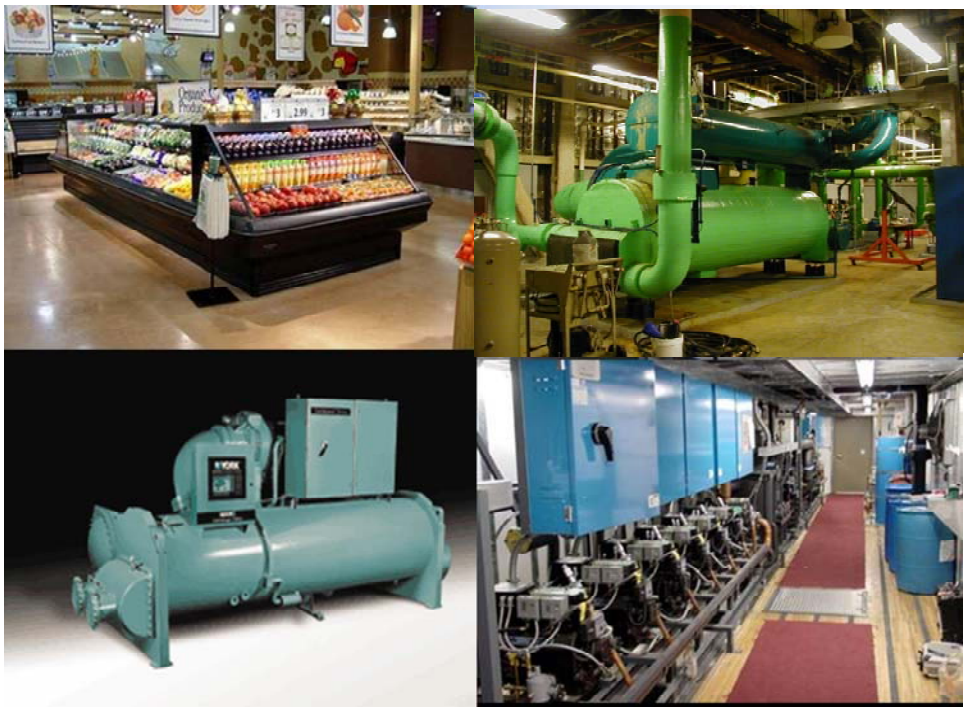
STATE OF CALIFORNIA

California Environmental Protection Agency

Air Resources Board

INITIAL STATEMENT OF REASONS FOR PROPOSED REGULATION FOR

THE MANAGEMENT OF HIGH GLOBAL WARMING POTENTIAL REFRIGERANTS FOR STATIONARY SOURCES



Research Division

Release Date

October 23, 2009

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State of California
AIR RESOURCES BOARD

INITIAL STATEMENT OF REASONS FOR PROPOSED RULEMAKING

Public Hearing to Consider

ADOPTION OF THE PROPOSED REGULATION FOR THE MANAGEMENT OF HIGH GLOBAL WARMING POTENTIAL REFRIGERANTS FOR STATIONARY SOURCES

To be considered by the California Air Resources Board
On December 9-10, 2009

at

Cal/EPA Headquarters
1001 I Street
Sacramento, California

Air Resources Board
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State of California
AIR RESOURCES BOARD

PROPOSED REGULATION FOR THE MANAGEMENT OF HIGH GLOBAL WARMING POTENTIAL REFRIGERANTS FOR STATIONARY SOURCES

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- California Grocers Association
- California Retailers Association
- California Small Business Association
- Carrier Corporation
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ABBREVIATIONS AND ACRONYMS

AB 32	Assembly Bill 32, California Global Warming Solutions Act of 2006
Air District	Air Quality Management District or Air Pollution Control District
AC	Air Conditioning
APA	Administrative Procedures Act
APCO	Air Pollution Control Officer
ARB	Air Resources Board
AHRI	Air-Conditioning, Heating and Refrigeration Institute
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
BAU	Business-As-Usual
Btu	British Thermal Units
CAAA	Clean Air Act and its Amendments
CAPCOA	California Air Pollution Control Officers Association
CAR	Climate Action Reserve
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CO_2E	Carbon Dioxide Equivalents
CEC	California Energy Commission
CFC	Chlorofluorocarbon
CFR	Code of Federal Regulations
DX	Direct Expansion (Refrigeration Systems)
CO_2	Carbon Dioxide
EOL	End-of-life
EU	European Union
F-Gas	Fluorinated Gas
FR	Federal Register
GHG	Greenhouse Gas or Greenhouse Gases
GWP	Global Warming Potential
HARDI	Heating, Air Conditioning & Refrigeration Distributors International

