these substitutes is not greater than the overall risk posed by other substitutes in the same end-uses. In addition, we discuss why the flammability risks have led us to find that these substitutes are only acceptable for use in new equipment specifically designed for these flammable refrigerants.

Due to their flammable nature, ethane, isobutane, propane, HFC–32, and R–441A could pose a significant safety concern for workers and consumers in the end-uses addressed in this rule if they are not handled correctly. In the presence of an ignition source (*e.g.,*

exemption from the standard pursuant to OHA's authority under Section 504 of the DOE Organization Act (42 U.S.C. 7194), as implemented at subpart B of 10 CFR part 1003. OHA has the authority to grant such relief on a case-by-case basis if it determines that a manufacturer has demonstrated that meeting the standard would cause hardship, inequity, or unfair distribution of burdens.

[17] The analysis included stand-alone retail food refrigeration equipment and coolers; vending machines; refrigerated transport; water coolers; commercial ice machines; household refrigerators and freezers; and room air conditioners (window AC, PTAC, and PTHP). The analysis did not expressly break out very low temperature refrigeration or non-mechanical heat transfer from commercial refrigerators and freezers.

[18] Refrigerants in this scenario included propane, isobutane, and R–441A in the end-uses where they are listed to be acceptable, subject to use conditions, among others. Ethane was not expressly included, since the type of equipment using ethane is not broken out separately in the analysis. However, ethane is less reactive than the other refrigerants included in the analysis, so this omission is expected to result in a slight overestimation of impacts, if any.

static electricity spark resulting from closing a door, using a torch during service, or a short circuit in wiring that controls the motor of a compressor), an explosion or a fire could occur when the concentration of refrigerant exceeds its LFL. The LFLs of the substitutes are: ethane—30,000 ppm; HFC–32—139,000 ppm; isobutane—18,000 ppm; propane—21,000 ppm; and R–441A—20,500 ppm. Therefore, to use these substitutes safely, it is important to minimize the presence of potential ignition sources and to reduce the likelihood that the levels of ethane, HFC–32, isobutane, propane, or R–441A will exceed the LFL.

To determine whether flammability would be a concern for manufacturing and service personnel or for consumers, EPA analyzed a plausible worst-case scenario to model a catastrophic release of the refrigerants. The worst-case scenario analysis for each refrigerant revealed that even if the unit's full charge is emitted within one minute, none of these refrigerants reached their respective LFLs of 1.8% for isobutane, 2.1% for propane, 2.05% for R–441A, or 3.0% for ethane, provided that the charge sizes were no greater than those specified in the relevant standard from UL (ICF, 2014b,c,d,e,f,g,h,i,j,k). Thus, there would not be a significant risk of fire or explosion, even under those worst-case assumptions, so long as the charge meets the use conditions in this final rule. Detailed analysis of the modeling results are discussed below in the next section regarding ''Toxicity and asphyxiation.''

EPA also reviewed the submitters' detailed assessments of the probability of events that might create a fire and engineering risk and approaches to avoid sparking from the refrigeration equipment. Further information on these analyses and EPA's risk assessments are available in public docket EPA–HQ–OAR–2013–0748 at *www.regulations.gov.* Although the analysis showed no potential for the released refrigerant from one piece of equipment to reach the LFL, manufacturing and service personnel or consumers may not be familiar with refrigeration or AC equipment containing a flammable refrigerant. Therefore, use conditions are necessary to ensure that people handling such equipment are aware that the equipment contains a flammable refrigerant and to ensure safe handling. Because of existing OSHA and building code requirements, we expect that the equipment manufacturer, who would be storing large quantities of the refrigerant, is familiar with and uses proper safety precautions to minimize the risk of explosion. We are including in the ''Further Information'' section of the SNAP listings recommendations that these facilities be equipped with proper ventilation systems and be properly designed to reduce possible ignition sources. The use conditions allow the flammable refrigerants to be used without a higher risk to human health and the environment than that posed by nonflammable substitutes.

C. Toxicity and asphyxiation

In evaluating potential toxicity impacts of ethane, HFC–32, isobutane, propane, and R–441A on human health, EPA considered both occupational and consumer risks. EPA investigated the risk of asphyxiation and of exposure to toxic levels of refrigerant for a plausible worst-case scenario and a typical use scenario for each refrigerant. In the worst-case scenario of a catastrophic leak, we modeled release of the unit's full charge within one minute into a confined space to estimate concentrations that might result. We considered a conservatively small space appropriate to each end-use, such as a small convenience store of 244 m^3 for retail food refrigeration, a small galley kitchen of 18 m^3 for a household refrigerator/freezer, or a small bedroom of 41 m^3 for a room air conditioner.

To evaluate toxicity of all five refrigerants, EPA estimated the maximum TWA exposure both for a short-term exposure scenario, with a 15-minute and 30-minute TWA exposure, and for an 8-hour TWA that would be more typical of occupational exposure for a technician servicing the equipment. We compared these short-term and long-term exposure values to relevant industry and government workplace exposure limits for ethane, HFC–32, isobutane, propane, and components of R–441A (including potential impurities). The modeling results indicate that both the short-term (15-minute and 30-minute) and long-term (8-hour) worker exposure concentrations would be below the relevant workplace exposure limits, such as the OSHA permissible exposure limit (PEL), the NIOSH recommended exposure limit (REL), the American Conference of Governmental Industrial Hygienists' (ACGIH) TLV, or in the case of HFC–32, the manufacturer's recommended workplace exposure limit. In some cases where there was not an established short-term exposure limit (STEL), we considered information on short-term exposure such as the no observed adverse effect level (NOAEL) from available toxicity studies or the National Research Council's Acute Emergency Guideline Limits (AEGL).[19] The respective workplace exposure limits we considered for the various compounds, including components of the refrigerant blend R–441A, are as follows:

- n-Butane, a component in R–441A: 800 ppm NIOSH REL on 10-hr TWA; 6,900 ppm AEGL–1 over 30 minutes
- Ethane: 1,000 ppm TLV on 8-hour TWA; 3,000 ppm over 15 minutes
- HFC–32: 1,000 ppm manufacturer's exposure guideline on 8-hour TWA; 3,000 ppm over 15 minutes
- Isobutane: 800 ppm REL on 10-hr TWA; 6,900 ppm over 30 minutes
- Propane: 1,000 ppm PEL on 8-hr TWA; 6,900 ppm AEGL–1 over 30 minutes

For equipment with which consumers might come into contact, such as retail food refrigerators and freezers, vending machines, household refrigerators and freezers, and room air conditioners, EPA performed a consumer exposure analysis. In this analysis, we examined potential catastrophic release of the entire charge of the substitute in one minute under a worst-case scenario. We did not examine exposure to consumers in very low temperature refrigeration, since such equipment is typically used in workplaces, such as in laboratories, and not in homes or public spaces. The analysis was undertaken to determine the 15-minute or 30-minute TWA exposure levels for the substitute, which were then compared to the toxicity limits to assess the risk to consumers.

EPA considered toxicity limits for consumer exposure that reflect a short-term exposure such as might occur at home or in a store or other public setting where a member of the general public could be exposed and could then escape. Specific toxicity limits that we used in our analysis of consumer exposure include:

[19] The AEGL limit is an emergency guideline for exposures to the general population (including susceptible populations) and is not time-weighted. It also considers the chemical's flammability in addition to its toxicity. EPA develops a set of AEGL values for chemical for five exposure periods (10 and 30 minutes, 1 hour, 4 hours and 8 hours). For each exposure period, three different AEGL values are developed to address different levels of toxicological impacts. Of relevance for the modeled scenarios is the AEGL–1 (10,000 ppm), which is defined as: ''the airborne concentration, expressed as parts per million or milligrams per cubic meter (pm or mg/m^3) of a substance above which it is predicted that the general population including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.'' While permanent toxicological effects are not expected up to the AEGL–2 value, this limit is not relevant for this analysis because at that level, flammability would be a greater concern.

- n-Butane: 6,900 ppm AEGL–1 over 30 minutes
- HFC–32: cardiotoxic NOAEL of 350,000 ppm over 5 minutes
- Isobutane: 6,900 ppm over 30 minutes
- Propane: 6,900 ppm AEGL–1 over 30 minutes

The analysis of consumer exposure assumed that 100 percent of the unit's charge would be released over one minute, at which time the concentration of refrigerant would peak in an enclosed space, and then steadily decline. Refrigerant concentrations were modeled under two air change scenarios, believed to represent the baseline of potential flow rates for a home or other public space, assuming flow rates of 2.5 and 4.5 air changes per hour (ACH) (Sheldon, 1989). The highest concentrations of the refrigerant occur in the lower stratum of the room when assuming the lower ventilation level of 2.5 ACH. Calculating the TWA exposure using 2.5 ACH results in a higher concentration than calculating the TWA exposure using 4.5 ACH. Even under the very conservative assumptions used in the consumer exposure modeling, the estimated 15-minute or 30-minute consumer exposures to the refrigerants are much lower than the relevant toxicity limits and thus should not pose a toxicity risk any greater than that of other acceptable refrigerants in the end-uses in this final rule. Other acceptable refrigerants pose similar toxicity risks.

For further information, including EPA's risk screens and risk assessments as well as fault tree analyses from the submitters of the substitutes, see docket number EPA–HQ–OAR–2013–0748 at *www.regulations.gov*.

V. What are the differences between the proposed and final rules?

This final rule lists all five refrigerants as acceptable, subject to use conditions, in the same end-uses as in the proposed rule. This final rule retains the same use conditions as proposed for very low temperature refrigeration equipment; non-mechanical heat transfer equipment; retail food refrigeration, stand-alone equipment only; household refrigerators, freezers, and combination refrigerator/freezers; and vending machines.

For *room AC units,* EPA is retaining the same use conditions as proposed, with one exception. For portable AC units, EPA is not applying the proposed charge limits for PTAC, PTHP, and other floor mounted AC units, which are set forth in Table D. New Table E establishes charge limits for portable AC units, consistent with the requirements in Appendix F of UL 484, 8th Edition. This change allows larger charge sizes for small portable units than in the proposed rule and limits the charge size to no more than 2.45 kg of HFC–32, 300 g of propane, or 330 g of R–441A. Proposed Table D was based on a different section of Appendix F of UL 484, 8th Edition. EPA is making this change because we agree with commenters that the final rule should incorporate specific provisions for charge limits for portable units in UL 484, which is the standard that is the basis of EPA's other charge limits, as well.

This final rule exempts the four hydrocarbon refrigerants for the end-uses addressed in the proposed rule from the venting prohibition under Section 608. HFC–32 remains prohibited from being knowingly vented or otherwise knowingly released or disposed of by any person maintaining, servicing, repairing, or disposing appliances containing HFC–32.

VI. What are EPA's responses to public comments?

A. EPA's Acceptability Determinations

1. R–441A

Comment: The Environmental Investigation Agency-U.S. (EIA), an environmental organization, and A.S. Trust & Holdings, the submitter for R–441A, supported the listing of R–441A as an acceptable substitute in new stand-alone retail food refrigeration equipment, residential and light commercial AC, and vending machines. EIA noted the climate benefits, improved energy efficiency, and reduced flammability for this refrigerant.

Response: EPA agrees and thanks the commenters for their support of this listing decision. We are taking final action in this rule to list R–441A as acceptable subject to use conditions for use in new retail food refrigerators and freezers (stand-alone units only); new residential and light commercial room AC units; and vending machines.

Comment: A.S. Trust & Holdings requested clarification as to whether EPA is approving the SNAP applications (*i.e.,* submissions) for R–441A in household window AC units, vending machines, new commercial refrigerators, commercial freezers, and stand-alone refrigerated display cases, and new residential split-system AC units, residential heat pumps, and portable (floor) room air conditioners.

Response: This final rule lists R–441A as acceptable, subject to use conditions, for use in (1) residential and light commercial room AC units, (2) vending machines, and (3) stand-alone retail food refrigeration equipment, including refrigerators, freezers, and refrigerated display cases. These correspond to the submissions for R–441A for household window AC units, vending machines, new commercial refrigerators, commercial freezers, and stand-alone refrigerated display cases, and the portable room air conditioners portion of the submission for new residential split-system AC units, residential heat pumps, and portable room air conditioners. EPA is reviewing R–441A separately for new residential and light commercial split-system AC units and heat pumps, and so is not in this action listing R441A as acceptable in these uses at this time.

2. Ethane

Comment: EIA supported the listing of ethane as acceptable subject to use conditions for use in very low temperature refrigeration and non-mechanical heat transfer, and indicated that equipment using ethane is available that will reduce impacts on climate and cut energy use.

Response: EPA appreciates the support for listing ethane as acceptable subject to use conditions in very low temperature refrigeration and non-mechanical heat transfer.

Comment: Hoshizaki America, a manufacturer of commercial refrigeration equipment, questioned the test methods used to evaluate ethane's flammability and fire safety.

Response: The commenter provided no support for why they believed this was necessary or what, if anything else, they question in the test methods used to evaluate ethane. EPA evaluated flammability risks in the risk screen included in the docket (Docket ID EPA–HQ–OAR–2014–0748–0004). This evaluation followed the standard approach for evaluating health and environmental risks that the SNAP program has used over its 20-year history. The results found worst-case leaks of ethane to result in concentrations far below the LFL of 30,000 ppmv, showing a lack of flammability risk. We note that a use condition requires that the ethane-containing equipment meet the requirements of Supplement SB to the 10th edition of UL Standard 471 and this use condition will ensure ethane will be tested and will meet specific safety testing requirements.

3. Isobutane

Comment: EIA and a private citizen supported EPA's proposal to list isobutane as acceptable subject to use conditions for the proposed end-uses

and noted that it is already available and in use in the United States and global markets in vending machines and in stand-alone retail food refrigeration equipment. Hoshizaki America questioned the listing of isobutane and does not agree that it should be listed as acceptable without proper safety analysis.

Response: EPA appreciates the support for listing isobutane as acceptable subject to use conditions in vending machines and stand-alone retail food refrigeration equipment. EPA evaluated flammability risks in the risk screens included in the docket (Docket ID EPA–HQ–OAR–2014–0748–0013 and -0021). The commenter that suggested isobutane should not be listed provided no support for their statement and did not explain what they meant by ''proper safety analysis.'' EPA's evaluations followed the standard approach for evaluating health and environmental risks that the SNAP program has used over its 20-year history. The results found leaks of isobutane in stand-alone retail food refrigeration equipment and vending machines to result in concentrations far below the LFL of 30,000 ppmv, showing a lack of flammability risk. We note that a use condition requires that retail food refrigeration equipment using isobutane meet the requirements of Supplement SB to the 10th edition of UL Standard 471 and that vending machines using isobutane meet the requirements of Supplement SA to the 7th edition of UL Standard 541. This use condition will ensure isobutane is further tested in equipment and will meet specific safety testing requirements.

4. HFC–32

Comment: A.S. Trust & Holdings; ComStar, a distributor of R–441A and other chemicals, and several private citizens expressed concerns with the listing of HFC–32 as an acceptable substitute in room AC units due to its toxicity, flammability, and high GWP relative to hydrocarbon refrigerants. These commenters said that HFC–32's higher GWP, in combination with its flammability and other characteristics, is reason for not finding this substitute acceptable. Most of these commenters were specifically concerned, due to the GWP and toxicity of HFC–32, that EPA might exempt HFC–32 from the venting prohibition. EIA and Daikin, the submitter of HFC–32, supported listing HFC–32 as acceptable subject to use conditions.

Response: EPA appreciates the support from the commenters who support listing HFC–32 as acceptable subject to use conditions for use in room AC units.

EPA disagrees with the commenters who suggest that the toxicity, flammability and GWP of HFC–32 indicate it should not be listed as acceptable, subject to use conditions, for use in room AC units. The GWP of HFC–32 (675) is two-thirds less than that of the most commonly used alternative for this type of equipment, R–410A (approximately 2,090) and also significantly lower than that of HCFC–22 (1,810) and R–407C (approximately 1,770). The only currently acceptable alternatives in this end-use with lower GWP include ammonia absorption and the non-vapor compression technologies evaporative cooling and desiccant cooling. However, there are technical limits on the effective use of the non-vapor compression technologies in different climates, and ammonia has a higher toxicity that HFC–32 and the other alternatives. HFC–32 also has a higher GWP than two other substitutes being listed in this end-use in this final rule—propane (GWP of 3) and R–441A (GWP of less than 5). However, it is considerably less flammable than either propane or R–441A. For example, HFC–32 has an LFL of 13.8% and a burning velocity of 6.7 cm/s compared to an LFL of 2.1% and a burning velocity of 46 cm/s for propane and an LFL of 2.05% and a burning velocity of 47.6 cm/s for R–441A (Daikin, 2011; A.S. Trust & Holdings, 2012). EPA's risk screen on the use of HFC–32 in residential and light commercial AC is available in the docket for this rulemaking (Docket ID EPA–HQ–OAR–2014–0748–0005). This risk screen indicates that HFC–32's LFL is not reached where the charge size is consistent with the use conditions, so we do not expect a significant risk of fire.

The commenters did not provide any information concerning why they believed that HFC–32 should be listed as unacceptable based on its toxicity; the commenters merely provided general information such as Material Data Safety Sheets (MSDSs) without giving analysis specific to HFC–32. The potential health effects listed in the MSDSs provided by the commenters, such as freeze burns, anesthetic effects, and asphyxia, are common to many refrigerants already in the same end-use, such as HCFC–22, R–410A, or HFC–134a. Further, these health effects apply to both HFC–32 and to the two hydrocarbon refrigerant substitutes that we are also listing in this action as acceptable, subject to use conditions, in this end-use, and the commenters did not raise concerns for the health effects for those substitutes. EPA's risk screen evaluates exposure and toxicity risks. In the End-Use Exposure Assessment the modeled 15-minute and 30-minute TWA exposures for consumers were well below the relevant short-term limit, the cardiotoxic NOAEL for HFC–32, for all charge sizes. Based on the Occupational Risk Assessment, occupational exposure to HFC–32 is anticipated to be significantly below the STEL during servicing and installation.

In addition, as discussed below in section VI.G, ''Venting prohibition,'' EPA did not propose, nor is it finalizing, an exemption to the venting prohibition for HFC–32.

5. Propane

Comment: EIA supported listing propane for use in all of EPA's proposed end-uses (household refrigerators and freezers, vending machines, and room air conditioners), since hydrocarbons are already being used successfully in these types of equipment around the world. A private citizen agreed with the listing of propane specifically for AC units. Hozishaki America disagreed with the proposed listing of propane without proper safety analysis.