HCFC	Hydrochlorofluorocarbon
HFC	Hydrofluorocarbon
HVAC	Heating, Ventilation, and Air Conditioning
ICLEI	International Council for Local Environmental Initiatives
IPCC	Intergovernmental Panel on Climate Change
ISOR	Initial Statement of Reasons
LCCP	Life Cycle Climate Performance
$MTCO_2E$	Metric Tonnes of Carbon Dioxide Equivalent
$MMTCO_2E$	Million Metric Tonnes of Carbon Dioxide Equivalent
MVAC	Motor Vehicle Air Conditioning
NAICS	North American Industry Classification System
ODS	Ozone Depleting Substance
PFC	Perfluorocarbon
ppm	parts per million
R/AC	Refrigeration or Air Conditioning or Refrigeration and Air Conditioning
SCAQMD	South Coast Air Quality Management District
SNAP	U.S. EPA Significant New Alternatives Policy
SIC	Standard Industrial Classification
TEAP	Technology and Economic Assessment Panel
UNFCC	United Nations Framework Convention on Climate Change
U.S. EPA	U.S. Environmental Protection Agency
U.S. DOT	U.S. Department of Transportation
VMT	Vehicle Miles Traveled

EXECUTIVE SUMMARY

I. Introduction

This report presents the California Air Resources Board (ARB) staff's proposed regulation for the management of high global warming (GWP) potential refrigerants from stationary sources (Regulation), which is generally referred to as the Refrigerant Management Program to 1) reduce emissions of high-GWP refrigerants from leaky stationary, non-residential refrigeration equipment, 2) reduce emissions resulting from the installation and servicing of refrigeration and air-conditioning (R/AC) appliances using high-GWP refrigerants, and 3) verify greenhouse gas(es) (GHG) emission reductions. High-GWP refrigerants are potent GHG, trapping heat in the atmosphere at many times that of carbon dioxide on a pound-for-pound basis. These gases are also used in many applications, with refrigeration and air conditioning among the most important for society and the economy. In many cases, however, the systems that contain these gases, or the practices used in servicing those systems, allow refrigerants to be emitted into the atmosphere, contributing to the overall effect of global warming. The United States Environmental Protection Agency (U.S. EPA) estimates that 37 percent of the stationary source refrigeration and air-conditioning related emissions of high-GWP gases are from stationary, large commercial refrigeration systems

To address this situation, ARB staff has developed the proposed Regulation to mitigate the emissions of high-GWP refrigerants from stationary sources. Specific objectives of the proposed program and accompanying Regulation include:

- Reduce refrigerant emissions from existing refrigeration systems annually by 8 million metric tonnes of carbon dioxide equivalent ($MMTCO_2E$).
- Improve service practices for existing and future systems to reduce refrigerant leaks and maximize reclamation and recycling of high-GWP refrigerants from the servicing of stationary R/AC appliances.
- Improve refrigerant management by restricting sales of high-GWP refrigerants to properly trained personnel and improve disposal practices to provide for refrigerant recovery from R/AC appliances and refrigerant storage cylinders.
- Minimize administrative requirements on business while crafting a program that leads to significant emission reductions of GHG at low cost or a net savings for most businesses impacted.
- Provide clear best management standards of practice for managing refrigeration systems to meet the objectives of the proposed Regulation and complement existing federal, state, and local laws and regulations.

The Regulation provides annual emission reduction of 8 $MMTCO_2E$. Currently ozone depleting substances (ODS) are regulated under the Clean Air Act and Amendments (CAAA) to a limited degree, but non-ODS, high-GWP refrigerants are not managed other than by way of a federal restriction on venting.