Response: EPA appreciates the comments supporting our decision to list propane as acceptable subject to use conditions in the proposed end-uses and agrees that hydrocarbons are already being used safely and successfully in such types of equipment around the world.

The commenter opposing listing of propane provided no support for their statements and did not explain what they meant by ''proper safety analysis.'' EPA's evaluations followed the standard approach for evaluating health and environmental risks that the SNAP program has used over its 20-year history. EPA performed risk screens on the use of propane in household refrigerators and freezers, vending machines, and room air conditioners which are available in the docket for this rulemaking (Docket IDs EPA–HQ–OAR–2013–0748–0006, –0007, and –0008). EPA's vending machine risk screen indicates that propane's LFL is not reached in the typical scenario, and for room air conditioners and household refrigerators and freezers, worst-case concentrations would be well below propane's LFL, showing a lack of flammability risk. We note that EPA is including a use condition that requires that household refrigerators and freezers using propane meet the requirements of Supplement SA to the 10th edition of UL Standard 250, that vending machines using propane meet the requirements of Supplement SA to the 7th edition of UL Standard 541, and that

room air conditioners meet the requirements of Supplement A and Appendices B through F of the 8th edition of UL Standard 484.[20]

Comment: Some commenters suggested that propane should be added to the list of acceptable substitutes for the very low temperature refrigeration end-use, particularly since it could be used with the same UL 471 Standard as for commercial refrigeration equipment.

Response: EPA did not receive a submission and thus has not evaluated propane for the very low temperature refrigeration end-use. EPA may consider it in a future rulemaking action.

B. Environmental and Public Health Impacts

1. GWP and Direct Climate Impacts

Comment: The Alliance for Responsible Atmospheric Policy (the Alliance), California's Air Resources Board (CARB), EIA, the Institute of Scrap Recycling Industries (ISRI), and private citizens stated that the proposed list of substitutes is an important step towards mitigating the industry's environmental impact, specifically by broadening availability of substitutes that would reduce GHG emissions from the refrigeration and AC sector. CARB estimates that if the proposed low-GWP refrigerants replace the high-GWP HFCs in the identified end-use sectors, nationwide annual emissions of GHGs would be reduced by between 9 and 11 million metric tons of carbon dioxide equivalents ($MMTCO_2eq$). CARB also stated that while the reductions are a modest three percent decrease from current fluorinated gas emissions, they believe the proposal is an important step in mitigating the anticipated growth in emissions of HFCs.

Response: EPA agrees that listing these five substitutes as acceptable subject to use conditions in the specified end-uses is an important step towards mitigating GHG emissions and the anticipated growth in emissions of HFCs. We thank the commenter for the calculated estimate of the potential environmental benefits associated with this rule. We do not know if the market penetration for these newly-listed alternatives will align with the assumptions used by CARB in developing their estimates. However, we agree that the entrance of these alternatives into the market and the decrease in use of higher GWP alternatives will mitigate climate impacts from the end-uses addressed in this rule.

2. Energy Efficiency and Indirect Climate Impacts

Comment: CARB and EIA stated that the use of low-GWP hydrocarbon refrigerants also indirectly reduces GHG emissions through decreased energy use. In contrast, Master-Bilt Products, a manufacturer of commercial refrigeration equipment, said that some of the proposed alternatives have poor energy efficiency.

Response: EPA agrees with CARB and EIA that, based on the available information, the hydrocarbon refrigerants may decrease energy use and thereby reduce GHG emissions indirectly. Each submission provided information showing reduced energy consumption when using the alternative refrigerants listed in this rule (Daikin, 2011; A.S. Trust & Holdings, 2012; A/S Vestfrost, 2012; CHEAA, 2013). However, we note that the specific energy benefits will depend on a number of factors other than the refrigerant, such as the design of the equipment and efforts made to fine-tune the equipment once it is installed. Master-Bilt did not submit any specific information regarding energy efficiency and EPA is not aware of information supporting a claim that any of the refrigerants being listed have poor energy efficiency.

3. Ozone Depletion

Comment: A private citizen stated that ''hydrofluorocarbon refrigerants and CHFC [*sic*] refrigerants all have significant, demonstrated negative impacts on our atmospheric ozone, while hydrocarbons have no effect on stratospheric ozone depletion.'' The commenter also stated that ''[i]t is accepted fact that these synthetic fluorinated gases including HFC–32 rapidly accumulate in the atmosphere destroying ozone by breaking molecular bonds of O_3'' and requested that EPA remove HFC–32 from the rule.

Response: The role of HCFCs in ozone depletion is well-documented (WMO, 2010) and these substances are in the process of being phased out of production and consumption globally in steps. EPA agrees that hydrocarbons do not contribute to stratospheric ozone depletion. However, we disagree with the commenter's statement that HFC refrigerants have significant, demonstrated negative impact on atmospheric ozone or that they break molecular bonds of ozone. On the contrary, HFCs have long been considered to have a negligible impact on stratospheric ozone depletion (Ravishankara et al, 1994;[21] WMO, 2010). Thus, EPA considers the impact of HFCs on the ozone layer to be comparable to those of hydrocarbons.

4. Local Air Quality Impacts

Comment: Regarding the air quality modeling using CMAQ, A.S. Trust & Holdings stated that that the assumption of rapid transition to all hydrocarbon refrigerants (in Scenarios 1, 2, and 3) is not a viable assumption, and disregards simple market realities. CARB referred to Scenarios 1 through 3 as upper-bound maximums that are not expected to occur.

Response: In Scenarios 1, 2, and 3 of the air quality analysis (ICF, 2014a), isobutane or propylene were assumed to be the only refrigerant used, respectively, in (1) all refrigeration and air conditioning uses, (2) all refrigeration and air conditioning uses except for MVAC, or (3) all refrigeration and air conditioning uses except for MVAC and large commercial chillers. EPA agrees that these scenarios are not likely to occur. These scenarios were not intended to project what is likely to happen in the market, but rather, to provide screening estimates to see if there would be some level of refrigerant emissions that could result in unacceptably high increases in ground-level ozone. The modeling indicated that widespread use of isobutane, propane, R–441A, and other saturated hydrocarbon refrigerants are not likely to result in significant increases in ground-level ozone concentrations. In contrast, the screening estimates in Scenarios 1, 2, and 3 indicated that there could be significant increases in ground-level ozone concentrations if use (and emissions) of propylene were widespread. Thus, further analysis of potential air quality impacts based on likely use of propylene in the market may be needed for evaluating propylene or refrigerants containing propylene in any future action in which EPA considers listing propylene for these end-uses.

Comment: A.S. Trust & Holdings commented that the air quality modeling focuses on only one year (2005) of meteorological data. The commenter stated it is standard practice in ambient air modeling studies to focus on typically five years of meteorological data to provide a more representative sample of conditions on different days

[20] Similarly, EPA previously listed propane as acceptable, subject to use conditions, in stand-alone retail food refrigeration equipment, including a condition requiring that such equipment meet the requirements of Supplement SB to the 10th edition of UL Standard 471. December 20, 2011; 76 FR 78832.

[21] Ravishankara, A. R., A. A. Turnipseed, N. R. Jensen, S. Barone, M. Mills, C. J. Howard, and S. Solomon. 1994. Do hydrofluorocarbons destroy stratospheric ozone? *Science* 263: 71–75.

and thus reduce the uncertainties in the analysis.

Response: It is standard practice to use five years of meteorological data in regulatory analyses where the assessment is for a single facility or small group of facilities seeking an air quality permit, such as a permit for prevention of significant deterioration, authority to construct, or air contaminant discharge. However, in state implementation plans or nationwide regulatory impact assessments where an entire state or the continental United States is modeled, a full ozone season or a single year of meteorology is generally considered sufficient (EPA, 2007). In the case of the CMAQ analysis performed for this rule, modeling was performed based upon refrigerant emissions from the entire United States and thus, use of one year of meteorological data was appropriate.

Comment: A.S. Trust & Holdings noted that specific hydrocarbon refrigerants were not separately modeled in the air quality model. This commenter states that each refrigerant should be assessed separately by the Agency and that it does not seem reasonable to regulate a single refrigerant based on a whole family of refrigerants. This commenter also stated that it is difficult to make any substantial conclusions regarding propylene without assessing the more realistic Scenario 4. CARB stated that Scenario 4 of the analysis is a good representation of anticipated emissions and useful for assessing the potential ozone impacts of the proposal. This commenter also stated that the small estimated impact based on national modeling is consistent with its own estimate of the magnitude of potential emission increases and the lower ozone formation potential of the hydrocarbon refrigerants.

Response: Scenario 4 is a scenario that analyzed potential air quality impacts of hydrocarbon refrigerants in a set of end-uses that would be more likely to use hydrocarbon refrigerants between now and 2030. These included end-uses for which UL currently has standards in place, for which the SNAP program has already listed hydrocarbon refrigerants as acceptable, subject to use conditions, or for which the SNAP program is reviewing a submission, including those end-uses addressed in this final rule. EPA agrees with the second commenter that this scenario is useful for assessing the potential ozone impacts of the proposal.

We disagree with the first commenter that EPA should have assessed each refrigerant separately in Scenario 4 as we did in the bounding Scenarios 1, 2, and 3. We are listing a number of refrigerants as acceptable, subject to use conditions, in several end-uses and we expect that they all will be present in the market and in the atmosphere at the same time. The interactions of the different compounds in the atmosphere are interdependent and are not linear. Modeling each refrigerant separately would result in a less realistic, and for some refrigerants an unrealistically low, estimate of environmental impacts. The current air quality analysis found that the peak 8-hr ozone increase of 0.15 ppb for Los Angeles is about 75% associated with the use of propylene as a refrigerant and 21% from propane under Scenario 4 (ICF, 2014a, p. 10).

5. Trifluoroacetic Acid

Comment: The Australian Refrigeration Association (ARA) stated that the toxic buildup of trifluoroacetic acid (TFA) (which they claimed is a byproduct of HFC–32 decomposition) in fragile eco-systems is not reversible. This commenter also stated that if TFA levels are allowed to build up until algae and plant life is destroyed, it will be too late to prevent the collapse of the food chain and global catastrophe. The same commenter also noted that even before catastrophic levels are reached, crop yields and marine life will be adversely affected.

Response: Available information indicates that TFA is not a byproduct of the decomposition of HFC–32 (Wellington and Nielsen, 1999, as cited in ICF, 2015a). We note that even if TFA were a minimal byproduct of HFC–32, HFC–32 would not pose significantly greater risk than other available substitutes because TFA is generated by some other acceptable substitutes used in the same end-uses as in this rule.

C. Toxicity

1. Toxicity of Proposed Refrigerants

Comment: Master-Bilt Products stated that the non-drop-in alternatives available and proposed by EPA have many negative characteristics including toxicity. The commenter stated that as a result, much more testing is going to be required now than was required with the switch from CFCs to HFCs. This commenter stated that before these newly redesigned products can be sold, many additional steps will need to take place, such as upgrading appliance manufacturing facilities; training service technicians in using toxic refrigerants; achieving customer acceptance of having toxic refrigerants in their facilities, near their employees and customers, and around their food products; an expansion in capacity of testing companies such as UL, the Canadian Standards Association, and Intertek; and updating building codes to allow for toxic refrigerants.

Response: EPA recognizes that steps by industry and government such as physical upgrades to equipment manufacturer facilities, capital investments, technician training, third-party testing of equipment, and revisions to building codes may be needed before manufacturers of refrigeration equipment and their customers will be able to adopt the refrigerants listed in this final rule. We also recognize that finalizing this rule removes regulatory uncertainty about EPA's requirements for use of these refrigerants in the listed end-uses, another required step before these refrigerants will be adopted.

Concerning toxicity of the proposed refrigerants, our risk screens find that even a worst-case release of isobutane or R–441A from stand-alone retail food refrigeration equipment will not result in exceeding exposure limits such as the TLVs of 1,000 ppm for isobutane or for the four components of R–441A or the relevant short-term exposure limits for these compounds. Similarly, for propane in household refrigerators and freezers, a worst-case release would not exceed exposure limits such as the AEGL–1 of 6,900 ppm for propane. For vending machines, propane, isobutane, and the components of R–441A do not exceed exposure limits in the typical scenario, such as the AEGL–1 of 6,900 ppm for propane. We found similar results for the other types of equipment in this rule, as discussed above in Section IV.C, ''Toxicity and asphyxiation.'' Thus, the refrigerants that we are finding acceptable subject to use conditions present comparable toxicity risk to other acceptable refrigerants already used in these end-uses.

Comment: A private citizen stated that EPA should confirm there is no health threat to society before approving this rule.

Response: EPA has assessed risks to human health and the environment—including the flammability and toxicity, considering exposure to workers, consumers, and the general public of each substitute listed in this final rule. In addition, we have evaluated the environmental impacts, including potential increases in generation of ground-level ozone, impacts on the ozone layer and global climate, all of which can impact human health. Based on these assessments, we have determined that the human health risks of the listed refrigerants are comparable to or less than those from other

acceptable refrigerants in the same end-uses.

2. Toxicity of Decomposition Products of HFC–32

Comment: ARA and A.S. Trust & Holdings expressed concern about the potential for HFC–32 to decompose into hydrogen fluoride (HF), carbonyl fluoride, and other toxic chemicals because it is a fluorocarbon refrigerant. A.S. Trust & Holdings suggested that HFC–32 should not be acceptable because of the toxicity of its decomposition products.

Response: EPA disagrees that the potential for toxic decomposition products from HFC–32, when used consistent with the established use conditions, creates a risk more significant than the risks posed by other available refrigerants in the same end-uses. The risks of decomposition products from HFC–32 in room air conditioners are no greater than that from currently used refrigerants such as HCFC–22 or R–410A, all of which contain fluorine. Indeed, the most commonly used acceptable alternative refrigerant for room air conditioners, R–410A, is a blend that contains 50% HFC–32.

It is true that hydrocarbon refrigerants do not contain fluorine and thus do not have the potential for the same toxic byproducts such as HF or carbonyl fluoride. However, the risk of generating HF only exists when HFC–32 burns. Even in the worst-case scenario in our risk screen for use of HFC–32 in room AC units, the concentration of HFC–32 would not exceed 69% of the LFL. Therefore, the flammability risks of HFC–32, and the related potential to generate HF are extremely low. Based on analysis of all of the relevant health and environmental factors, EPA concluded that HFC–32 does not present a significantly higher risk to human health or the environment than other currently or potentially available substitutes in the room AC end-use.

D. Flammability

Comment: Traulsen, a manufacturer of commercial refrigeration equipment, and Hoshizaki America, believed there has been an incomplete safety assessment for listing flammable substitutes as acceptable. The North American Association of Food Equipment Manufacturers (NAFEM) requested that the Agency reevaluate the safety and enforcement issues that must be addressed before flammable refrigerants are ubiquitous in the marketplace. Hoshizaki America requested further testing and analysis on actual machines to provide more concrete evidence that there is no significant risk for this use. This commenter specifically questioned the test method used for the flammability and fire safety for isobutane and ethane and disagreed with the listing of isobutane or propane without proper safety analysis.

Response: EPA agrees that flammability is an important consideration with regard to substitutes evaluated in this rulemaking. EPA evaluated the safety of these refrigerants prior to issuing the proposal for this rule. EPA believes flammability risks can be mitigated to ensure the substitutes can be used as safely as other available substitutes in these uses. EPA also notes that more than 400 million hydrocarbon refrigerators are in use worldwide, as well as millions of smaller residential air conditioners using hydrocarbons or HFC–32. Reports of refrigerator ignition incidents resulting from leaked hydrocarbons have been rare. To determine whether the refrigerants would present flammability concerns for consumers or for workers, including those servicing or disposing of appliances. EPA reviewed the submitters' detailed assessments of the probability of events that might create a fire, as well as engineering approaches to avoid sparking from the refrigerant equipment. EPA also conducted risk screens, available in the docket for this rulemaking, evaluating reasonable worst-case and more typical, yet conservative, scenarios to model the effects of the sudden release of the refrigerants. This final rule establishes maximum charge sizes for each type of equipment, and analysis for each of the substitutes revealed that even if the unit's full charge were emitted within one minute, the concentration would not reach the LFL for that refrigerant.

The listings of ethane, HFC–32, isobutane, propane, and R–441A as acceptable, subject to use conditions, will allow manufacturers to develop equipment that will use these substitutes as refrigerants. It is not necessary for EPA to pre-test the actual equipment as part of its threshold analysis of whether refrigerants, used consistent with the use conditions, will pose a flammability risk of concern. In addition, we note that the use conditions required by this rule include testing requirements in the relevant UL standards which are intended, among other things, to ensure that any leaks will result in concentrations well below the LFL, and that potential ignition sources will not be able to create temperatures high enough to start a fire. EPA believes risks can be mitigated to ensure the substitutes can be used as safely as other available substitutes.

EPA believes that complying with the use conditions listed in this final action, as well as with use conditions listed in previous SNAP rules, reduces overall risk to human health and the environment. These use conditions will ensure the substitutes are further tested in equipment and will meet specific safety testing requirements.

EPA believes that (1) these evaluations have followed standard SNAP methods and showed low risk, (2) our decisions rely on consensus-based safety standards developed specifically to test and to assure safe use of flammable refrigerants, and (3) the required use conditions reduce the flammability risk associated with the listed substitutes. For these reasons, these alternatives provide lower overall risk to human health and the environment than other available or potentially available alternatives in very low temperature refrigeration equipment, non-mechanical heat transfer, retail food refrigeration equipment (stand-alone units only), vending machines, room air conditioners and household refrigerators and freezers. In response to the comment requesting EPA to ''evaluate the safety and enforcement issues that must be addressed before flammable refrigerants are ubiquitous in the marketplace,'' we note that the commenter did not elaborate on what it meant regarding ''enforcement issues.'' We considered compliance concerns as we developed the proposed and final rule. For example, EPA notes elsewhere in this final rule that placing the responsibility on the manufacturer to design equipment that restricts the maximum refrigerant charge based upon the cooling capacity needed provides a better means for EPA to ensure compliance with the use conditions and thus to ensure that the risk to human health will not be greater than that posed by other available substitutes.

Comment: Several commenters noted the flammability of HFC–32. A.S. Trust & Holdings indicated surprise at the charge size allowed for HFC–32, as provided in the proposed use conditions, given its flammability. ARA states that HFC–32 is extremely flammable and notes the high ignition temperature of HFC–32. ComStar believes HFC–32's flammability, and proposed high refrigerant charges in indoor systems, are compelling reasons to keep HFC–32 out of all indoor refrigerant applications.