For this reason, the Refrigerant Management Program is designed to not only complement federal regulations but also to present a template for a management framework for all high-GWP refrigerants that can be used by other states and the U.S. EPA.

What is the Source of Authority to Regulate Stationary Refrigeration and Air Conditioning?

In 2006, The California Global Warming Solutions Act (AB 32)[1] was signed into law, creating a comprehensive, multi-year program to reduce GHG emissions in California.

What are the Environmental Benefits of Reducing Greenhouse Gases?

Greenhouse gases remain in the atmosphere for many years, decades, and even centuries. As a result, the climate change effect of gases emitted years ago may not yet be fully realized. The primary environmental benefit of reducing GHG emissions is the potential mitigation of future environmental and health risks that accompany global warming.

California's landscape and geography make it particularly vulnerable to climate change. Climate change affects the high Sierra Nevada snowpack. Throughout the 20th century annual April to July spring runoff has been decreasing, with total water runoff declining by about ten percent over the last 100 years. "Average spring snowmelt from the Sierra Nevada into the Sacramento River has decreased by about 12 percent since 1906."[2] This observation has direct consequences - less spring runoff for hydroelectric power production, agricultural irrigation, and human consumption.

California has seen a sea level rise of 3 – 8 inches in the last century. This can lead to serious consequences such as flooding of low-lying property, loss of coastal wetlands, erosion of cliffs and beaches, saltwater contamination of drinking water, and damage to roads and bridges.[3] Research on sea level changes indicates that the mean sea level rise values, determined from a survey of several climate models, range from approximately 10–80 cm (3.9–31 in) between 2000 and 2100. The middle to higher end of this range would substantially exceed the historical rate of sea level rise of 15–20 cm (5.9–7.9 in) per century observed at San Francisco and San Diego during the last 100 years.[4]

Climate change will also adversely affect the public health of Californians. ARB modeling indicates that even with very effective programs to clean up the remaining sources of criteria pollutants, we will have to pay a 'climate penalty' since elevated temperatures will affect our cities, raising ozone levels.

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[1] California Global Warning Solutions Act of 2006, Statutes of 2006, Chapter 488. Health & Safety Code 38500 - 38599.
[2] California Environmental Protection Agency and California Resources Agency, Environmental Protection Indicators for California, 2004 update.
[3] Air Resources Board, Fact Sheet – The Greenhouse Effect and California. http://www.arb.ca.gov/cc/factsheets/ccbackground.pdf. (accessed September 14, 2009.
[4] California Climate Change Center, Projecting Future Sea Level, March 2006.

What Are the Requirements of the Proposed Regulation?

The proposed Regulation focuses on the largest refrigeration sources of GHG emissions. The Regulation would establish requirements by category of refrigeration system: large (uses 2,000 pounds or more of refrigerant; medium (uses between 200 and 2,000 pounds of refrigerant); and small (uses between 50 and 200 pounds of refrigerant).

Below is a brief summary of the key requirements of the Regulation. There are additional administrative requirements in the proposed Regulation. For details on the proposed regulatory provisions, see the Refrigerant Management Program Proposed Regulatory Provisions section (Section VI) of this report.

1. **Registration Requirements for Facilities with Stationary Refrigeration Systems (Section 95383)**: registration will be required in 2012, 2014, and 2016 based on the refrigerant charge size category of the largest refrigeration system in operation at a facility.
2. **Implementation Fees for Facilities with Stationary Refrigeration Systems (Section 95384):** an initial and annual fee to cover the costs of administering and enforcing the Regulation will be required for facilities with large and medium refrigeration systems - $370 for a facility with a large refrigeration system starting in 2012 and $170 for a facility with a medium refrigeration system starting in 2014. There is no fee for a facility with a small refrigeration system.
3. **Leak Detection and Monitoring Requirements for Facilities with Stationary Refrigeration Systems (Section 95385)**: starting in 2011, an automatic leak detection system or quarterly or annual leak inspections will be required for large, medium, and small refrigeration systems, respectively.
4. **Leak Repair Requirements for Facilities with Stationary Refrigeration Systems (Section 95386):** a refrigerant leak repair is generally required by a U.S. EPA certified technician within 14 days of leak detection. Under specified conditions up to 45 or 120 days after leak detection are allowed.
5. **Requirements to Prepare Retrofit or Retirement Plans for Facilities with Leaking Stationary Refrigeration Systems (Section 95387):** this plan is required if a refrigerant leak cannot be repaired.
6. **Reporting Requirements for Facilities with Stationary Refrigeration Systems (Section 95388)**: annual reporting of refrigeration system service and leak repair and refrigerant purchases and use will be required for facilities with large and medium refrigeration systems starting in 2012 and 2014 respectively. There is no annual reporting for a facility with a small refrigeration system.
7. **Recordkeeping Requirements for Facilities with Stationary Refrigeration Systems (Section 95389):** to document compliance, recordkeeping is required with records retained for a minimum of five years.

8. **Required Service Practices for High-GWP Appliances (Section 95390)**: will be specific to all high-GWP refrigerants and are based on existing U.S. EPA regulations specific to ODS refrigerants.
9. **Prohibitions (Section 95391)**: will be specific to sales of all high-GWP refrigerants and are based on existing U.S. EPA regulations specific to ODS refrigerants.
10. **Reporting Requirements for Refrigerant Distributors, Wholesalers, and Reclaimers (Section 95392):** annual reporting of refrigerant purchased and sold, or reclaimed for certified reclaimer reporting, will be required on a company-wide basis.
11. **Recordkeeping Requirements for Refrigerant Distributors, Wholesalers, and Reclaimers (Section 95393):** to document compliance, recordkeeping is required with records retained for a minimum of five years.

Who Will Be Impacted By the Regulation?

The proposed Regulation will apply to:

- anyone operating a facility with a refrigeration system charged with more than 50 pounds of a high-GWP refrigerant.
- anyone who maintains or repairs a R/AC appliance using a high-GWP refrigerant.
- anyone who distributes or reclaims a high-GWP refrigerant.

What Types of Stationary, Non-residential Refrigeration Systems are Covered?

The proposed Regulation will apply to any non-residential facility that has a refrigeration system that requires more than 50 pounds of a high-GWP refrigerant for the registration, leak detection and monitoring, leak repair, retrofit or retirement plan, and recordkeeping provisions. The implementation fee and facility reporting provisions of the proposed Regulation will additionally apply to any non-residential facility that has a refrigeration system that requires 200 pounds or more of a high-GWP refrigerant.

Some of the types of facilities that are likely to have these types of refrigeration systems include: cold storage warehouses; food preparation and processing service facilities; grocery stores and supermarkets; hotels and recreational facilities; and facilities with process cooling equipment. Many facilities that tend to be owned or operated by small businesses such as bars and restaurants, gas stations, bakeries, and liquor stores are not expected to be subject to the proposed Regulation as research conducted for the ARB indicates that the refrigerant charge size for refrigeration systems used by these facilities are generally below 50 pounds.

Further, facilities using ammonia-based refrigeration systems, or refrigeration systems using any refrigerant with a GWP less than 150, are not subject to the proposed Regulation.

What Are the Current Emissions and Expected Reductions?

Under the proposed Regulation, the total estimated GHG emission reductions in 2020 are 8.1 $MMTCO_2E$, as compared to the estimated 2020 business-as-usual (BAU) emissions of 15.8 $MMTCO_2E$. This proposed strategy will provide the sixth largest quantity of GHG reductions as outlined in the approved Scoping Plan, and is an essential part of ARB's efforts to meet the 2020 emissions reduction target as required under AB 32.

As described in Appendix B, BAU emissions and potential emission reductions were determined based on empirical emissions data reported by businesses to the South Coast Air Quality Management District (SCAQMD) pursuant to Rule 1415. BAU emissions were based on existing average leak rates determined for specific categories of refrigeration systems. The potential emission reductions are equal to the difference in the statewide emissions estimated using the average BAU leak rates and the statewide emissions estimated using the leak rates obtainable using best management practices.

Why Focus on High-GWP Refrigerants from Stationary Refrigeration Systems?