Response: As discussed above in section VI.A.4, HFC–32 is significantly less flammable than the other

refrigerants considered in this rulemaking for use in room AC equipment. The charge sizes are calculated using the same formulas from UL 484 as those for propane and R–441A. The charge size is larger for HFC–32 because it has a much higher (safer) LFL.

Comment: Enertech Global, a manufacturer of heat pumps, noted that one disadvantage of hydrocarbon refrigerants is their flammability. However, the commenter believes that careful design, manufacturing, and use can ensure ''safe operation and handling in every step of the value chain.'' Daikin has sold approximately three million units worldwide and indicated that it is unaware of any incidents where the refrigerant ignited during installation, servicing, or removal of these systems. Additionally, the commenter stated that in Sweden, more than 100,000 packaged heat pumps that use flammable refrigerants have been used in safe operation for over two decades. Daikin noted that service technician training materials already developed could reduce flammability risks associated with hydrocarbon refrigerants.

Response: EPA agrees that the flammability risks of concern with hydrocarbon refrigerants can be adequately managed through proper design, controls, and use conditions. EPA also believes that service technician training materials will help provide protection and minimize risks associated with hydrocarbon refrigerants. The safe operating history of millions of HFC–32 AC units and more than 100,000 packaged heat pumps that use flammable refrigerants is encouraging.

Comment: NAFEM, ICOR International (ICOR), Traulsen, and Hoshizaki America expressed various other concerns regarding the flammability of proposed substitutes in the heating, ventilation, air conditioning and refrigeration (HVACR) industry including: the capital costs associated with using flammable refrigerants; the need to redesign equipment; the lack of awareness and training for service personnel and consumers; the need for proper technician training; and industry codes and standards. NAFEM and ICOR expressed concerns for the technicians being able to recognize potential ignition sources.

Response: Refrigeration and AC equipment manufacturers are not required to use any of the flammable refrigerants listed as acceptable subject to use conditions in this action; we expect that those who choose to do so will make appropriate capital investments in their facilities. For example, EPA would expect private sector investments in safety upgrades similar to those made when we listed certain hydrocarbon refrigerants previously for household refrigerators and freezers and stand-alone retail food refrigeration equipment. In addition, manufacturers would need to invest in training their staff in safe handling of flammable refrigerants, including how to recognize ignition sources. For example, technicians need to be aware that standard refrigerant recovery equipment manufactured for non-flammable refrigerants should not be used for recovering flammable refrigerants, because even though it technically is capable of recovering many of these hydrocarbons at similar pressure levels, such equipment may lack adequate explosion proofing or non-sparking parts. Further, they need to be aware that plugging or unplugging either the refrigeration and AC equipment or electrical refrigerant recovery equipment is an ignition source. In addition, we note that many of the use conditions, such as the labeling and colored hoses, are for the express purpose of ensuring that technicians are aware that the refrigerant is flammable.

Second, EPA believes that greater awareness of the presence, risks, and benefits of flammable refrigerants among consumers, industry code- and standard-setting organizations, fire marshals, and first responders will lead to a smoother, safer transition to flammable refrigerants. EPA is working with standards setting organizations such as UL and ASHRAE and with technician certifying organizations to improve the level of knowledge of technicians. EPA also intends to update the test bank for technician certification under Section 608 of the CAA, and could include additional questions on the safe handling of flammable refrigerants. EPA will seek additional information and guidance on how best to incorporate this content through a separate process outside of this rule.

Comment: NAFEM and ICOR expressed concern about what to do when a leak occurs and a trained technician is not present. NAFEM suggested that EPA should consider other foreseeable conditions in which flammable refrigerants are used, and specify precautionary measures in situations such as a leak where no trained technician is present.

Response: We expect that owners of this kind of equipment will follow the manufacturer's recommendations for safe use and, for retail food refrigeration and other commercial equipment, OSHA requirements, as discussed in our risk screens for each refrigerant and end-use (ICF, 2014b,c,d,e,f,g,h,i,j,k). These would assist the owner in planning for situations where there is a leak of flammable refrigerant but no trained technician is available. For retail food refrigeration equipment and very low temperature refrigeration equipment, such plans could include training staff to recognize signs of leaks (*e.g.,* odors, sounds, reduced cooling ability, and alarm signals where there is leak monitoring equipment) and to actively seek steps to remove or avoid ignition sources (*e.g.,* post signs prohibiting smoking or open flames, avoid plugging in or unplugging electrical equipment when a leak is suspected). For household appliances, consumers would have guidance provided by the equipment manufacturer in the owner's manual. In addition, we note that the use conditions provide additional safety measures that make equipment owners, consumers, and emergency first responders aware of the presence of a flammability risk and that minimize the risk that refrigerant concentrations would reach flammable or explosive levels.

Comment: NAFEM noted that some local building and fire safety codes still do not allow even small quantities of flammable refrigerants and that manufacturers will be forced to maintain their current use of R–134a and R–404A until states and municipalities update their codes. Traulsen believed that all issues regarding codes, standards, safe handling and venting can and should be resolved before the option to switch to a flammable refrigerant is the only choice available to a manufacturer or equipment purchaser.

Response: This current rule expands rather than limits the refrigerant choices available in each of the proposed end-uses; thus, no one is restricted to using a flammable refrigerant in those end-uses. There are multiple acceptable nonflammable refrigerants available for use in these end-uses. Government and industry cooperation, such as the task force formed to examine and work towards updating building codes to allow use of alternative refrigerants, has begun to address barriers to revising building codes. However, in the absence of any flammable refrigerant being acceptable for use, government and other code-setting bodies may not have an incentive to revise codes to address the use of flammable refrigerants. EPA supports the concept of a national training program for flammable refrigerants and welcomes industry efforts to educate technicians on proper

refrigerant use and proper service and disposal practices, including safe handling and venting.

Comment: NAFEM is concerned the rulemaking will result in danger to the public as flammable refrigerants are forced into certain market applications.

Response: This rule does not require the use of flammable refrigerants; other, non-flammable refrigerants remain available for use in each of the end-uses addressed in this action. Further, as discussed in the proposed rule and elsewhere in the preamble to the final rule, this action requires that when the listed flammable refrigerants are used in the specific end-uses, they will be used under specific conditions that will mitigate the flammability risks.

Comment: Hoshizaki America requested that refrigerants used in the commercial refrigeration sector be from the A1 group. The commenter noted that refrigerant manufacturers are in the phase of gaining approval of nonflammable refrigerants that have low GWPs. The commenter claims that these refrigerants would be near drop-in replacements with added efficiency benefits. Structural Concepts, a manufacturer of commercial refrigeration equipment, requested EPA to approve R–448A, R–449A, and R–450A (nonflammable refrigerant blends of HFOs and HFCs) for the stand-alone, supermarket, and condensing unit end-uses.

Response: There are multiple non-flammable A1 refrigerants listed as acceptable for commercial refrigeration (retail food refrigeration and vending machines), including CO_2 and, as mentioned by the commenter, R–450A, a non-flammable refrigerant blend that performs very similarly to HFC–134a but with a lower GWP. As of the writing of this final rule, EPA was still reviewing submissions for R–448A and R–449A.

Comment: Hoshizaki America noted that stand-alone refrigeration equipment is well-known for having low probability of field leaks as leaks in such equipment would prevent the equipment from maintaining safe temperature for food. Due to low probability of leaks, the commenter believes the evaluation of commercial refrigeration products should be considered separate from other fields which exhibit larger leakage to the atmosphere.

Response: EPA agrees that stand-alone refrigeration equipment is less likely to leak than other types of refrigeration equipment, such as remote systems. This final rule lists a number of flammable refrigerants acceptable, subject to use conditions, for use in stand-alone refrigeration equipment such as stand-alone retail food refrigeration equipment, very low temperature refrigeration equipment, and household refrigerators, freezers, and combination refrigerator/freezers. We note that for purposes of our review, we consider each end-use separately.

E. Use Conditions

1. New Equipment Only; Not Intended for Use a Retrofit Alternative

Comment: Traulsen, ISRI, and Hudson Technologies, a refrigerant reclaimer, supported limiting the use of the substitutes to new equipment.

Response: EPA appreciates the support for our proposal to establish use conditions to limit the use of the substitutes to new equipment only and agrees with the commenters. EPA is including this use condition in this final action.

2. Compliance With UL Standards

Comment: AHRI, DuPont, and GE Appliances stated that the UL 484 Standard (for room AC units) is being revised to match the fourth edition of IEC 60335–2–40, and that these revisions will likely include a reduced allowable charge level for flammable refrigerants. According to the commenters, this reduction was determined to be necessary for safe use by a group of U.S. experts. The new limit is determined by the equation ''Charge limit = 3 $m^3 \times$ LFL, where LFL is the lower flammable limit in kg/m^3 for the refrigerant used.'' The commenters noted that the charge level is small enough that restriction based on room size is not necessary. As such, the commenters recommended that EPA modify the methodology used to determine maximum charge level and revise the 3rd paragraph of use conditions as follows:

''The charge size for the entire air conditioner must not exceed the maximum refrigerant mass determined according to Appendix F of UL 484, 8th edition for the room size where the air conditioner is used. The charge size for these three refrigerants must in no case exceed 918 g (32.4 oz or 2.02 lb) of HFC–32; 114 g (4.0 oz or 0.25 lbs) of propane; or 123 g (4.3 oz or 0.27 lb) of R–441A..'' [The previous sentence is in place of the proposed statements, ''The charge size for these three refrigerants must in no case exceed 7960 g (280.8 oz or 17.55 lb) of HFC–32; 1000 g (35.3 oz or 2.21 lb) of propane; or 1000 g (35.3 oz or 2.21 lb) of R–441A. The manufacturer must design a charge size for the entire air conditioner that does not exceed the amount specified for the unit's cooling capacity, as specified in Table A, B, C, or D of this appendix.'']. The commenters note that they expect the next revision to UL 484 to be published by the end of 2014 or early 2015.

Response: EPA understands that the consensus-based standards that are the basis of the use conditions in the proposed rule are under review and may change in the future. This is true for all standards controlled by an active organization such as UL. EPA does not believe that it would be appropriate to adopt use conditions to reflect standards that are not yet final and may still be subject to change. EPA believes the consensus-based standards it relied upon are protective of human health, rest upon sound science and reflect the currently used and accepted guidelines in the appliance industry. Our risk screens found that equipment that met EPA's proposed charge limits based on the current, 8th Edition of UL 484 did not exceed the LFL or exposure limits for each of the three refrigerants proposed for use in room AC units, even in relatively small spaces. If UL 484 is revised in the future, or if other information becomes available that would support a change in charge size limits, particularly to address specific risks, EPA remains open to revising the charge size use condition and/or the specific edition of the UL standard, whether in response to a petition or in an action initiated by EPA.

Furthermore, the commenters did not provide any technical support for the changes they anticipate will be made to the UL 484 Standard, nor do they provide information demonstrating that the charge sizes we proposed present unacceptable risks. We also note that while the commenters suggest that the charge size they anticipate will be included in a revision to the UL 484 Standard will be small enough that no restrictions based on room size would be needed, our understanding is that the current UL 484 standard includes formulas for charge limits based upon a peer-reviewed study (Kataoka et al., 2000) and the IEC 60335–2–40 Standard (EPA, 2015).

By relying on the existing UL standard, EPA remains consistent with our approach in listing other flammable refrigerants acceptable, subject to use conditions, including charge size limits (76 FR 78832; December 20, 2011) as set forth in the applicable UL standards at the time of our final listing action.

We believe that reliance on current standards, developed with a focus on U.S. products and applications, are more appropriate than potential future standards that have not yet been

adopted. We believe reliance on existing standards provides certainty for manufacturers, while reducing the flammability risks that may exist due to use of the flammable refrigerants listed in this action. While charge size limits may change in the future, EPA cannot anticipate the timing or extent of such changes.

Should a manufacturer seek UL approval of their equipment in a possible future where the standard has changed, they would need to meet both the use conditions EPA has finalized today and meet the presumably more restrictive requirements of the UL standard applicable at the time they are seeking UL approval. We also note that should a manufacturer choose to adopt one of the refrigerants covered by today's action, they must decide what charge size they will design their equipment for and may choose any charge size equal to or below the maximums set under today's action.

Comment: The Association of Home Appliance Manufacturers (AHAM) and the Alliance stated that EPA should work towards a harmonized international standard. UL noted their organization's work towards harmonizing standards through the introduction of the UL 60335–2–40 Standard. This commenter suggested that EPA allow compliance with both the UL 484 and the UL 60335–2–40 Standards. UL also clarified that the UL 484 Standard will eventually be withdrawn and replaced with the UL 60335–2–40 Standard, possibly in 2020.

Response: EPA appreciates information regarding efforts that may result in the withdrawal of UL 484 and its being replaced by UL 60335–2–40 perhaps by 2020. As provided in the previous response, however, EPA believes it is appropriate to rely on the existing UL 484 Standard in this final rule. If UL 484 is replaced with UL 60335–2–40 in the future or is otherwise modified, EPA remains open to revising the use condition, whether in response to a petition or in an action initiated by EPA. Regarding the comment that the use condition allows compliance with either UL 484 or UL 60335–2–40, we note that today there are some differences in labeling requirements and in the specific tests to be performed that could lead to confusion and difficulty in enforcing requirements of two standards simultaneously. Moreover, as noted in our previous response, EPA's consistent practice for flammable refrigerants has been to base the use conditions on the applicable UL standard.

Comment: Daikin notes a discrepancy between UL 484, which allows for limited ducts used in PTAC installations, and the EPA footnote 10, which indicates that no ducts can be used for PTACs using HFC–32. This commenter believes that the UL 484 standard should be followed, as ducts present no additional fire risk in systems with hermetically sealed refrigerant loops.

Response: EPA agrees with the commenter that UL 484 does allow for limited ducts in PTAC installations, contrary to footnote 10 in the preamble to the proposal. In this final action, we are clarifying by correcting that footnote to be consistent with the 8th edition of the UL 484 standard by removing the statement about ducts.

Comment: Traulsen recommends that EPA consider that equipment being manufactured specifically for markets outside the United States is governed by the applicable standards and guidelines of those countries. The commenter states that the proposed use conditions would restrict a manufacturer's ability to place a product on the market in another country. The commenter encourages the EPA to allow flexibility for products to be sold into global markets, providing that such equipment is clearly marked for export purposes only. For example, Traulsen requested that equipment manufactured exclusively for export only be subject to the charge sizes in regulations applicable to the destination country.

Response: Under Section 612 of the CAA and EPA's implementing regulations in Subpart G of 40 CFR part 82, the SNAP program is applicable to any person introducing a substitute into interstate commerce. This applies to the introduction into interstate commerce of any appliances produced in the United States, including appliances that will be exported. EPA has previously responded to comments about the applicability of the SNAP program to products destined for export. Most recently, in a final rule issued December 20, 2011, EPA responded to a comment concerning whether appliances manufactured for export should be allowed to have larger charge sizes than those being sold in the United States (and thus not have to comply with the use conditions being established in that rule). EPA stated that:

> Under Section 612 of the Clean Air Act, the SNAP program is applicable to any person introducing a substitute into interstate commerce. Interstate commerce is defined in 40 CFR 82.104(n) as: The distribution or transportation of any product between one state, territory, possession or the District of Columbia, and another state, territory, possession or the District of Columbia, or the sale, use or manufacture of any product in more than one state, territory, possession or the District of Columbia. The entry points for which the product is introduced into interstate commerce are the release of a product from the facility in which the product was manufactured, the entry into a warehouse from which the domestic manufacturer releases the product for sale or distribution, and at the site of United States Customs clearance. This definition applies to any appliances produced in the United States, including appliances that will be exported. (76 FR 78846)

The commenter has provided no new information that would cause us to reverse our earlier decision.

We believe that compliance with these final use conditions, including the specified UL standards and charge sizes, does not restrict or prohibit manufacturers from exporting to other markets. For most of the uses addressed in this rule, international standards regarding charge size are the same as those we are establishing in the use conditions.

In the case of household refrigerators and freezers, the charge size requirement in our regulation is more stringent (57 g vs. 150 g) than the comparable international standard. Even in this case, however, the use condition would not restrict or prohibit the export of products to international markets. Rather, the manufacturers could export products so long as they complied with all of the use restrictions, including the charge size of no more than 57 g.

3. Charge Size Limitations

Comment: EIA stated that the propane charge limit size of 57 g for household refrigerators and freezers, set by the UL 250 standards, should be increased to 150 grams, matching the IEC 60335–2–24 standards. The commenter notes that this is consistent with European policies, and corresponds to an R–22 charge size of 300–350 grams.

Response: As discussed in our previous final rule that required a charge size of 57 g for R–441A and isobutane in household refrigerators and freezers, ''EPA does not have sufficient information supported by safety testing data at this time from other commenters, industry, U.S. national safety organizations, or non-governmental organizations to support a charge size limit different from one based on UL 250, such as the 150-gram limit in IEC 60335–2–24.'' (76 FR 78845; December 20, 2011). Further, our risk screen analysis of potential exposure at end-use for a household refrigerator/freezer indicates that in a worst-case release scenario, a charge as small as 104 g could result in consumer exposure above the STEL of 6,900 ppm for propane (ICF, 2014h). The commenter did not submit any technical

information showing that a charge size of 150 g could be used in this end-use without posing a significantly greater risk than other available substitutes.

Comment: UL believes that the lowered charge limits suggested by the Joint Task Group (JTG) and Standards Technical Panels (STP) from the 2011 Flammable Refrigerant Stakeholder Forum are especially important for safety in room AC units, given that many room air conditioners are removed from wall or window sleeves annually and placed in storage, potentially increasing the risk of ignition in the presence of flammable refrigerants.

Response: EPA recognizes that many room air conditioners are removed and placed in storage, for example when changing from warmer, summer temperatures to colder, winter temperatures. This fact was understood when the current charge limits set in UL 484 were developed. While we recognize that an annual removal/replacement cycle could increase the risk that refrigerants in such products might leak, we are not aware of, nor did we receive comments providing a safety assessment that would give an analytical basis on which to set charge size limits different than those proposed. EPA does not believe that the commenter fully justified the need or reason to change our proposed charge size limit, which are based on the existing UL 484 Standard (8th edition), to a charge size recommended by the JTG and STP, but not yet formally adopted.