The proposed Regulation is the largest component of a suite of sector-specific measures and is necessary to mitigate emissions from the stationary source high-GWP GHG sector. The Regulation focuses on the largest source of emissions from this sector – large commercial refrigeration systems, which, in aggregate, have extensive GHG emissions. As previously noted, the U.S. EPA estimates that 37 percent of the stationary source R/AC related emissions of high-GWP gases are from stationary, large commercial refrigeration systems.

Of all refrigeration systems using more than 50 pounds of a high-GWP refrigerant that were reported to the SCAQMD, on average, 29 percent leak annually. These leaking refrigeration systems lost, on average, 65 percent of their refrigerant charge annually.

In many cases, owners and operators of refrigeration systems can benefit financially from using the refrigerant best management practices required by the proposed rule as these practices will result in cost savings by reducing the need to purchase refrigerant to replenish the refrigerant that had leaked.

What Are The Expected Costs?

Total annualized gross costs for impacted facilities after full implementation in 2020 are estimated at $49 million. However, total annualized net costs for these facilities are estimated at a savings of $19 million, reflecting a cost savings resulting from reduced refrigerant consumption.

Annual costs for refrigerant distributors, wholesalers, and reclaimers are estimated at $0.2 million.

Cost estimates were made specific to emission reductions for Kyoto gases[5] only and for Kyoto gases and non-Kyoto gases combined. The estimated cost-effectiveness is a savings of $2 per metric tonne carbon dioxide equivalent ($MTCO_2E$) of GHG reduced (in 2008 dollars) based on estimated reductions in 2020 for Kyoto gases only. The result for Kyoto gases and non-Kyoto gases combined is approximately the same at $2 saved for each $MTCO_2E$ of GHG reduced.

ARB staff conducted an analysis to determine how sensitive the average cost-effectiveness of the proposed rule is to the discount rate used. A range of discount rates were used to determine their impact on the average cost-effectiveness of the proposed rule. This analysis resulted in a net savings or net cost depending on the discount rate used with all results within the range of cost-effectiveness for measures approved by the Board in 2009, which have ranged from over $100 in savings to a cost of $21 per $MTCO_2E$.

What Was The Public Process to Develop The Regulation?

The proposed Regulation was developed through an extensive public process involving multiple stakeholders, state agencies, the U.S. EPA, the California Air Pollution Control Officers Association (CAPCOA), and the public. A large number of industry stakeholders including various trade associations, facility owners and operators, refrigerant and appliance manufacturers, agricultural industry, technicians, contractors, refrigerant distributors and reclaimers, technician training institutions and individual businesses actively participated in the proposed rule development process.

ARB staff held technical workgroup meetings and public workshops including:

- A kick-off public workshop in Sacramento specific to the stationary source, high-GWP GHG sector.
- Five technical working group meetings.
- Two series of public workshops with each including a workshop in three cities representing the southern, northern, and Central Valley areas of California.
- A public workshop in Sacramento to outline current recommendations.

Each public workshop in Sacramento was webcast to ensure the greatest possible access.

Public meeting notices, the draft regulation, emission estimates, cost analyses documents and the revised versions were posted on the web page created to provide information and periodic updates to anyone interested in the development of the proposed Refrigerant Management Program. Three ARB

[5] Kyoto gases include all gases specially listed in the Kyoto Protocol including carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.

email lists were used to distribute information to approximately 6,700 individuals who expressed interest in the proposed program and climate change.

The public process also included direct outreach to businesses and facilities including:

- Surveys of facilities
- Surveys of stationary heating, ventilation, and air conditioning (HVAC) service contractors and technicians
- Development and distribution of a Frequently Asked Questions (FAQ) pamphlet
- Development and distribution of refrigerant best management practices brochure
- Pilot outreach efforts conducted in two California cities (City of Industry and Merced) selected based on their size and the distribution of business in industries relevant to the proposed Refrigerant Management Program.
- Communications with several small business associations in California, including the California Small Business Association, Small Business California, and the Merced and City of Industry chambers of commerce, as well as small business advocates such as the Governor's Office of Planning and Research, Office of the Small Business Advocate.

A detailed discussion of the public process and outreach is provided in Appendix D.

How Will Facilities Submit Reports and Pay Fees?

The development of an efficient reporting and payment system will be integral to the success of the Regulation. A web-based, secure reporting and payment system will be developed to provide a user-friendly reporting and payment framework.

Important characteristics of the reporting and payment system include:

1. Web-based recordkeeping and submittal of reports and payments.
2. Web-based batch data entry from existing refrigerant management software programs used by facilities.
3. Web-accessible interface that provides selective and secure access.
4. User-friendly interface with pull-down screens and help-based tools to facilitate accurate and efficient data entry and transfer.
5. Recordkeeping templates to assist facilities with implementing effective refrigerant management practices to reduce refrigerant consumption.

How Will the Proposed Regulation be Enforced?

The proposed Refrigerant Management Program affects GHG sources statewide. However, local and regional air districts have extensive expertise in enforcement, and already have relationships with many of the facilities that will be regulated. It

is ARB's goal to leverage the expertise of the air districts in the administration of the proposed Regulation. Air districts may elect to assume the lead in enforcing the Regulation in two ways:

1. Entering a collaborative agreement between air districts and ARB. The agreement between the ARB and air district will outline all roles and responsibilities, enforcement performance requirements, and the amount and methods of payments that ARB will remit to the air district.
2. Air district adoption and implementation of a regulation that is functionally equivalent to the statewide Regulation.

As a statewide regulation, ARB will have full responsibility and authority to enforce the Regulation. This will include the collection and administration of fees.

Recommendation

Staff recommends that the Board approve its proposal to adopt sections 95380 through 95398 of title 17, California Code of Regulations, known as the Refrigerant Management Program.

I. OVERVIEW AND STAFF RECOMMENDATION

The California Global Warming Solutions Act of 2006 (AB 32) created a comprehensive program to reduce greenhouse gas (GHG) emissions in California. AB 32 required ARB to develop a Scoping Plan and consider regulations, market mechanisms, incentives, and other approaches to ultimately reduce California's GHG emissions equivalent to the 1990 baseline year by 2020. Additionally, AB 32 requires that rules and regulations adopted achieve maximum technologically feasible and cost-effective GHG emission reductions.

As part of its analysis to identify feasible and cost-effective emission reductions, ARB staff identified stationary refrigeration and air-conditioning (R/AC) appliances and refrigerant cylinders as sources of GHG emissions. The analysis revealed significant emissions from R/AC appliances and informed options to achieve GHG emission reductions from these appliances on the order of millions of metric tons of carbon dioxide equivalents ($MMTCO_2E$). In this rulemaking, the ARB staff is proposing a Regulation to: 1) reduce emissions of high-GWP refrigerants from stationary, non-residential refrigeration equipment, 2) reduce emissions resulting from the installation and servicing of R/AC appliances using high global warming potential (GWP) refrigerants, and 3) verify GHG emission reductions. This will be accomplished through registration, leak detection and monitoring, leak repair, retrofit or retirement planning, required service practices, refrigerant distributor and wholesaler prohibitions, and reporting and recordkeeping. The proposed Regulation is designed in accordance with AB 32 and was outlined in both the Early Action Report and Scoping Plan approved by the Board in October 2007 and December 2008, respectively.

This report with its appendices represents the Initial Statement of Reasons (ISOR) for Proposed Rulemaking required by the California Administrative Procedures Act. In this report the ARB staff presents the proposed Regulation for high-GWP refrigerant management for stationary sources, how it was developed, and why the proposed options were selected.

ARB staff estimates that business-as-usual (BAU) emissions from stationary R/AC appliances in 2020 will be 17.2 $MMTCO_2E$; 15.8 $MMTCO_2E$ from refrigeration systems and 1.4 $MMTCO_2E$ from air-conditioning systems. A significant fraction of these emissions can be reduced through technologically feasible, cost-effective best management practices enabling the earlier detection and repairs of refrigerant leaks. Implementation of this Regulation is estimated to reduce emissions by 7.2 $MMTCO_2E$ of Kyoto gases (HFC refrigerants) and 0.9 $MMTCO_2E$ of non-Kyoto gases (ozone depleting substances, or ODS, refrigerants), as compared to the 2020 BAU, on an annual basis once fully implemented. The estimated cost-effectiveness of the proposed Regulation is an approximate savings of $2 per metric tonne of carbon dioxide equivalent ($MTCO_2E$) of reduced emissions.