Comment: Enertech Global believes that the proposed charge limitations for propane found in Table 4, Maximum Design Charge Sizes for Packaged Terminal AC Units and Heat Pumps and Portable AC Units, are set too low and that it is not feasible to manufacture a unit with the specified cooling capacity using the small refrigerant charges listed. De' Longhi, another manufacturer of AC equipment, stated that under relevant standards, there is a specific formula with higher charges allowed for portable AC units in IEC 60335–2–40 Clause gg.8 and UL 484 Appendix F Clause F.1.7 (*e.g.,* 300 g for a capacity of 12,000 BTU/hr instead of 160 g under the proposal). This commenter states that there are additional safety requirements specifically for portable AC units that allow for larger charge sizes.

Response: EPA is establishing a use condition that sets charge size limits based on the need to ensure the risk to human health and the environment posed by propane is not significantly greater than that for other available substitutes, not on the feasibility of manufacturing specific products. The charge sizes in the proposed and final rule are based upon the UL 484 Standard, 8th Edition. For portable AC units, the use condition establishing charge size relies on the provisions of UL 484 Appendix F Clauses F.1.7–F.1.14. Clause F.1.7 allows non-fixed, factory-sealed units, which for purposes of this rule we define solely as portable room AC units, to follow the formula:

$$M_{max} = 0.25 \times A \times LFL \times 2.2$$

Where,
M_{max} is the maximum charge size in kg,
A is the room area in m^2 and
LFL is the lower flammability limit in kg/m^3.

The formula applies only to units with a refrigerant charge M that is less than or equal to twice the value of ''m_1,'' which in turn is defined as four cubic meters multiplied by the LFL in kg/m^3.

Similar to the use-conditions set forth for other room air-conditioners, EPA is setting additional charge size limits according to the normal rated capacity of the unit. For portable room air conditioners, these maximum charge sizes in terms of capacity are in Table E (also described above in Section III.C.3, ''Charge size'').

Comment: Daikin stated that the charge limits in UL Standard 484 are sufficient to protect the safety of all involved in the use and maintenance of relevant equipment, and that any further limitations would cause the commenter ''to revisit EPA's justifications for any R–32 charge size limits.'' The commenter agreed with the guidance to use linear interpolation to determine maximum charge size if the capacity lies between two values in EPA's tables and believes that it would not be beneficial to add any more values to the tables. The commenter also states that a requirement for manufacturers to match charge size to design cooling capacity in flammable refrigerant systems would not significantly reduce fire risk.

Response: EPA is finalizing charge size limits for room air conditioners as proposed, including a linear interpolation, as supported by this commenter. EPA notes in its response to other commenters that if and when charge sizes are updated, EPA remains open to revising the charge size use condition, whether in response to a petition or in an action initiated by EPA. EPA also believes that the use condition requiring manufacturers to meet charge size limits based on design cooling capacity may allow for more appropriate selection of unit sizes by the end-user than the use of room area, as well as greater enforceability.

Comment: ComStar opposed the use of HFC–32 as a refrigerant in indoor applications because of its proposed high charges, as well as its toxicity, flammability, and GWP over 600. The commenter remarked that the use of R–32 in indoor applications is counter to ''the direction foreign governments, science, and OEMs are heading.''

Response: Charge sizes are higher for HFC–32 under this standard than for propane or R–441A, the other refrigerants proposed for use in room air conditioners, because HFC–32 is far less flammable and has a much higher LFL. Based on the safety testing available in the record for this action, we believe that meeting a charge size that is no higher than that provided in the use conditions, HFC–32 does not pose significantly greater risk than other refrigerants in the room air condition end-use. This testing addressed flammability and toxicity risks. Moreover, HFC–32's GWP of 675 is two-thirds less than that of the most commonly used alternative for this type of equipment, R–410A (approximately 2,090) and also significantly lower than that of HCFC–22 (1,810) and R–407C (approximately 1,770). The only currently acceptable alternatives in this end-use with lower GWP include ammonia absorption and the non-vapor compression technologies evaporative cooling and desiccant cooling. However, there are technical limits on the effective use of the non-vapor compression technologies in different climates, and ammonia has a higher toxicity that HFC–32 and the other alternatives.

Regarding the direction of foreign governments, we note that EPA is setting requirements for appliances that enter interstate commerce in the United States. The European Union (EU) regulations addressing fluorinated substances allow use of refrigerants with a GWP of up to 750 for split residential AC, which includes the potential for HFC–32 to be used, while their regulations do not allow for refrigerants with a GWP higher than 150 in ''moveable room air-conditioning appliances,'' which would exclude HFC–32 for that type of equipment. The EU regulations also include a phasedown schedule with a plateau and not a complete phaseout of HFCs. Thus, it does not appear that the EU F-gas regulations are moving in a direction away from allowing for HFC–32 for all end-uses. EPA based charge size limits on UL 484, which is the same approach used for other refrigerants which this commenter supports.

The listing of HFC–32 acceptable subject to use conditions contained in

today's action does not prevent OEMs from choosing a different refrigerant; it only provides an option for those who wish to pursue it. Further, EPA notes that the submission under SNAP for the use of HFC–32 came from an OEM that supports its use in United States as well as in other markets around the world.

Comment: A.S. Trust & Holdings stated that they are surprised by the high charge amount for HFC–32, given its flammability. Further, the commenter provided charge information for R–443A and has noted that the LFL of R–441A is nearly identical to that of R–443A, such that the maximum allowable charge per room volume for a portable AC unit charge with R–441A could be determined via the similar chart for R–443A.

Response: EPA set the charge size limits for HFC–32 using the same approach as used for the other refrigerants listed as acceptable subject to use conditions for self-contained room air conditioners. Charge sizes are higher for HFC–32 under the UL 484 standard than for propane or R–441A, the other refrigerants proposed as acceptable for use in room air conditioners, because HFC–32 is far less flammable and has a much higher LFL. As discussed above, we have set the charge sizes for R–441A based upon the formulas in UL 484, including new charge size limits for portable AC units.

Comment: Traulsen stated it agrees with the necessity of charge sizes, but requested that these limits be continually revisited and updated as applicable standards update safety information.

Response: EPA notes that charge size limits within consensus-based standards are under constant revision and updating. In fact, several commenters supplied information about one or more revisions that are under consideration. If and when charge sizes are updated, EPA remains open to revising the charge size use condition, whether in response to a petition or in an action initiated by EPA.

Comment: Panasonic Healthcare, a manufacturer of very low temperature refrigeration equipment, stated that the maximum charge size for propane in commercial refrigeration applications should be 150 g per circuit, matching the level described for ethane in commercial refrigerators and freezers, given that both are subject to the 10th edition of UL 471.

Response: In a previous rulemaking (76 FR 78832; December 20, 2011), EPA found propane acceptable subject to use conditions, including a charge size limit of 150 g as specified in the 10th edition of UL 471, in stand-alone retail food refrigeration equipment. EPA did not receive a SNAP submission, and did not address in its proposed rulemaking, the use of propane in very low temperature refrigeration.

Comment: Master-Bilt Products stated that the 150 g charge limit will allow for only 25% of its self-contained models to be used, as the BTU/hr capacity required for larger models cannot be achieved at the charge limit. The commenter also noted that it is unclear if multiple systems can use the 150 g charge in one larger model.

Response: EPA recognizes that a charge size limit, regardless of what it is, could restrict the types of products that could be manufactured with these refrigerants. Manufacturers may choose to pursue these refrigerants for smaller BTU/hr capacity equipment and/or investigate technologies that could extend the use of these refrigerants to larger equipment while still meeting the 150 g use condition. Consistent with previous actions, (76 FR 78832; December 20, 2011), the charge size limit applies to any sealed refrigeration system in a product, and some products could employ two or more separate sealed systems. EPA notes that if more than one sealed system is employed, each must meet the charge size limit (*i.e.,* 150 g each). Having multiple sealed systems is of less concern than having a single system with the same combined charge since the probability of two sealed systems leaking simultaneously is lower than that of any one system leaking. See 76 FR at 78845.

4. Color-Coded Hoses and Piping

Comment: Daikin stated that HFC–32 is unique in being a ''lower flammability'' refrigerant in the A2L category of the ASHRAE standard and in being subject to venting restrictions, as opposed to the other four substitutes that are ''higher flammability'' refrigerants in the A3 category of the ASHRAE standard and that are to be exempted from the venting restriction. In light of this, the commenter requested the use of ANSI Safety Yellow PMS #109 for HFC–32 and continued use of red PMS #185 for the other four substitutes. The commenter asserted that this change will avoid confusion and inadvertent venting of HFC–32 by installers and technicians.

Response: Red coloring is understood to represent ''hot,'' ''stop,'' or ''danger,'' and red coloring will provide technicians, consumers, and emergency responders with an unambiguous signal that a potential hazard is present. The latter two groups in particular are more likely to be familiar with the meaning of red coloring and to consider that color as a warning of danger. Yellow coloring could communicate the flammability risks less clearly than red, and use of two colors for different flammable refrigerants may both increase confusion and dilute the effectiveness of the coloring as a warning. EPA is finalizing a requirement to use red PMS #185 coloring on hoses and tubing for equipment charged with HFC–32, R–441A, or propane in room air conditioners. This is the same color specified in AHRI Guideline N–2012, ''Assignment of Refrigerant Container Colors,'' to identify containers of flammable refrigerant, such as propane, isobutane, and R–441A (AHRI, 2012). We believe the purpose of the coloring is to communicate the presence of a flammable refrigerant and that this purpose can be accomplished best by using the same coloring for HFC–32, propane, isobutane, and R–441A. EPA may consider whether there should be added markings to communicate when a refrigerant may or may not be vented in a future rule.

Comment: Traulsen agreed that the colored hoses and piping may increase attention.

Response: EPA agrees with the commenter.

Comment: Traulsen stated that the benefits of colored hoses and piping have not been proven relative to the cost of burden in any studies. Additionally, the commenter noted that if a product is serviced, there is a risk that the sleeve or cap may not be properly replaced unless EPA establishes a ''safe practice'' for servicers.

Response: EPA does not believe that this requirement will impose a burdensome additional cost. The only commenter to raise this point did not provide any information about what such costs might be and why the commenter thought they would be burdensome. EPA believes that the use of a sleeve or cap is consistent with the use condition as long as the requirements of the use condition (use of PMS #185, location, and dimension) are met. However, in order to remain in compliance with the use condition, a technician who removes a sleeve during servicing is required to replace the sleeve on the serviced tube.

The purpose of the colored hoses and tubing in this case is to inform service technicians, consumers and emergency responders that a flammable refrigerant is in use and to enable technicians to take additional precautions (*e.g.,* reducing the use of sparking equipment) as appropriate to avert accidents when servicing the appliance. Color coding is particularly useful in the event that labels are no longer legible. The air-conditioning and refrigeration industry

currently uses distinguishing colors to identify containers of different refrigerants. Likewise, distinguishing coloring is used elsewhere to indicate an unusual and potentially dangerous situation, such as the use of orange-insulated wires in hybrid electric vehicles.

The labeling requirement discussed in Section III.C.5 will complement the color-coding requirements by providing a more precise warning of the potential hazards and necessary precautions. Further, it is possible that labels, particularly those on the outside of the appliance, may be removed or fall off or become illegible over time; adding red coloring on tubing inside the appliance provides additional assurance that technicians will be aware that a flammable refrigerant is present.

5. Labeling

Comment: Traulsen, ISRI, Daikin, and Hudson Technologies expressed support for the requirement for warning labels. Traulsen stated that because equipment is designed for multiple markets with different languages, the warning symbols and colors should be sufficient to allow for 1/8-inch lettering in the UL standards as opposed to the 1/4-inch proposed.

Response: EPA appreciates the support for the requirement for warning labels. Regarding the lettering size, EPA continues to believe that it would be difficult to read warning labels with the smaller 1/8-inch lettering stipulated by UL 250 and UL 471 and is finalizing the 1/4-inch minimum height proposed, making it easier for technicians, consumers, retail store-owners, and emergency first responders to see the warning labels. The color markings would be inside the equipment where technicians could see them, but not consumers, retail store-owners, or emergency first responders. The warning symbol appears in fewer locations than the warning labels and provides less information, and thus is not a substitute for an easily readable set of warning statements.

6. Unique Service Fittings

Comment: The Alliance, Hudson Technologies, and ISRI, supported the use of unique service fittings for flammable refrigerants, in response to EPA's proposal to recommend, but not require, such fittings. Hudson Technologies and ISRI stated that EPA should require unique service fittings. Traulsen agreed with the decision to not require service ports for self-contained equipment given the increased risk of system leaks. The commenter acknowledged that requiring a different service port for non-flammable refrigerants may establish a ''safe practice,'' but noted that it does not guarantee servicing companies will safely work on installed equipment. The Alliance stated that separate fittings for flammable refrigerants, in addition to color coded hosing and piping, will be an effective warning system to alert technicians to the presence of flammable substances. ISRI stated that these fittings will be useful for the future recovery of refrigerants by recyclers.

Response: EPA agrees with commenters that service ports and unique fittings should not be required for self-contained equipment given the increased risk of system leaks. EPA also agrees that separate fittings for flammable refrigerants, in addition to color-coded hosing and piping and warning labels, can be an effective warning system to alert technicians to the presence of flammable substances, and that these fittings would be useful for the future recovery of refrigerants by recyclers. We disagree with the commenters that suggested we require unique fittings as a use condition. While there are some benefits to unique fittings, there are also concerns. As we recognized in our December 2011 rule, these concerns include that: Installation of fittings at the time of manufacture is not appropriate for certain appliance types; additional fittings present an increased leak risk; the ease of circumventing the requirement; and inconsistency with UL and international standards. In particular because the types of equipment in this rule are self-contained and have a hermetically-sealed refrigerant circuit, installing fittings at manufacture would increase the risk of leakage and thus increase potential of a fire. Also, the UL standards that are incorporated by reference in the use conditions do not allow for equipment to be constructed with an access port (which would be where unique servicing fittings would be installed on the equipment). Therefore, this final rule continues to recommend, but not require, only if someone chooses to add an access port that they do so with separate servicing fittings for flammable refrigerants and that they only consider this where it is not prohibited by the required UL standard.

F. Technician Training

Comment: A number of commenters stated that technicians should be properly trained in handling flammable refrigerants, with Traulsen, NAFEM, ICOR, Hudson Technologies, and the Alliance commenting that training should be mandatory. Daikin, the Alliance, and DuPont expressed concern that technicians could be confused if EPA exempts certain refrigerants from venting requirements. Hoshizaki America commented that U.S. technicians are not properly trained in servicing appliances with flammable refrigerants, EPA does not explain the risk of explosion well, and that U.S. industry and consumers might not be aware that a unit contains flammable substances. ARA includes a list of questions about MSDSs that HVACR contractors can ask to improve safety with any refrigerant.

Response: While EPA appreciates the concerns raised by the commenters, we have been exempting certain refrigerant substitutes from the venting prohibition since 1995. EPA already exempts certain refrigerants used from the venting prohibition including propane (in retail food refrigeration—stand-alone units only), and isobutane and R–441A (in household refrigerators, freezers, and combination refrigerator/freezers). Therefore, we do not believe that continuing with this established practice should cause confusion.

The Agency understands that over the past 20 years there have been numerous developments in this industry and that often training programs are developed to familiarize technicians with these changes, including the introduction of new refrigerants. EPA is aware of such continuing education programs offered by vocational schools, unions, trade associations, equipment manufacturers and other entities that provide technicians information on a range of technology developments. Therefore, the Agency recommends that anyone servicing appliances with a flammable refrigerant receive appropriate training and follow industry best practices. Given the extent of technical knowledge available within the industry and the presence of voluntary training programs, we believe that it is not necessary for EPA to require training at this time in order for these newly listed refrigerants to be used as safely as other refrigerants currently available.

EPA is not requiring training through today's action. EPA notes that the Agency does require technician certification under Section 608 for technicians servicing, maintaining, or repairing appliances containing ozone-depleting refrigerants, but does not require any specific training and the certification program is limited in its scope, as it is not intended to replace vocational training. The goals of the Section 608 technician certification program reflect the need to reduce emissions during servicing,

maintenance, repair, and disposal. The complete requirements are included at 40 CFR part 82, subpart F. Currently the regulations require anyone who services, maintains or repairs appliances containing an ozone-depleting refrigerant to be tested and certified. However, the Agency is undertaking a review of the Section 608 technician certification requirements—including whether to address flammable refrigerant substitutes—through a separate process.

G. Venting Prohibition

Comment: ISRI and a number of private citizens support EPA's conclusion that venting hydrocarbons does not pose a threat to the environment. One commenter notes that other countries allow venting of hydrocarbons. In contrast, Hudson Technologies believes intentional venting to the atmosphere to be poor environmental policy and that the low GWP of hydrocarbons does not justify their exemption from venting prohibitions.

Response: For the reasons discussed in section III.D, ''Venting prohibition,'' EPA agrees that venting, release, or disposal of the following hydrocarbon refrigerant substitutes in the following end-uses and subject to the use conditions listed in this action does not pose a threat to the environment: (1) Isobutane and R–441A in retail food refrigerators and freezers (stand-alone units only); (2) propane in household refrigerators, freezers, and combination refrigerators and freezers; (3) ethane in very low temperature refrigeration equipment and equipment for non-mechanical heat transfer; (4) R–441A, propane, and isobutane in vending machines; and (5) propane and R–441A in self-contained room air conditioners for residential and light commercial air conditioning and heat pumps. EPA's decision is based on consideration of multiple environmental characteristics and not just GWP. The comments do not give us sufficient reason to change our proposed conclusion that these refrigerant substitutes in these end-uses, subject to the required use conditions, do not pose a threat to the environment or to change this final rule so that they would not be exempt from the venting prohibition.

In addition, EPA's exemption from the CAA venting prohibition of these substances in these end-uses is consistent with how other countries, including Australia, Japan, and those in the European Union, regulate the venting of hydrocarbons.

Comment: ARA and some private citizens asserted that HFC–32 has a significant impact on the environment, with a 100-year GWP of 675, raised concerns about its toxicity in the context of venting, and stated that it should not be exempt from the venting prohibition.

Response: EPA did not propose to create an exemption to the venting prohibition for HFC–32 and is not establishing such an exemption in this final action. Therefore, the venting prohibition under Section 608 and the implementing regulations at 40 CFR 82.154(a)(1) on knowingly venting, releasing, or disposing of refrigerant substitutes still applies to HFC–32 (and all other fluorinated gases), including in the end-use for which we are taking final action today under SNAP (*i.e.,* room AC units).

Comment: Traulsen, Hoshizaki America, NAFEM and DuPont expressed concern about the potential confusion from and safety consequences of EPA's proposal to exempt certain substances from the venting prohibition. DuPont states that the differential treatment of refrigerants in such a manner could be misunderstood and could lead to unintended venting and environmental consequences from the release of ozone-depleting refrigerants.