In developing the proposed Regulation, staff worked with stakeholders including representatives of refrigerant manufacturers, appliance manufacturers, non-

governmental organizations, and organizations representing the users of R/AC appliances such as grocers, property managers, and agricultural industries.

Staff recommends that the Board adopt the proposed Regulation for the following reasons:

1. The proposed Regulation will achieve an annual reduction of 7.2 $MMTCO_2E$ of Kyoto gases, as compared to the 2020 BAU, to make a significant contribution towards achieving the total statewide emission reduction goal of approximately 169 $MMTCO_2E$ by 2020.
2. The proposed Regulation addresses the fastest growing sector of GHG emissions – the high-GWP GHG sector.
3. The proposed Regulation is technologically feasible and provides a necessary transition from management of ODS refrigerants only to management of non-ODS, high-GWP refrigerants and ensures a consistent regulatory framework for ODS and non-ODS refrigerants that complements existing federal regulations specific to ODS refrigerants originally published in 1993, and last amended in 2004.
4. The proposed Regulation is cost-effective. It requires improved refrigerant management practices such as leak detection and monitoring and leak repair, which are technologically feasible and are also good economic policy that, in a majority of cases can create cost savings to facility owners.

II. REQUIREMENTS OF AB 32

AB 32 (California Health and Safety Code, section 1, division 25.5 (commencing with section 38500), The California Global Warming Solutions Act of 2006, creates a comprehensive, multi-year program to reduce GHG emissions in California. Specifically, Health and Safety Code section 38562 requires that ARB adopt regulations that "achieve the maximum technologically feasible and cost-effective reductions in greenhouse gas emissions" from the sources identified for early actions or strategies. Section 38562(d) requires that reductions must be real, permanent, quantifiable, verifiable, and enforceable. AB 32 criteria are summarized below, with staff's assessment as to why the proposed regulatory action meets these criteria. The proposed regulatory action will reduce GHG emissions attributable to stationary, non-residential refrigeration systems.

1. **The State Board shall adopt rules and regulations in an open public process to achieve the maximum technologically feasible and cost-effective greenhouse gas emission reduction from sources or categories of sources.**

   This Regulation was developed through an extensive public process involving multiple stakeholders, state agencies, the United States Environmental Protection Agency (U.S. EPA), the California Air Pollution Control Officers Association (CAPCOA), and the public. A large number of stakeholders including various trade associations, facility owners and operators, refrigerant and appliance manufacturers, agricultural industry, technicians, contractors, refrigerant distributors and reclaimers, technician training institutions and individual businesses actively participated in the proposed rule development process.

   The staff held several technical workgroup meetings and public workshops including:

   - One kick-off public workshop specific to the stationary source high-GWP GHG sector.
     - Sacramento, February 2008
   - Five technical working group meetings in Sacramento.
     - April, May, and June 2008
     - January and July 2009
   - Public workshops in cities throughout southern, northern, and Central Valley areas of California.
     - Sacramento, Fresno, and El Monte - September 2008
     - Sacramento, Modesto, and Diamond Bar - February 2009
   - One public workshop to outline current recommendations.
     - Sacramento, August 2009

   Each public workshop in Sacramento was also webcast to ensure access by a broader audience.

   Public meeting notices, the draft regulation, emission estimates, cost analyses documents and the respective revised versions were posted on the

web page created especially to provide information and periodic updates to anyone interested in the development of the proposed Refrigerant Management Program. Three ARB email list serves were used to distribute information to approximately 6,700 individuals who signed up and expressed interest in the proposed program and climate change.

The public process also included direct outreach to businesses and facilities including:

- Surveys of facilities
- Surveys of stationary heating, ventilation, and air conditioning (HVAC) service contractors and technicians
- Development and distribution of a Frequently Asked Questions (FAQ) pamphlet
- Development and distribution of refrigerant best management practices brochure
- Pilot outreach effort conducted in two CA cities (City of Industry and Merced) selected based on their size and the distribution of business in industries relevant to the proposed Refrigerant Management Program.
- Staff communicated with several small business associations in California, including the California Small Business Association, Small Business California, and the Merced and City of Industry chambers of commerce, as well as small business advocates such as the Governor's Office of Planning and Research, Office of the Small Business Advocate.