Response: EPA has evaluated the environmental and safety considerations of venting in: (1) Isobutane and R–441A in retail food refrigerators and freezers (stand-alone units only); (2) propane in household refrigerators, freezers, and combination refrigerators and freezers; (3) ethane in very low temperature refrigeration equipment and equipment for non-mechanical heat transfer; (4) R–441A, propane, and isobutane in vending machines; and (5) propane and R–441A in self-contained room air conditioners for residential and light commercial air conditioning and heat pumps. After this review, EPA has determined the exempted releases do not pose a threat to the environment and thus that it is appropriate to exempt these refrigerant in these specific end-uses and subject to these use conditions from the venting prohibition under Section 608(c) of the CAA. The comments do not provide sufficient grounds to compel us to change that conclusion. While EPA appreciates the concerns raised by the commenters, the agency has been exempting certain refrigerant substitutes from the venting prohibition since 1995. Therefore, we do not believe that continuing with this established practice should cause confusion. Also, as discussed above, the Agency is undertaking a review of the Section 608 technician certification requirements—including whether to address flammable refrigerants—through a separate process.

Comment: CARB was concerned with the potential increase in ground-level ozone formation resulting from venting hydrocarbons, especially in non-attainment regions in California such as the South Coast Air Basin and the San Joaquin Valley Air Basin. CARB commented that their own modeling results agree with the conclusion of Scenario 4 of EPA's air quality modeling results.

Response: EPA has assessed the possible increase in ground-level ozone formation and believes it is appropriate to finalize the exemption from the venting prohibition as described in this action. We found that even if all the refrigerant in appliances in end-uses addressed in this rule were to be emitted, there would be a worst-case impact in the Los Angeles area of less than 0.15 ppb. Further, this estimate is likely to be higher than the impact resulting from actual emissions due to venting of the refrigerant substitutes listed in this rule in the specified end-uses, because the estimate includes emissions from a more reactive refrigerant substitute that is not listed and not allowed to be vented under this rule. Because of the relatively low air quality impacts of these refrigerants if they are released to the atmosphere in limited amounts, as well as the factors discussed above, such as their low GWP, zero ODP, and lack of aquatic effects, EPA is concluding that these four hydrocarbon refrigerant substitutes in the end-uses and subject to the use conditions do not pose a threat to the environment. For more detail, see Sections III.D, IV.A and VI.B.

Comment: Two private citizens state that hydrocarbons are non-toxic and therefore venting of hydrocarbon refrigerants into the atmosphere would be an acceptable practice.

Response: While the hydrocarbons being listed as acceptable in this rule are generally low in toxicity, they can lead to asphyxiation and other adverse health effects in high enough concentrations. Therefore, EPA considered exposure limits and potential exposure concentrations when assessing the safety and the acceptability of hydrocarbons under SNAP. This analysis found that the listed refrigerant substitutes, when used according to the required use conditions, would not exceed the relevant exposure limits (*e.g.,* TLVs, STELs, or AEGLs), indicating that toxicity is not a significant risk for the specific refrigerant substitutes in the end-uses listed when used according to the required use conditions. See

Sections III.D.4.ii and IV.C for more detail on EPA's toxicity assessment of these refrigerants during servicing and disposal. Thus to the extent that this information is relevant to EPA's determination under Section 608(c)(2), EPA does not believe that toxicity considerations preclude finalizing the exemption from the venting prohibition in this action.

Comment: Traulsen, Hoshizaki America, NAFEM, ICOR and DuPont expressed concerns about the flammability of hydrocarbon refrigerants and the adequacy of safety measures during venting. DuPont stated that because of the low minimum ignition energy of hydrocarbon refrigerants, these refrigerants are easily ignited by static electricity. This commenter stated that venting in an uncontrolled environment could lead to unsafe conditions. NAFEM and ICOR mentioned that use of a class B fire extinguisher would not be sufficient to avoid an explosive condition.

Response: Because of safety concerns, EPA has required numerous use conditions for appliances using flammable refrigerants as part of the SNAP listings. A discussion of the SNAP use conditions and EPA's assessment of safety, which considered a full release of the charge within one minute, is available in the risk screens released with the proposal. When it comes to servicing, the charge size limit and the labeling requirements (*e.g.,* visible warning statement and red coloring on the pipes, hoses and devices which contain refrigerant) will reduce the risk of a fire significantly. However, additional precautions are recommended, like ensuring proper ventilation and avoiding ignition sources during servicing.

Concerning the risks of fire from static electricity, EPA notes this concern about the ignition of hydrocarbon refrigerants was discussed in the 2011 SNAP rule, in which propane was evaluated for use in stand-alone retail food refrigeration equipment and R–441A and isobutane were evaluated for use in household refrigerators and freezers, and were determined to be acceptable, subject to use conditions, under SNAP. In section ''B. Flammability'' of part IV of that SNAP rule, titled ''What is the basis for EPA's final action?'' the Agency describes the evaluation and conclusion for approving those hydrocarbon refrigerant substitutes for the specific end-uses under the use conditions. The 2011 SNAP rule explains that, ''when the concentration of a flammable refrigerant reaches or exceeds its LFL in the presence of an ignition source (*e.g.,* a static electricity spark resulting from closing a door, use of a torch during servicing, or a short circuit in wiring that controls the motor of a compressor), an explosion or fire could occur'' (76 FR at 78837). The 2011 SNAP rule continues by stating that, ''To determine whether the three hydrocarbon refrigerants would present flammability concerns for service and manufacture personnel or for consumers, EPA reviewed the submitters' detailed assessments of the probability of events that might create a fire, as well as engineering approaches to avoid sparking from the refrigeration equipment. EPA also conducted risk screens, available in the docket for [that] rulemaking, evaluating reasonable worst-case scenarios to model the effects of the sudden release of the refrigerants. The worst-case scenario analysis for each of the three hydrocarbons revealed that even if the unit's full charge were emitted within one minute, the concentration would not reach the LFL for that hydrocarbon'' (id. at 78839). EPA's risk screens evaluating the environmental, toxicity and flammability risks of the refrigerant substitutes and end-uses in this action came to similar conclusions that the LFL would not be exceeded. Thus, although end-users should take precautions to reduce sparking from static electricity, this concern is not sufficient to cause EPA to prohibit use of these refrigerant substitutes or to decline to exempt these refrigerant substitutes in the specified end-uses when used according to the required use conditions.

Use of a Class B fire extinguisher would not prevent a fire or explosive condition from occurring, as the commenter suggested; but if there is a fire, it is important to use a Class B extinguisher that is intended for use with hydrocarbon fires, rather than a Class A extinguisher intended for use with fires from wood, paper, or other ordinary combustibles. The statements in the ''further information'' column for each listing, including the recommendation for having a Class B dry powder type fire extinguisher available, are not intended to be a comprehensive set of all precautions needed, but rather basic guidelines or areas of consideration that users should consider as they develop their own safety programs. The Australian Institute of Refrigeration, Air Conditions and Heating (AIRAH) provides useful guidance on safety precautions technicians can follow when servicing equipment containing flammable refrigerants. This document is included in the docket for this rule (AIRAH, 2013).

Comment: DuPont stated that the presence of lubricants during the venting process can potentially increase risk of ignition, and is not sure whether EPA fully evaluated these potential risks.

Response: EPA has evaluated this potential risk and taken it into consideration in this action. Most lubricant will remain in the unit, along with a small amount of hydrocarbon refrigerant substitutes. Typical compressor oils have flashpoints over 130 °C, which is well above both ambient temperatures and the flashpoint of the hydrocarbon refrigerant substitutes in this rule. Thus, the presence of compressor oil should not have a significant effect on the flammability of the refrigerant-oil mixture. Our risk screens available in the docket for this rulemaking find that even if the full charge is lost in one minute, the LFL of the hydrocarbon refrigerant substitute is not reached. Having said that, the Agency recommends technicians working with hydrocarbon refrigerants follow proper safety precautions, such as ensuring their workspace is well-ventilated and removing ignition sources.

Observance of OSHA requirements could further limit concentrations and attendant flammability risks associated with those oils. For example, OSHA has a PEL for one class of compressor oil, mineral oil mist, of 5 mg/m^3 of air, as well as rules for respiratory protection and personal protective equipment that apply. EPA additionally notes that the very small amount of dissolved compressor oil expected to be used in the small hydrocarbon charge size required by the use conditions will significantly mitigate the amount and the impact of any release into the environment of lubricants dissolved in the hydrocarbon refrigerant substitutes that may result from any venting, release or disposal that may occur under this final action. EPA also notes that many of the lubricants used with hydrocarbon refrigerants, such as alkyl benzene and polyalkylene glycol, are considered environmentally acceptable because they biodegrade easily, as noted in EPA's document on environmentally acceptable lubricants, available in the docket.

EPA received a similar comment on the rule exempting isobutane and R–441A, as refrigerant substitutes in household refrigerators, freezers, and combination refrigerators and freezers, and propane as a refrigerant substitute in retail food refrigerators and freezers (stand-alone units only) (see 79 FR

29682). EPA considered such studies and the influence of lubricant on the LFLs of the hydrocarbon refrigerants in the specific end-uses in that rule when finding them acceptable subject to use conditions under the SNAP program (see December 20, 2011; 76 FR 78832, sections ''D. Charge Size Limitation (Household Refrigeration)'' and ''E. Charge Size Limitation (Retail Food Refrigeration)'' and discussions of Standards UL 250 and UL 471 regarding lubricant oil). We believe that same analysis and the same results are applicable here.

Comment: A private citizen states that replacing old refrigerants with new ones decreases the risk of toxicity yet increases a risk of combustion. This commenter asked who would be responsible for fires due to use and disposal of these refrigerants (*e.g.,* junkyard owner, appliance owner) and whether EPA and appliance manufacturers are responsible for ensuring that the end user is aware of risks from the usage and disposal of flammable refrigerants.

Response: In this rule, EPA is exempting certain hydrocarbon refrigerants in specific applications from the venting prohibition, not making a determination of fault for individual incidents such as fires, which global experience indicates can be prevented with appropriate precautions. Thus, the commenter's point about who would be responsible for fires is outside the scope of this rulemaking. With respect to the commenter's concerns about the end-user's awareness, in the Agency's risk screen, we have assessed a worst-case scenario for consumer exposure (available in the docket for this rulemaking). Even in that worst-case scenario, the charge size for these approved applications is small enough that if the complete charge is lost within one minute in a confined space, the amount released does not reach the LFL, and therefore, a fire would not occur. Further, charges in the analyzed scenarios do not exceed the relevant exposure limits, and therefore, there should not be a significant toxicity risk. Since junkyards, scrap yards, and other facilities disposing of or recycling small appliances are already bound by the venting prohibition, they should already have a system in place to determine whether an appliance contains an ODS or substitute refrigerant. EPA believes that the required labeling of the product and prominent red marking on the refrigeration circuit will help these facilities to identify that the appliance contains a flammable refrigerant. Thus, these facilities likely have procedures in place to identify and appropriately handle flammable refrigerant substitutes, whether or not they are subject to an exemption from the venting prohibition. See also EPA's guidance in the further information column in 40 CFR part 82, subpart G, Appendix R, concerning appropriate personal protective equipment (PPE), type of fire extinguisher to use, use of spark-proof tools, use of recovery equipment designed for flammable refrigerants, and releasing refrigerant to well-ventilated areas.

Comment: Traulsen and NAFEM stated that EPA should reevaluate the suggestion that venting should be conducted outside of a building because of local codes, lease terms, or logistical concerns that may make outdoor venting disruptive or even impossible. One of these commenters, Traulsen, also is concerned that EPA has not yet outlined what a network of properly trained service professionals to handle venting practices safely would consist of, yet assumes that one will exist.

Response: EPA is not requiring that flammable refrigerant substitutes from appliances be vented, nor that they be vented outside. We recognize that outdoor venting may not always be feasible and that such activity may be restricted by fire codes. Venting outdoors is likely to allow sufficient ventilation to reduce concentrations and mitigate flammability risks, but sufficient ventilation could also be provided by engineered ventilation systems. Some manufacturers and end-users may instead choose to recover flammable refrigerants rather than venting. While the use conditions under SNAP finalized by this action, in particular charge size, will minimize safety risk, other precautions are recommended, like ensuring proper ventilation and avoiding ignition sources during servicing. These would also be appropriate guidelines, whether venting or recovering the refrigerant. AIRAH provides useful guidance on safety precautions technicians can follow when servicing equipment with flammable refrigerants. One of those practices is to connect a hose to the appliance to allow for venting the refrigerant outside. This document is included in the docket for this rule. We note that at least two organizations, RSES and the ESCO Institute, already offer training for handling of flammable refrigerants, which is the first step to building a network of properly trained technicians. Similarly, equipment manufacturers and end-users that have sent EPA SNAP submissions for flammable refrigerants have indicated that there is technician training for their own staff and for contractors responsible for servicing appliances. Also, the Agency intends to update the test bank for technician certification under Section 608 of the CAA as we have done previously, and will consider including additional questions on flammable refrigerants. By adding such questions to the test bank, EPA would supplement but would not replace technician training programs currently provided by non-government entities. We will seek additional information and guidance on how best to incorporate this content through a separate process outside of this final rule.

Comment: Traulsen has not found a solution regarding EPA's question about an industry standard for hydrocarbon recovery units and their availability in the U.S. market. No other commenters provided information on such an industry standard.

Response: EPA is not aware of an industry standard for hydrocarbon recovery equipment, but encourages industry to develop one. However, the agency is aware of the existence of some hydrocarbon recovery devices. One of those recovery devices uses activated carbon to assist in the safe removal of hydrocarbons from appliances. A canister containing activated carbon is pulled to a 25 in.Hg vacuum. The canister is then filled with nitrogen up to 10 psi and pulled to a vacuum again to bring oxygen levels below 0.1% in the cylinder, thereby preventing conditions that might allow ignition. The canister is then attached to the appliance containing a hydrocarbon refrigerant. The hydrocarbon refrigerant is pulled from the appliance into the canister and the canister is then sealed off. This can be done with no pump or other electrical equipment near the equipment containing the flammable refrigerant. The carbon within the canister bonds with the hydrocarbon, eliminating its ability to oxidize or burn. Once the process is complete, the hydrocarbon can be recovered from the canister and appropriately managed for reuse or disposal. Given the lack of additional information on standards for recovery equipment for hydrocarbon refrigerant substitutes, and our finding that release of the specific refrigerants in the specific end-uses identified in this rule do not pose a threat to the environment, we continue to believe there is reason for allowing venting of the hydrocarbon refrigerant substitutes in the specified end-uses as an alternative to recovery.

Comment: ISRI seeks clarification on how 40 CFR 82.156(f) applies to the recycling of appliances with exempt substitutes that may be vented pursuant to 40 CFR 82.154(a)(1).

Response: Under 40 CFR 82.156(f), the person who takes the final step in the disposal process (including but not limited to scrap recyclers and landfill operators) of a small appliance, room AC, MVACs, or MVAC-like appliances must either recover any remaining refrigerant in accordance with the regulations or verify that refrigerant has been evacuated previously. Since the current definition of refrigerant excludes non-ozone-depleting refrigerant substitutes, these recordkeeping requirements do not presently apply to the hydrocarbon refrigerant substitutes in the specified end-uses that are the subject of this action. The only requirement under 40 CFR part 82 Subpart F that would have applied is the venting prohibition. However, since EPA is exempting those hydrocarbons for the specific uses from the venting prohibition in this final rule, that prohibition would no longer apply. Moreover, as this action does not change the applicability of other environmental regulations, other applicable environmental regulations would continue to apply (*e.g.,* under RCRA).

Comment: ISRI notes that in the last rule exempting isobutane and R–441A as refrigerant substitutes in household refrigerators, freezers, and combination refrigerators and freezers, and propane as a refrigerant substitute in retail food refrigerators and freezers (stand-alone units only) (see 79 FR 29682), EPA stated that certain hydrocarbons could be characterized as hazardous waste due to their flammability (as defined under the RCRA regulations; see 40 CFR 261.21). The commenter notes that the agency also stated that incidental releases of these hydrocarbons ''would not be subject to RCRA requirements for the disposal of hazardous waste as the release would occur incidentally during the maintenance, service and repair of the equipment, and would not constitute disposal of the refrigerant charge as solid waste, per se,'' (79 FR 29687). ISRI seeks clarity on whether full venting is allowed if flammable refrigerants have been exempted from the venting prohibition at 40 CFR 82.154(a). The commenter also seeks clarity on whether hydrocarbons would be considered hazardous waste under RCRA. The commenter suggests that EPA could create a new exclusion from hazardous waste at 40 CFR 261.4(b) for an acceptable ignitable refrigerant substitute, or determine that an acceptable ignitable refrigerant is equivalent to household waste under 40 CFR 261.4(b)(1).

Response: In this rule, EPA is exempting from the venting prohibition under CAA Section 608(c) certain hydrocarbons in certain end-uses listed as acceptable subject to use conditions under SNAP. Specifically, EPA is exempting from the venting prohibition the following refrigerant substitutes in the following uses: (1) Isobutane and R–441A in retail food refrigerators and freezers (stand-alone units only); (2) propane in household refrigerators, freezers, and combination refrigerators and freezers; (3) ethane in very low temperature refrigeration equipment and equipment for non-mechanical heat transfer; (4) R–441A, propane, and isobutane in vending machines; and (5) propane and R–441A in self-contained room air conditioners for residential and light commercial air conditioning and heat pumps.

The commenter's request to modify the hazardous waste regulations is beyond the scope of this rulemaking, since it focuses on Sections 608 and 612 of the CAA. However, as discussed in the final rule exempting from the venting prohibition isobutane and R–441A, as refrigerant substitutes in household refrigerators, freezers, and combination refrigerators and freezers; and propane, as a refrigerant substitute in retail food refrigerators and freezers (stand-alone units only); incidental releases that occur during the maintenance, service, and repair of appliances would not be subject to RCRA requirements for the disposal of hazardous waste because this would not constitute disposal of the refrigerant charge as a solid waste, per se (see 79 FR 29687).

The commenter raises questions about how the hazardous waste requirements under RCRA apply at disposal (or in the case of scrap metal recycling, disassembly) of an appliance. Under the RCRA requirements at 40 CFR part 261, it does appear that certain refrigerants, like hydrocarbons, could potentially be subject to regulation as hazardous wastes if they exhibit the ignitability characteristic.

In the case of household appliances, repair and disposal of hydrocarbons would not be considered hazardous waste management because the appliance is exempt from the hazardous waste regulations under the household hazardous waste exemption at 40 CFR 261.4(b)(1) (although States may have more stringent regulations). The refrigerant could therefore generally be vented without triggering RCRA hazardous waste requirements.

On the other hand, for commercial and industrial appliances that are not generated by households as defined in 40 CFR 261.4(b)(1), ignitable refrigerants would be subject to regulation as hazardous waste (see 40 CFR 261.21) subject to a limited exception if the ignitable refrigerant is to be recycled. Ignitable refrigerant that has been used and has become contaminated through use would fit the definition of a spent material under RCRA (40 CFR 261.1(c)(1)) if it must be reclaimed prior to its reuse. Spent materials that are reclaimed are solid wastes per Section 261.2(c). However, if the hydrocarbon refrigerant is recovered for direct reuse (*i.e.,* no reclamation), it would not be classified as a solid or a hazardous waste (40 CFR 261.2(e)). EPA believes that recycling of these materials would require cleaning before they are reused.

H. Cost and Economic Impacts

1. Equipment Redesign

Comment: NAFEM and Hoshizaki America stated that refrigeration equipment manufacturers would incur capital costs in switching to flammable refrigerants because they would need to redesign equipment and facilities to eliminate ignition sources to reduce the risk of fire. Hoshizaki America stated that manufacturers would have to go through considerable and costly staff training to understand the risks of explosion for the proposed list of substitutes. Master-Bilt Products stated that the large expenses for upgrading factories and additional testing to meet different standards will slow innovation for their business as well as other small businesses.

Response: EPA agrees that manufacturers choosing to use one of the refrigerants listed in this rule may need to make capital investments in their facilities, including the redesign of equipment to handle flammable refrigerants, and may need to invest in training their staff to handle flammable refrigerants safely. These investments would be needed for safe use of these refrigerants and would be needed irrespective of use conditions established by EPA in listing these refrigerants as acceptable subject to use conditions. Therefore manufacturers may decide, based on their own business considerations, whether to pursue hydrocarbon refrigerants. This rule does not restrict nonflammable substitutes currently in use nor does it require manufacturers to use any of the flammable substitute refrigerants listed through this action.

Comment: Master-Bilt commented that if multiple systems using the 150 g charge can be used in larger models, propane could potentially be used in some larger equipment, but the cost would go up approximately 25–50% and the systems would be more complex.

Response: The 150 g limit applies to each refrigerant circuit and multiple circuits could be used in the same piece of equipment, as discussed above under section VI.E.3. We agree with the commenter that the cost for models that have multiple circuits could be higher and that the systems would be more complex. We are not requiring manufacturers to use propane or any of the substitute refrigerants listed in this action.

2. Market Options

Comment: Traulsen believes this rule will give the industry more flexibility to explore market options. EIA believes the rule will allow U.S. businesses to sell international products domestically and encourage foreign businesses to expand their manufacturing operations and distribution in the United States.

Response: EPA agrees with the commenters. Whenever the Agency expands the list of acceptable substitutes it provides industry, including manufacturers, with more flexibility and options.

3. Recycling

Comment: ISRI is concerned that EPA may not have adequately considered the impacts of the proposed rule on the recycling industry. The commenter stated that, for example, the recycling industry (NAICS 423930) was not even identified as potentially affected in Table 1 of the proposed rule.

Response: EPA has added the recycling industry in Table 1 in this final rule. Further, EPA has performed research to consider impacts of the rule on the recycling industry more fully (ICF, 2015b). We investigated the impacts of use of flammable refrigerants in waste streams of other countries using these refrigerants. This analysis found that it is not anticipated that the recycling industry will experience additional risk if appliances containing hydrocarbon refrigerants are sent to recycling facilities prior to the refrigerant being properly vented or evacuated. This analysis suggested that recycling facilities should vent or otherwise remove the refrigerant (consistent with other requirements like RCRA) before any mechanical processing of the appliance (*e.g.,* shredders, choppers, magnets), due to the potential presence of ignition sources. Further, based upon experience with flammable refrigerants in Europe, Australia, and Japan, there are best practices for handling flammable refrigerants at disposal, such as those provided by AIRAH (2013).

I. Statutory and Executive Order Reviews

Comment: Traulsen stated that EPA's rule adding to the list of acceptable SNAP substitutes may not be affected by the Regulatory Flexibility Act (RFA), but any requirement related to the removal of a previously approved substance would violate the RFA. Traulsen expressed concern about the potential future impacts on small businesses if flammable refrigerants, including the proposed refrigerants, become the only refrigerant options available, combined with uncertainties such as building disparities and placement and installation of equipment.

Response: EPA agrees with the commenter that this final rule, which adds to the list of acceptable substitutes, is consistent with requirements of the RFA. The commenter raises a concern that actions that remove substitutes from the list of acceptable substitutes could have implications for the RFA. EPA will address the RFA in any action proposing and finalizing a decision to remove one or more substitutes from the lists of acceptable substitutes.

Comment: Traulsen commented that although this rule adding these substitutes may not be affected by the Unfunded Mandates Reform Act (UMRA) or Paperwork Reduction Act (PRA), subsequent SNAP rules may.

Response: EPA will address how these Acts apply to any subsequent action in that separate action.

Comment: Traulsen stated that it supports the Agency's adoption of well-known and developed safety standards like those issued by UL and other organizations under the application of the National Technology Transfer and Advancement Act (NTTAA).

Response: EPA appreciates the support for this aspect of the rule.

Comment: Traulsen expressed interest in EPA's statement regarding the position of deferring to agencies with jurisdiction in other areas, with regards to Executive Order (EO) 13132: Federalism and 13175: Tribal Governments. Specifically, the commenter is interested in how those orders apply to the installation of equipment in localities where the substitutes are regulated under different authorities, including VOC and building occupancy codes.

Response: This regulation does not impose direct requirements on state, local, or tribal governments, nor does it preempt state, local, or tribal law, the major concerns of EO 13132 and 13175. When using the refrigerants in this final rule, technicians, end users, and manufacturers would need to comply with the requirements in this final rule and must also comply with state, local, or tribal laws. For example, if local occupancy codes do not allow intentional release of hydrocarbons on the premises, or if a state regulation limits VOC releases, a technician may not be able to release hydrocarbon refrigerants to the atmosphere, even if they would be permitted to do so by this rule.

J. Relationship With Other Rules

Comment: NAFEM, Master-Bilt Products, and private citizens raised concerns about the relationship between this rule and the proposed rule, *Protection of Stratospheric Ozone: Change of Listing Status for Certain Substitutes under the Significant New Alternatives Policy Program* (August 6, 2014, 79 FR 46126). Among the concerns expressed are that available alternatives to comply with the other proposed rule are not commercially available drop-in replacements, thus requiring redesign of equipment, additional testing, training, and cost; the compliance date proposed in the other rule is too short; the potential for detrimental effects of alternative refrigerants on energy efficiency demanded by Department of Energy (DOE) standards; and the charge size restrictions in this rule will mean many types of equipment will not be able to use the refrigerants listed in this rule to comply with the Change of Listing Status proposed rule.

Response: The concerns raised by these commenters concern the basis for certain decisions in the Change of Listing Status proposed rule, including whether alternatives other than those we propose to list as unacceptable are available and what is the appropriate date on which a substitute is no longer acceptable for use. EPA will address these issues concerning the Change of Listing Status proposed rule when we take final action on that proposal. As discussed above in section VI.B.2, ''Energy efficiency and indirect climate impacts,'' available information supports reduced energy use with the refrigerants being listed in this final rule. We note that we are continually reviewing and listing additional alternatives for the various end-uses at issue.

Comment: NAFEM stated that their industry has been inundated with various DOE energy standards rulemakings, as well as this rule and the proposed rule concerning changing the listing status of some alternatives. The commenter mentioned the timing and cumulative impacts of other government actions and requested a 60-day

extension to the comment period for EPA's proposal to change the listing status of certain alternatives.

Response: This comment concerns the comment period on a separate rule. EPA responded to this request to extend the public comment period on the proposal to change the listing status of certain alternatives by granting a 14-day extension. For further information, please see EPA Docket # EPA–HQ–OAR–2014–0198, ''*Protection of Stratospheric Ozone: Change of Listing Status for Certain Substitutes under the Significant New Alternatives Policy Program*.''

K. Timing of Final Rule

Comment: Daikin, EIA, and some private citizens requested EPA to move forward with the final rule as quickly as possible, while NAFEM requested that EPA delay both this final rule and the final rule to change the listing status of certain alternatives. Commenters in favor of finalizing the rule as quickly as possible cite environmental reasons and point out that hydrocarbons are already widely in use around the world. Commenters in favor of delay note the separate proposal concerning the change of status of certain substitutes and requested that EPA extend the compliance deadline to ensure adequate training.

Response: EPA appreciates the support from those commenters requesting rapid promulgation of this rule. We agree that finalizing this rule promptly allows for earlier use of the lower GWP refrigerants in this rule and allows earlier and greater climate benefits than delaying issuance of the rule. Training would be more useful for technicians and manufacturer personnel if it addresses the requirements of this final rule as set forth in the use conditions. We disagree with the commenter who suggests that this rule should not be finalized, and thus the substitutes should not be acceptable for use, until there is ''adequate training.'' Some companies have already begun training and are prepared to use these refrigerants now. As we discussed in section VI.F, ''Technician training'' above, we are not including a requirement for technician training as a use condition. Further, we believe that issuing this final rule with a delayed date of compliance would increase risk to manufacturers and the public. A number of submitters have provided EPA with the required 90-day notice prior to introducing these substitutes into interstate commerce; therefore, delaying the compliance date would not delay introduction of these substitutes, but it would allow some equipment to be manufactured without meeting the use conditions of this rule, which we believe are necessary to mitigate risk sufficiently for these substitutes to be acceptable. If the commenter is instead referring to delaying the date of compliance of the Change of Listing Status Rule, we will address that compliance date when we take final action on that rule.

L. Other Comments

1. Propylene

Comment: A.S Trust & Holdings commented that propylene, a component of the refrigerant R–443A, is not toxic and included an industry standard reference to prove this. This commenter also stated that they thought EPA was confusing propylene with propylene glycol.

Response: EPA has not proposed action on propylene or on R–443A in this rule and is not taking action on propylene or R–443A at this time. We included propylene in our analysis of air quality effects because EPA has received a submission for R–443A, a blend containing propylene, for use in residential air conditioners, including portable AC units. In order to consider the potential ground-level ozone impacts of all refrigerants under review for the end-uses in this rule, we analyzed the potential impacts of propylene along with other hydrocarbon refrigerants. However, our review has not progressed to include review of R–443A's toxicity.

We note that in our reviews of toxicity, we do not characterize substances as ''toxic'' or ''non-toxic.'' Rather, EPA considers exposure limits and potential exposure concentrations when assessing the toxicity and determining whether a substitute should be listed as acceptable and, if so, whether a use condition is necessary. For example, for propane, EPA evaluated whether long-term exposure would exceed a TLV of 1,000 ppm and whether short-term exposure would exceed an AEGL of 6,900 ppm. If EPA uses the same approach for other refrigerants mentioned by the commenter, we might use industry exposure limits that are more difficult to achieve (*e.g.,* TLV of 500 ppm for propylene).

2. R–443A

Comment: A.S Trust & Holdings commented on certain assumptions that EPA mentioned as its likely approach to assessing R–443A, including worst-case assumptions. This commenter referred EPA to his own risk assessment provided to the Agency, as well as a sizing guide.

Response: EPA has consistently evaluated alternatives through a risk screen process that begins with a highly conservative worst-case scenario, such as where the entire refrigerant charge of a window AC unit leaks out rapidly in a specific room size. If a substitute's concentrations remain below the LFL and relevant toxicity limits in the worst-case scenario with highly conservative assumptions, we do no further assessment. If the substitute's concentrations exceed the LFL or a relevant toxicity limit in the worst-case scenario, then we consider more typical scenarios based on less conservative assumptions. EPA will consider the submitter's risk assessment and recommended charge sizes as part of our ongoing review of R–443A. EPA has not proposed action on R–443A in this rule and is not taking action on R–443A at this time.

3. Reductions of HFC Emissions Under Other Sections of CAA Title VI

Comment: CARB urges EPA to continue to use its existing authority under the CAA Sections 608 and 609 to reduce HFC emissions from all sources, including stationary refrigeration and AC, insulating foam, consumer product aerosol propellants, and MVAC.

Response: The comment's suggestions go beyond the scope of this rule. Separate from this rulemaking action, EPA is considering input from various stakeholders about possible actions under Section 608 and other parts of the Act to address impacts of HFCs and would welcome any comments the commenter would care to provide on this subject.

4. Refrigerants for Retrofit

Comment: Hudson Technologies suggested that the determination that a substitute is acceptable for use as a retrofit refrigerant for existing equipment should be more highly scrutinized by EPA, even when dealing with non-flammable substitutes. This commenter recommends that EPA limit listings for acceptable refrigerants to use in new equipment unless the substitute has a lower GWP and the use of the substitute in existing equipment will not result in loss of efficiency.

Response: This comment goes beyond the scope of this rulemaking. This final rule establishes use conditions limiting the five refrigerants listed to use in new equipment designed for that refrigerant. EPA evaluates each submission on its merits and where a submitter requests that a substitute be listed as acceptable for use in retrofit equipment, we

consider such requests based on the same criteria that we consider in reviewing all SNAP submissions.

VII. Statutory and Executive Order Reviews

Additional information about these statutes and Executive Orders can be found at *www2.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 not a significant regulatory action and was therefore not submitted to the Office of Management and Budget (OMB) for review.

B. Paperwork Reduction Act

This action does not impose any new information collection burden under the PRA. OMB has previously approved the information collection activities contained in the existing regulations and has assigned OMB control number 2060–0226. This final rule contains no new requirements for reporting or recordkeeping.

C. Regulatory Flexibility Act

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 impact of concern is any significant adverse economic impact on small entities. An agency may certify that a rule will not have a significant economic impact on a substantial number of small entities if the rule relieves regulatory burden, has no net burden or otherwise has a positive economic effect on the small entities subject to the rule.

Today's action allows equipment manufacturers the additional options of using ethane, HFC–32, isobutane, propane, and R–441A in the specified end-uses but does not mandate such use. Because refrigeration and AC equipment for these refrigerants are not manufactured yet in the U.S. for the end-uses (with the exception of limited test-marketing), no change in business practice is required to meet the use conditions, resulting in no adverse impact compared to the absence of this rule. Provisions that allow venting of hydrocarbon refrigerants in the uses addressed by this rule reduce regulatory burden. We have therefore concluded that this action will relieve regulatory burden for all small entities that choose to use one of the newly listed hydrocarbon refrigerants.

The use conditions of this rule apply to manufacturers of household and commercial refrigerators and freezers, vending machines, non-mechanical heat transfer equipment, very low temperature refrigeration equipment for laboratories and room air conditioners that choose to use these refrigerants.

D. Unfunded Mandates Reform Act

This action does not contain any unfunded mandate as described in UMRA, 2 United States Code (U.S.C.) 1531–1538, and does not significantly or uniquely affect small governments. This action imposes no enforceable duty on any state, local, or tribal governments or the private sector.

E. Executive Order 13132: Federalism

This action does not have federalism implications. It will not have substantial direct effects on the states, on the relationship between the national government and the states, or on the distribution of power and responsibilities among the various levels of government.

F. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments

This action does not have tribal implications, as specified in E.O. 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. Thus, Executive Order 13175 does not apply to this action.

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

This action is not subject to E.O. 13045 because it is not economically significant as defined in E.O. 12866, and because the environmental health or safety risks addressed by this action do not present a disproportionate risk to children. This action's health and risk assessments are contained in Section IV.C of the preamble and in the risk screens in the docket for this rulemaking.

H. Executive Order 13211: Actions That Significantly Affect Energy Supply, Distribution, or Use

This action is not a ''significant energy action'' because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy. Available information indicates that these new systems may be more energy efficient than currently available systems in some climates.

I. National Technology Transfer and Advancement Act

This action includes technical standards. EPA has decided to use standards from UL in the use conditions for the five listed substitutes. EPA is incorporating by reference portions of current editions of the UL Standards 250, ''Household Refrigerators and Freezers'' (10th Edition, August 25, 2000), 471, ''Commercial Refrigerators and Freezers'' (10th Edition, November 24, 2010), 541 ''Refrigerated Vending Machines'' (7th Edition, December 30, 2011), and 484 ''Room Air Conditioners'' (8th Edition, August 3, 2012), which include requirements for safe use of flammable refrigerants. This final rule ensures that these new substitutes for household and commercial refrigerators and freezers, vending machines, non-mechanical heat transfer equipment, very low temperature refrigeration equipment, and room air conditioners do not present significantly greater risk to human health or the environment than other available substitutes. These standards may be purchased by mail at: COMM 2000; 151 Eastern Avenue; Bensenville, IL 60106; Email: *orders@comm-2000.com;* Telephone: 1–888–853–3503 in the U.S. or Canada (other countries dial +1–415–352–2168); Internet address: *http://ulstandardsinfonet.ul.com/* or *www.comm-2000.com.*

J. Executive Order 12898: Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations

The EPA believes the human health or environmental risk addressed by this action will not have potential disproportionately high and adverse human health or environmental effects on minority, low-income or indigenous populations because this action provides human health and environmental protection for all affected populations without having any disproportionately high and adverse human health or environmental effects on any population, including any minority or low-income population. This final rule provides refrigerant substitutes that have no ODP and lower GWP than other substitutes currently listed as acceptable. The reduction in ODS and GHG emissions assists in restoring the stratospheric ozone layer and provides climate benefits. The results of this evaluation are contained in sections III. and IV. of the preamble.

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 is not a ''major rule'' as defined by 5 U.S.C. 804(2).

VIII. References

This preamble references the following documents, which are also in the Air Docket at the address listed in Section I.B.1. Unless specified otherwise, all documents are available electronically through the Federal Docket Management System, Docket # EPA–HQ–OAR–2013–0748.

AHRI, 2012. AHRI Guideline N–2012: Assignment of Refrigerant Container Colors. 2012.

AIRAH, 2013. Flammable Refrigerants—Safety Guide. Australian Institute of Refrigeration, Air Conditioning and Heating. 2013.

ASHRAE, 2010. American National Standards Institute (ANSI)/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). Standard 34–2010 (supersedes ANSI/ASHRAE Standard 34–2007): Designation and Safety Classification of Refrigerants. 2010.

A.S. Trust & Holdings, 2012. Significant New Alternatives Policy Program Submission to the United States Environmental Protection Agency for R–441A in retail food refrigeration.

A/S Vestfrost, 2012. Significant New Alternatives Policy Program Submission to the United States Environmental Protection Agency for isobutane in retail food refrigeration.

Climate Action Plan, 2013. The President's Climate Action Plan. Executive Office of the President. June, 2013. Available online at *www.whitehouse.gov/sites/default/files/image/president27sclimateactionplan.pdf.*

Chinese Household Electrical Appliance Association (CHEAA), 2013. Significant New Alternatives Policy Program Submission to the United States Environmental Protection Agency for Propane (R–290) in residential and light commercial air conditioning and dehumidifiers.

Daikin, 2011. Significant New Alternatives Policy Program Submission to the United States Environmental Protection Agency for HFC–32 in residential and light commercial air conditioning.

EPA, 2007. Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze. U.S. Environmental Protection Agency Office of Air Quality Planning and Standards. April 2007.

EPA, 2015. Derivation of Charge Limits for Room Air Conditioners. Staff memo to Air Docket. 2015.

ICF, 2014a. Assessment of the Potential Impact of Hydrocarbon Refrigerants on Ground-Level Ozone Concentrations.

ICF, 2014b. Risk Screen on Substitutes for CFC–12, HCFC–22 and R–502 in Retail Food Refrigeration; Substitute: Isobutane (R–600a)

ICF, 2014c. Risk Screen on Substitutes for CFC–12, HCFC–22 and R–502 in Retail Food Refrigeration; Substitute: R–441A

ICF, 2014d. Risk Screen on Substitute for CFC–12, CFC–13, R–13B1, and R–503 in Very Low Temperature Refrigeration and Non-Mechanical Heat Transfer; Substitute: Ethane (R–170)

ICF, 2014e. Risk Screen on Substitutes for CFC–12 and R–502 in Vending Machines; Substitute: R–441A

ICF, 2014f. Risk Screen on Substitutes for CFC–12 and R–502 in Vending Machines; Substitute: Isobutane (R–600a)

ICF, 2014g. Risk Screen on Substitutes for CFC–12 and R–502 in Vending Machines; Substitute: Propane (R–290)

ICF, 2014h. Risk Screen on Substitutes for CFC–12 and HCFC–22 in Household Refrigerators and Household Freezers.; Substitute: Propane (R–290).

ICF, 2014i. Risk Screen on Substitutes for HCFC–22 in Residential and Light Commercial Air Conditioning and Heat Pumps; Substitute: Propane (R–290)

ICF, 2014j. Risk Screen on Substitutes for HCFC–22 in Residential and Light Commercial Air Conditioning and Heat Pumps; Substitute: HFC–32 (Difluoromethane)

ICF, 2014k. Risk Screen on Substitutes for HCFC–22 in Residential and Light Commercial Air Conditioning and Heat Pumps; Substitute: R–441A

ICF, 2015a. Potential impacts of trifluoroacetic acid (TFA) generated from HFC–32 in room air conditioners. January, 2015.

ICF, 2015b. Potential Impacts of Hydrocarbon Refrigerants during Recycling and Disposal of Appliances. January, 2015.

IEC 60225–2–40. Safety of Household and Similar Electrical Appliances, Part 2–40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers. 5th Edition. December, 2013.

Intergovernmental Panel on Climate Change (IPCC), 2007. *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M.Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. This document is accessible at *www.ipcc.ch/publications_and_data/ar4/wg1/en/contents.html*

Montzka, S.A., 2012. HFCs in the Atmosphere: Concentrations, Emissions and Impacts, ASHRAE/NIST Conference 2012.

National Oceanic and Atmospheric Administration (NOAA), 2013. NOAA emissions data on HFCs. Available online at *ftp://ftp.cmdl.noaa.gov/hats/hfcs/.*

Oak Ridge National Lab (ORNL), 1997. J. Sand, S. Fischer, and V. Baxter, ''Energy and Global Warming Impacts of HFC Refrigerants and Emerging Technologies,'' 1997, Oak Ridge National Lab.

Ravishankara et al., 1994. Ravishankara, A.R., A.A. Turnipseed, N.R. Jensen, S. Barone, M. Mills, C. J. Howard, and S. Solomon. Do hydrofluorocarbons destroy stratospheric ozone? *Science* 263: 71–75. 1994.

Sheldon, 1989. Sheldon, L.S., et al. 1989. ''An Investigation of Infiltration and Indoor Air Quality.'' New York State Energy Research & Development Authority, Report 90–11. As cited in ICF, 2014h, Risk screen for propane in household refrigerators and freezers.

UL 250. Household Refrigerators and Freezers. 10th edition. Supplement SA: Requirements for Refrigerators and Freezers Employing a Flammable Refrigerant in the Refrigerating System. August 2000.

UL 471. Commercial Refrigerators and Freezers. 10th edition. Supplement SB: Requirements for Refrigerators and Freezers Employing a Flammable Refrigerant in the Refrigerating System. November 2010.

UL 484. Room Air Conditioners. 8th edition. Supplement SA: Requirements for Refrigerated Venders Employing a Flammable Refrigerant in the Refrigerating System. August 2012.

UL 541. Refrigerated Vending Machines. 7th edition. Supplement SA: Requirements for Room Air Conditioners Employing a Flammable Refrigerant in the Refrigerating System. December 2011.

UL 60335–2–40. Safety of Household and Similar Electrical Appliances, Part 2–40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers. First Edition. November, 2012.

World Meteorological Organization (WMO), 2010. Scientific Assessment of Ozone Depletion: 2010, Global Ozone Research and Monitoring Project—Report No. 52, 516 pp., Geneva, Switzerland, 2011. This document is accessible at *www.wmo.int/pages/prog/arep/gaw/ozone_2010/ozone_asst_report.html.*

List of Subjects in 40 CFR Part 82

Environmental protection, Administrative practice and procedure, Air pollution control, Incorporation by reference, Recycling, Reporting and recordkeeping requirements, Stratospheric ozone layer.

Dated: February 27, 2015.

Gina McCarthy,

Administrator.

For the reasons stated in the preamble, 40 CFR part 82 is amended as follows:

PART 82—PROTECTION OF STRATOSPHERIC OZONE

■ 1. The authority citation for part 82 continues to read as follows:

Authority: 42 U.S.C. 7414, 7601, 7671–7671q.

Subpart F—Recycling and Emissions Reduction

■ 2. Amend § 82.154 by adding paragraph (a)(1)(iii) to read as follows:

§ 82.154 Prohibitions.

(a)(1) * * *

(iii) Effective June 9, 2015:

(A) Isobutane (R–600a) and R–441A in retail food refrigerators and freezers (stand-alone units only);

(B) Propane (R–290) in household refrigerators, freezers, and combination refrigerators and freezers;

(C) Ethane (R–170) in very low temperature refrigeration equipment and equipment for non-mechanical heat transfer;

(D) R–441A, propane, and isobutane in vending machines; and

(E) Propane and R–441A in self-contained room air conditioners for residential and light commercial air conditioning and heat pumps.

* * * * *

Subpart G—Significant New Alternatives Policy Program

■ 3. Appendix R to Subpart G is revised to read as follows:

Appendix R to Subpart G of Part 82—Substitutes Subject to Use Restrictions Listed in the December 20, 2011, final rule, Effective February 21, 2012, and in the April 10, 2015 Final Rule, Effective May 11, 2015

SUBSTITUTES THAT ARE ACCEPTABLE SUBJECT TO USE CONDITIONS

End-use	Substitute	Decision	Use conditions	Further information
Household refrigerators, freezers, and combination refrigerators and freezers. (New equipment only)	Isobutane (R–600a). Propane (R–290) R–441A	Acceptable subject to use conditions.	These refrigerants may be used only in new equipment designed specifically and clearly identified for the refrigerant (i.e., none of these substitutes may be used as a conversion or "retrofit" refrigerant for existing equipment designed for a different refrigerant). These refrigerants may be used only in a refrigerator or freezer, or combination refrigerator and freezer, that meets all requirements listed in Supplement SA to the 10th edition of the Underwriters Laboratories (UL) Standard for Household Refrigerators and Freezers, UL 250, dated August 25, 2000. In cases where the final rule includes requirements more stringent than those of the 10th edition of UL 250, the appliance must meet the requirements of the final rule in place of the requirements in the UL Standard. The charge size must not exceed 57 g (2.01 oz) in any refrigerator, freezer, or combination refrigerator and freezer in each circuit.	Applicable OSHA requirements at 29 CFR part 1910 must be followed, including those at 29 CFR 1910.106 (flammable and combustible liquids), 1910.110 (storage and handling of liquefied petroleum gases), 1910.157 (portable fire extinguishers), and 1910.1000 (toxic and hazardous substances). Proper ventilation should be maintained at all times during the manufacture and storage of equipment containing hydrocarbon refrigerants through adherence to good manufacturing practices as per 29 CFR 1910.106. If refrigerant levels in the air surrounding the equipment rise above one-fourth of the lower flammability limit, the space should be evacuated and reentry should occur only after the space has been properly ventilated. Technicians and equipment manufacturers should wear appropriate personal protective equipment, including chemical goggles and protective gloves, when handling these refrigerants. Special care should be taken to avoid contact with the skin since these refrigerants, like many refrigerants, can cause freeze burns on the skin. A Class B dry powder type fire extinguisher should be kept nearby. Technicians should only use spark-proof tools when working on refrigerators and freezers with these refrigerants. Any recovery equipment used should be designed for flammable refrigerants. Any refrigerant releases should be in a well-ventilated area, such as outside of a building. Only technicians specifically trained in handling flammable refrigerants should service refrigerators and freezers containing these refrigerants. Technicians should gain an understanding of minimizing the risk of fire and the steps to use flammable refrigerants safely.

SUBSTITUTES THAT ARE ACCEPTABLE SUBJECT TO USE CONDITIONS—Continued

End-use	Substitute	Decision	Use conditions	Further information
Household refrigerators, freezers, and combination refrigerators and freezers. (New equipment only)	Isobutane (R–600a). Propane (R–290) R–441A	Acceptable subject to use conditions.	As provided in clauses SA6.1.1 and SA6.1.2 of UL Standard 250, 10th edition, the following markings must be attached at the locations provided and must be permanent: (a) On or near any evaporators that can be contacted by the consumer: ''DANGER-Risk of Fire or Explosion. Flammable Refrigerant Used. Do Not Use Mechanical Devices To Defrost Refrigerator. Do Not Puncture Refrigerant Tubing.''. (b) Near the machine compartment: ''DANGER—Risk of Fire or Explosion. Flammable Refrigerant Used. To Be Repaired Only By Trained Service Personnel. Do Not Puncture Refrigerant Tubing.''. (c) Near the machine compartment: ''CAUTION—Risk of Fire or Explosion. Flammable Refrigerant Used. Consult Repair Manual/Owner's Guide Before Attempting To Service This Product. All Safety Precautions Must Be Followed.''. (d) On the exterior of the refrigerator: ''CAUTION—Risk of Fire or Explosion. Dispose of Properly In Accordance With Federal Or Local Regulations. Flammable Refrigerant Used.''. (e) Near any and all exposed refrigerant tubing: ''CAUTION—Risk of Fire or Explosion Due To Puncture Of Refrigerant Tubing; Follow Handling Instructions Carefully. Flammable Refrigerant Used.''. All of these markings must be in letters no less than 6.4 mm (1/4 inch) high. The refrigerator, freezer, or combination refrigerator and freezer must have red, Pantone® Matching System (PMS) #185 marked pipes, hoses, or other devices through which the refrigerant is serviced (typically known as the service port) to indicate the use of a flammable refrigerant. This color must be present at all service ports and where service puncturing or otherwise creating an opening from the refrigerant circuit to the atmosphere might be expected (e.g., process tubes). The color mark must extend at least 2.5 centimeters (1 inch) from the compressor and must be replaced if removed.	Room occupants should evacuate the space immediately following the accidental release of this refrigerant. If a service port is added then household refrigerators, freezers, and combination refrigerator and freezers using these refrigerants should have service aperture fittings that differ from fittings used in equipment or containers using non-flammable refrigerant. ''Differ'' means that either the diameter differs by at least 1/16 inch or the thread direction is reversed (i.e., right-handed vs. left-handed). These different fittings should be permanently affixed to the unit at the point of service and maintained until the end-of-life of the unit, and should not be accessed with an adaptor.

SUBSTITUTES THAT ARE ACCEPTABLE SUBJECT TO USE CONDITIONS—Continued

End-use	Substitute	Decision	Use conditions	Further information
Retail food refrigerators and freezers (stand-alone units only). (New equipment only)	Isobutane (R–600a). Propane (R–290). R–441A	Acceptable subject to use conditions.	As provided in clauses SB6.1.2 to SB6.1.5 of UL Standard 471, 10th edition, the following markings must be attached at the locations provided and must be permanent: (a) On or near any evaporators that can be contacted by the consumer: ''DANGER—Risk of Fire or Explosion. Flammable Refrigerant Used. Do Not Use Mechanical Devices To Defrost Refrigerator. Do Not Puncture Refrigerant Tubing.''. (b) Near the machine compartment: ''DANGER—Risk of Fire or Explosion. Flammable Refrigerant Used. To Be Repaired Only By Trained Service Personnel. Do Not Puncture Refrigerant Tubing.''. (c) Near the machine compartment: ''CAUTION—Risk of Fire or Explosion. Flammable Refrigerant Used. Consult Repair Manual/Owner's Guide Before Attempting To Service This Product. All Safety Precautions Must be Followed.''. (d) On the exterior of the refrigerator: ''CAUTION—Risk of Fire or Explosion. Dispose of Properly In Accordance With Federal Or Local Regulations. Flammable Refrigerant Used.''. (e) Near any and all exposed refrigerant tubing: ''CAUTION—Risk of Fire or Explosion Due To Puncture Of Refrigerant Tubing; Follow Handling Instructions Carefully. Flammable Refrigerant Used.''. All of these markings must be in letters no less than 6.4 mm (1/4 inch) high. The refrigerator or freezer must have red, Pantone® Matching System (PMS) #185 marked pipes, hoses, and other devices through which the refrigerant is serviced, typically known as the service port, to indicate the use of a flammable refrigerant. This color must be present at all service ports and where service puncturing or otherwise creating an opening from the refrigerant circuit to the atmosphere might be expected (e.g., process tubes). The color mark must extend at least 2.5 centimeters (1 inch) from the compressor and must be replaced if removed.	Room occupants should evacuate the space immediately following the accidental release of this refrigerant. If a service port is added then retail food refrigerators and freezers using these refrigerants should have service aperture fittings that differ from fittings used in equipment or containers using non-flammable refrigerant. ''Differ'' means that either the diameter differs by at least 1/16 inch or the thread direction is reversed (i.e., right-handed vs. left-handed). These different fittings should be permanently affixed to the unit at the point of service and maintained until the end-of-life of the unit, and should not be accessed with an adaptor.

SUBSTITUTES THAT ARE ACCEPTABLE SUBJECT TO USE CONDITIONS—Continued

End-use	Substitute	Decision	Use conditions	Further information
Very low temperature refrigeration. Non-mechanical heat transfer (New equipment only)	Ethane (R–170).	Acceptable subject to use conditions.	This refrigerant may be used only in new equipment specifically designed and clearly identified for the refrigerant (i.e., the substitute may not be used as a conversion or ''retrofit'' refrigerant for existing equipment designed for other refrigerants). This refrigerant may only be used in equipment that meets all requirements in Supplement SB to the 10th edition of the Underwriters Laboratories (UL) Standard for Commercial Refrigerators and Freezers, UL 471, dated November 24, 2010. In cases where the final rule includes requirements more stringent than those of the 10th edition of UL 471, the appliance must meet the requirements of the final rule in place of the requirements in the UL Standard. The charge size for the equipment must not exceed 150 g (5.29 oz) in each circuit.	Applicable OSHA requirements at 29 CFR part 1910 must be followed, including those at 29 CFR 1910.94 (ventilation) and 1910.106 (flammable and combustible liquids), 1910.110 (storage and handling of liquefied petroleum gases), 1910.157 (portable fire extinguishers), and 1910.1000 (toxic and hazardous substances). Proper ventilation should be maintained at all times during the manufacture and storage of equipment containing hydrocarbon refrigerants through adherence to good manufacturing practices as per 29 CFR 1910.106. If refrigerant levels in the air surrounding the equipment rise above one-fourth of the lower flammability limit, the space should be evacuated and reentry should occur only after the space has been properly ventilated. Technicians and equipment manufacturers should wear appropriate personal protective equipment, including chemical goggles and protective gloves, when handling ethane. Special care should be taken to avoid contact with the skin since ethane, like many refrigerants, can cause freeze burns on the skin. A Class B dry powder type fire extinguisher should be kept nearby. Technicians should only use spark-proof tools when working on equipment with flammable refrigerants. Any recovery equipment used should be designed for flammable refrigerants. Any refrigerant releases should be in a well-ventilated area, such as outside of a building. Only technicians specifically trained in handling flammable refrigerants should service equipment containing ethane. Technicians should gain an understanding of minimizing the risk of fire and the steps to use flammable refrigerants safely.

SUBSTITUTES THAT ARE ACCEPTABLE SUBJECT TO USE CONDITIONS—Continued

End-use	Substitute	Decision	Use conditions	Further information
Very low temperature refrigeration. Non-mechanical heat transfer (New equipment only)	Ethane (R–170).	Acceptable subject to use conditions.	As provided in clauses SB6.1.2 to SB6.1.5 of UL Standard 471, 10th edition, the following markings must be attached at the locations provided and must be permanent: (a) On or near any evaporators that can be contacted by the consumer: ''DANGER—Risk of Fire or Explosion. Flammable Refrigerant Used. Do Not Use Mechanical Devices To Defrost Refrigerator. Do Not Puncture Refrigerant Tubing.''. (b) Near the machine compartment: ''DANGER—Risk of Fire or Explosion. Flammable Refrigerant Used. To Be Repaired Only By Trained Service Personnel. Do Not Puncture Refrigerant Tubing.''. (c) Near the machine compartment: ''CAUTION—Risk of Fire or Explosion. Flammable Refrigerant Used. Consult Repair Manual/Owner's Guide Before Attempting To Service This Product. All Safety Precautions Must be Followed.''. (d) On the exterior of the refrigerator: ''CAUTION—Risk of Fire or Explosion. Dispose of Properly In Accordance With Federal Or Local Regulations. Flammable Refrigerant Used.''. (e) Near any and all exposed refrigerant tubing: ''CAUTION—Risk of Fire or Explosion Due To Puncture Of Refrigerant Tubing; Follow Handling Instructions Carefully. Flammable Refrigerant Used.''. All of these markings must be in letters no less than 6.4 mm (1/4 inch) high. The refrigeration equipment must have red, Pantone® Matching System (PMS) #185 marked pipes, hoses, and other devices through which the refrigerant is serviced, typically known as the service port, to indicate the use of a flammable refrigerant. This color must be present at all service ports and where service puncturing or otherwise creating an opening from the refrigerant circuit to the atmosphere might be expected (e.g., process tubes). The color mark must extend at least 2.5 centimeters (1 inch) from the compressor and must be replaced if removed.	Room occupants should evacuate the space immediately following the accidental release of this refrigerant. If a service port is added then refrigeration equipment using this refrigerant should have service aperture fittings that differ from fittings used in equipment or containers using non-flammable refrigerant. ''Differ'' means that either the diameter differs by at least 1/16 inch or the thread direction is reversed (i.e., right-handed vs. left-handed). These different fittings should be permanently affixed to the unit at the point of service and maintained until the end-of-life of the unit, and should not be accessed with an adaptor. Example of non-mechanical heat transfer using this refrigerant would be use in a secondary loop of a thermosiphon.

SUBSTITUTES THAT ARE ACCEPTABLE SUBJECT TO USE CONDITIONS—Continued

End-use	Substitute	Decision	Use conditions	Further information
Vending Machines. (New equipment only)	Isobutane (R–600a). Propane (R–290) R–441A	Acceptable subject to use conditions.	These refrigerants may be used only in new equipment specifically designed and clearly identified for the refrigerants (i.e., none of these substitutes may be used as a conversion or ''retrofit'' refrigerant for existing equipment designed for other refrigerants). Detaching and replacing the old refrigeration circuit from the outer casing of the equipment with a new one containing a new evaporator, condenser, and refrigerant tubing within the old casing is considered ''new'' equipment and not a retrofit of the old, existing equipment. These substitutes may only be used in equipment that meets all requirements in Supplement SA to the 7th edition of the Underwriters Laboratories (UL) Standard for Refrigerated Vending Machines, UL 541, dated December, 2011. In cases where the final rule includes requirements more stringent than those of the 7th edition of UL 541, the appliance must meet the requirements of the final rule in place of the requirements in the UL Standard. The charge size for vending machines must not exceed 150 g (5.29 oz) in each circuit.	Applicable OSHA requirements at 29 part 1910 must be followed, including those at 29 CFR 1910.94 (ventilation) and 1910.106 (flammable and combustible liquids), 1910.110 (storage and handling of liquefied petroleum gases), 1910.157 (portable fire extinguishers), and 1910.1000 (toxic and hazardous substances). Proper ventilation should be maintained at all times during the manufacture and storage of equipment containing hydrocarbon refrigerants through adherence to good manufacturing practices as per 29 CFR 1910.106. If refrigerant levels in the air surrounding the equipment rise above one-fourth of the lower flammability limit, the space should be evacuated and reentry should occur only after the space has been properly ventilated. Technicians and equipment manufacturers should wear appropriate personal protective equipment, including chemical goggles and protective gloves, when handling these refrigerants. Special care should be taken to avoid contact with the skin since these refrigerants, like many refrigerants, can cause freeze burns on the skin. A Class B dry powder type fire extinguisher should be kept nearby. Technicians should only use spark-proof tools when working on refrigeration equipment with flammable refrigerants. Any recovery equipment used should be designed for flammable refrigerants. Any refrigerant releases should be in a well-ventilated area, such as outside of a building. Only technicians specifically trained in handling flammable refrigerants should service refrigeration equipment containing these refrigerants. Technicians should gain an understanding of minimizing the risk of fire and the steps to use flammable refrigerants safely.

SUBSTITUTES THAT ARE ACCEPTABLE SUBJECT TO USE CONDITIONS—Continued

End-use	Substitute	Decision	Use conditions	Further information
Vending Machines. (New equipment only)	Isobutane (R–600a). Propane (R–290) R–441A	Acceptable subject to use conditions.	As provided in clauses SA6.1.2 to SA6.1.5 of UL Standard 541, 7th edition, the following markings must be attached at the locations provided and must be permanent: (a) On or near any evaporators that can be contacted by the consumer: ''DANGER—Risk of Fire or Explosion. Flammable Refrigerant Used. Do Not Use Mechanical Devices To Defrost Refrigerator. Do Not Puncture Refrigerant Tubing.''. (b) Near the machine compartment: ''DANGER—Risk of Fire or Explosion. Flammable Refrigerant Used. To Be Repaired Only By Trained Service Personnel. Do Not Puncture Refrigerant Tubing.''. (c) Near the machine compartment: ''CAUTION—Risk of Fire or Explosion. Flammable Refrigerant Used. Consult Repair Manual/Owner's Guide Before Attempting To Service This Product. All Safety Precautions Must be Followed.''. (d) On the exterior of the refrigerator: ''CAUTION—Risk of Fire or Explosion. Dispose of Properly In Accordance With Federal Or Local Regulations. Flammable Refrigerant Used.''. (e) Near any and all exposed refrigerant tubing: ''CAUTION—Risk of Fire or Explosion Due To Puncture Of Refrigerant Tubing; Follow Handling Instructions Carefully. Flammable Refrigerant Used.''. All of these markings must be in letters no less than 6.4 mm (1/4 inch) high. The refrigeration equipment must have red, Pantone® Matching System (PMS) #185 marked pipes, hoses, and other devices through which the refrigerant is serviced, typically known as the service port, to indicate the use of a flammable refrigerant. This color must be present at all service ports and where service puncturing or otherwise creating an opening from the refrigerant circuit to the atmosphere might be expected (e.g., process tubes). The color mark must extend at least 2.5 centimeters (1 inch) from the compressor and must be replaced if removed.	Room occupants should evacuate the space immediately following the accidental release of this refrigerant. If a service port is added then refrigeration equipment using this refrigerant should have service aperture fittings that differ from fittings used in equipment or containers using non-flammable refrigerant. ''Differ'' means that either the diameter differs by at least 1/16 inch or the thread direction is reversed (i.e., right-handed vs. left-handed). These different fittings should be permanently affixed to the unit at the point of service and maintained until the end-of-life of the unit, and should not be accessed with an adaptor.

SUBSTITUTES THAT ARE ACCEPTABLE SUBJECT TO USE CONDITIONS—Continued

End-use	Substitute	Decision	Use conditions	Further information
Residential and light-commercial air conditioning and heat pumps—self-contained room air conditioners only. (New equipment only)	HFC–32 ..... Propane (R–290) R–441A	Acceptable subject to use conditions.	These refrigerants may be used only in new equipment specifically designed and clearly identified for the refrigerants (i.e., none of these substitutes may be used as a conversion or ''retrofit'' refrigerant for existing equipment designed for other refrigerants) These refrigerants may only be used in equipment that meets all requirements in Supplement SA and Appendices B through F of the 8th edition of the Underwriters Laboratories (UL) Standard for Room Air Conditioners, UL 484, dated August 3, 2012. In cases where the final rule includes requirements more stringent than those of the 8th edition of UL 484, the appliance must meet the requirements of the final rule in place of the requirements in the UL Standard. The charge size for the entire air conditioner must not exceed the maximum refrigerant mass determined according to Appendix F of UL 484, 8th edition for the room size where the air conditioner is used. The charge size for these three refrigerants must in no case exceed 7,960 g (280.8 oz or 17.55 lb) of HFC–32; 1,000 g (35.3 oz or 2.21 lbs) of propane; or 1,000 g (35.3 oz or 2.21 lb) of R–441A. For portable air conditioners, the charge size must in no case exceed 2,450 g (80.0 oz or 5.0 lb) of HFC–32; 300 g (10.6 oz or 0.66 lbs) of propane; or 330 g (11.6 oz or 0.72 lb) of R–441A. The manufacturer must design a charge size for the entire air conditioner that does not exceed the amount specified for the unit's cooling capacity, as specified in Table A, B, C, D, or E of this Appendix.	Applicable OSHA requirements at 29 CFR part 1910 must be followed, including those at 29 CFR 1910.94 (ventilation) and 1910.106 (flammable and combustible liquids), 1910.110 (storage and handling of liquefied petroleum gases), 1910.157 (portable fire extinguishers), and 1910.1000 (toxic and hazardous substances). Proper ventilation should be maintained at all times during the manufacture and storage of equipment containing hydrocarbon refrigerants through adherence to good manufacturing practices as per 29 CFR 1910.106. If refrigerant levels in the air surrounding the equipment rise above one-fourth of the lower flammability limit, the space should be evacuated and reentry should occur only after the space has been properly ventilated. Technicians and equipment manufacturers should wear appropriate personal protective equipment, including chemical goggles and protective gloves, when handling these refrigerants. Special care should be taken to avoid contact with the skin since these refrigerants, like many refrigerants, can cause freeze burns on the skin. A Class B dry powder type fire extinguisher should be kept nearby. Technicians should only use spark-proof tools when working on air conditioning equipment with flammable refrigerants. Any recovery equipment used should be designed for flammable refrigerants. Any refrigerant releases should be in a well-ventilated area, such as outside of a building. Only technicians specifically trained in handling flammable refrigerants should service refrigeration equipment containing these refrigerants. Technicians should gain an understanding of minimizing the risk of fire and the steps to use flammable refrigerants safely.

SUBSTITUTES THAT ARE ACCEPTABLE SUBJECT TO USE CONDITIONS—Continued

End-use	Substitute	Decision	Use conditions	Further information
Residential and light-commercial air conditioning and heat pumps—self-contained room air conditioners only. (New equipment only)	HFC–32 ..... Propane (R–290) R–441A	Acceptable subject to use conditions.	As provided in clauses SA6.1.2 to SA6.1.5 of UL 484, 8th edition, the following markings must be attached at the locations provided and must be permanent:. (a) On the outside of the air conditioner: ''DANGER—Risk of Fire or Explosion. Flammable Refrigerant Used. To Be Repaired Only By Trained Service Personnel. Do Not Puncture Refrigerant Tubing.''. (b) On the outside of the air conditioner: ''CAUTION—Risk of Fire or Explosion. Dispose of Properly In Accordance With Federal Or Local Regulations. Flammable Refrigerant Used.''. (c) On the inside of the air conditioner near the compressor: ''CAUTION—Risk of Fire or Explosion. Flammable Refrigerant Used. Consult Repair Manual/Owner's Guide Before Attempting To Service This Product. All Safety Precautions Must be Followed.''. (d) On the outside of each portable air conditioner: ''WARNING: Appliance hall be installed, operated and stored in a room with a floor area larger the ''X'' m^2 (Y ft^2).'' The value ''X'' on the label must be determined using the minimum room size in m^2 calculated using Appendix F of UL 484, 8th edition. For R–441A, use a lower flammability limit of 0.041 kg/m^3 in calculations in Appendix F of UL 484, 8th edition. All of these markings must be in letters no less than 6.4 mm (1/4 inch) high. The air conditioning equipment must have red, Pantone® Matching System (PMS) #185 marked pipes, hoses, and other devices through which the refrigerant is serviced, typically known as the service port, to indicate the use of a flammable refrigerant. This color must be present at all service ports and where service puncturing or otherwise creating an opening from the refrigerant circuit to the atmosphere might be expected (e.g., process tubes). The color mark must extend at least 2.5 centimeters (1 inch) from the compressor and must be replaced if removed.	Room occupants should evacuate the space immediately following the accidental release of this refrigerant. If a service port is added then air conditioning equipment using this refrigerant should have service aperture fittings that differ from fittings used in equipment or containers using non-flammable refrigerant. ''Differ'' means that either the diameter differs by at least 1/16 inch or the thread direction is reversed (i.e., right-handed vs. left-handed). These different fittings should be permanently affixed to the unit at the point of service and maintained until the end-of-life of the unit, and should not be accessed with an adaptor. Air conditioning equipment in this category includes: Window air conditioning units. Portable room air conditioners. Packaged terminal air conditioners and heat pumps.

NOTE: The use conditions in this appendix contain references to certain standards from Underwriters Laboratories Inc. (UL). The standards are incorporated by reference, and the referenced sections are made part of the regulations in part 82:

1. UL 250: Household Refrigerators and Freezers. 10th edition. Supplement SA: Requirements for Refrigerators and Freezers Employing a Flammable Refrigerant in the Refrigerating System. Underwriters Laboratories, Inc. August 25, 2000.

2. UL 471. Commercial Refrigerators and Freezers. 10th edition. Supplement SB: Requirements for Refrigerators and Freezers Employing a Flammable Refrigerant in the Refrigerating System. Underwriters Laboratories, Inc. November 24, 2010.

3. UL 484. Room Air Conditioners. 8th edition. Supplement SA: Requirements for Room Air Conditioners Employing a Flammable Refrigerant in the Refrigerating System and Appendices B through F. December 21, 2007, with changes through August 3, 2012.

4. UL 541. Refrigerated Vending Machines. 7th edition. Supplement SA: Requirements for Refrigerated Venders Employing a Flammable Refrigerant in the Refrigerating System. December 30, 2011

The Director of the Federal Register approves this incorporation by reference in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies of UL Standards 250, 471, 484 and 541 may be purchased by mail at: COMM 2000; 151 Eastern Avenue; Bensenville, IL 60106; Email: *orders@comm-2000.com;* Telephone: 1–888–853–3503 in the U.S. or Canada (other countries dial +1–415–352–2168); Internet address: *http://ulstandardsinfonet.ul.com/* or *www.comm-2000.com.*

You may inspect a copy at U.S. EPA's Air and Radiation Docket; EPA West Building, Room 3334, 1301 Constitution Ave. NW., Washington DC or at the National Archives and Records Administration (NARA). For questions regarding access to these standards, the telephone number of EPA's Air and Radiation Docket is 202–566–1742. For information on the availability of this material at NARA, call 202–741–6030, or go to: *http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.*

BILLING CODE 6560–50–P

Table A. Maximum Design Charge Sizes for Window Air Conditioners

Refrigerant	Maximum design charge size (kg)													
	Associated cooling capacity (BTU/hr)													
	5,000	6,000	7,000	8,000	9,000	10,000	12,000	14,000	18,000	21,000	23,000	24,000	30,000	34,000
R-32	1.73	2.12	2.74	3.00	3.24	3.47	3.68	4.07	4.59	5.48	6.01	6.49	6.72	7.76
R-290	0.13	0.16	0.20	0.22	0.24	0.26	0.27	0.30	0.34	0.40	0.44	0.48	0.50	0.57
R-441A	0.14	0.17	0.22	0.24	0.26	0.28	0.30	0.33	0.37	0.44	0.49	0.53	0.54	0.63

Note: For use with self-contained air conditioning units or heat pumps with an evaporator at least 0.6 and no more than 1.0 m above the floor. Cooling capacities between those in the table are to be linearly interpolated between the next smaller and larger capacities listed in the table.

Table B. Maximum Design Charge Sizes for Packaged Terminal Air Conditioners and Packaged Terminal Heat Pumps

Refrigerant	Maximum design charge size (kg)													
	Associated cooling capacity (BTU/hr)													
	5,000	6,000	7,000	8,000	9,000	10,000	12,000	14,000	18,000	21,000	23,000	24,000	30,000	34,000
R-32	1.04	1.27	1.65	1.80	1.95	2.08	2.21	2.44	2.75	3.29	3.60	3.89	4.03	4.65
R-290	0.08	0.09	0.12	0.13	0.14	0.15	0.16	0.18	0.20	0.24	0.27	0.29	0.30	0.34
R-441A	0.08	0.10	0.13	0.15	0.16	0.17	0.18	0.20	0.22	0.27	0.29	0.32	0.33	0.38

Note: For use with self-contained air conditioning units or heat pumps with an evaporator no more than 0.6 m above the floor. Cooling capacities between those in the table are to be linearly interpolated between the next smaller and larger capacities listed in the table.

Table C. Maximum Design Charge Sizes for Wall-Mounted AC Units

Refrigerant	Maximum Design Charge Size (kg)													
	Associated capacity (BTU/hr)													
	5,000	6,000	7,000	8,000	9,000	10,000	12,000	14,000	18,000	21,000	23,000	24,000	30,000	34,000
R-32	3.12	3.82	4.94	5.41	5.84	6.24	6.62	7.32	7.96	7.96	7.96	7.96	7.96	7.96
R-290	0.23	0.28	0.36	0.40	0.43	0.46	0.49	0.54	0.61	0.73	0.80	0.86	0.89	1.00
R-441A	0.25	0.31	0.40	0.44	0.47	0.51	0.54	0.59	0.67	0.80	0.88	0.95	0.98	1.00

Note: For use with self-contained air conditioners or heat pumps with an evaporator at least 1.0 and no more than 1.8 m above the floor. Cooling capacities between those in the table are to be linearly interpolated between the next smaller and larger capacities listed in the table.

Table D. Maximum Design Charge Sizes for Ceiling-Mounted AC Units

Refrigerant	Maximum Design Charge Size (kg)													
	Associated capacity (BTU/hr)													
	5,000	6,000	7,000	8,000	9,000	10,000	12,000	14,000	18,000	21,000	23,000	24,000	30,000	34,000
R-32	3.82	4.67	6.03	6.61	7.14	7.63	7.96	7.96	7.96	7.96	7.96	7.96	7.96	7.96
R-290	0.28	0.34	0.44	0.49	0.53	0.56	0.60	0.66	0.74	0.89	0.97	1.00	1.00	1.00
R-441A	0.31	0.38	0.49	0.54	0.58	0.62	0.66	0.73	0.82	0.98	1.00	1.00	1.00	1.00

Note: For use with self-contained air conditioners or heat pumps with an evaporator more than 1.8 m above the floor. Cooling capacities between those in the table are to be linearly interpolated between the next smaller and larger capacities listed in the table.

Table E. Maximum Design Charge Sizes for Portable Room AC Units

Refrigerant	Maximum Design Charge Size (kg)													
	Associated capacity (BTU/hr)													
	5,000	6,000	7,000	8,000	9,000	10,000	12,000	14,000	18,000	21,000	23,000	24,000	30,000	34,000
R-32	1.56	2.35	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45
R-290	0.19	0.29	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
R-441A	0.21	0.31	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33

Note: For use with non-fixed portable room air conditioners or heat pumps. Cooling capacities between those in the table are to be linearly interpolated between the next smaller and larger capacities listed in the table.

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