The estimated reduced emissions are technically feasible as they are based on known best management practices such as automatic leak detection and regularly scheduled leak inspections, and leak repair as soon as practicable after detection.

The proposed Regulation is cost-effective as due to reduced refrigerant consumption, costs are reduced for facilities with stationary refrigeration systems and, on average, result in a net savings.

2. Design the regulations, including distribution of emissions allowances where appropriate, in a manner that is equitable, seeks to minimize costs and maximize the total benefits to California, and encourages early action to reduce greenhouse gas emissions.

The proposed Regulation is designed to maximize emission reductions through improved refrigerant leak detection and monitoring and expedited refrigerant leak repair. Requirements have also been designed to be equitable and applicable to potential GHG emission risk as it is related to the refrigerant charge of a R/AC appliance. Costs have been minimized through reduced requirements for facilities with refrigeration systems that use less than 200 pounds of refrigerant. Due to reduced refrigerant consumption,

costs are reduced and, on average, result in a net savings, which encourages early action prior to the adoption of the Regulation.

The leak detection and monitoring, leak repair, and retrofit or retirement components of the proposed Regulation all become effective in 2011 for facilities with refrigeration systems of all applicable refrigerant charge size categories to maximize the emission reductions, while providing for a multi-year phase-in for registration and implementation fee elements.

3. **Ensure that activities undertaken to comply with the regulations do not disproportionately impact low-income communities.**

   The proposed Regulation is applied consistently throughout the State and is not anticipated to disproportionately impact any community. The proposed Regulation is not expected to result in significant negative impacts in any community.

4. **Ensure that entities that have voluntarily reduced their greenhouse gas emissions prior to the implementation of this section receive appropriate credit for early voluntary reductions.**

   The proposed Regulation is based on best management practices. There are facilities in California that are already meeting the majority of the requirements of the proposed Regulation by voluntarily using best management practices. To a great degree, it is the example set by such facilities that has informed the proposed Regulation. In these cases, based on their current business decisions, these facilities may not incur any additional costs to meet the regulatory inspection and maintenance requirements.

   Additionally, proposed implementation fees will be waived for a facility that certifies to have maintained refrigeration systems in the prior calendar year using advanced technologies, strategies, and practices that reduce refrigerant charges and emissions of ozone-depleting substances and greenhouse gases.

5. **Ensure that activities undertaken pursuant to the regulations complement, and do not interfere with, efforts to achieve and maintain federal and state ambient air quality standards and to reduce toxic air contaminant emissions.**

   High-GWP GHG emissions are distinct from criteria pollutants and toxic air contaminants that have historically been regulated through federal and state air quality standards. The proposed Regulation does not interfere with and is complementary of existing federal, state, and local laws and regulations.

6. **Consider cost-effectiveness of these regulations.**

   The average cost-effectiveness of the proposed Regulation is a savings of about $2 per $MTCO_2E$ in reduced emissions, on average, for facilities with stationary refrigeration systems. Throughout the rulemaking process, staff have met with stakeholders to ensure a thorough understanding of cost impacts and refined the proposed Regulation to be as cost-effective as possible by considering alternatives to balance costs and potential emission reductions. See Appendix C for a more detailed discussion regarding economic impact estimates.

7. **Consider overall societal benefits, including reductions in other air pollutants, diversification of energy sources, and other benefits to the economy, environment, and public health.**

   The proposed Regulation is not expected to cause any overall adverse impacts to society or the environment. California will benefit from the reduction of GHG emissions, and thereby contributes towards the mitigation of potential adverse impacts of climate change. The proposed Regulation originally included specifications for new refrigeration systems. This component has been removed from the proposed Regulation to be integrated with work in collaboration with the California Energy Commission (CEC) as it will allow for a full assessment of the interrelationship between refrigerant management, energy efficiency, and lifecycle GHG emissions.

   The primary focus of the proposed Regulation is HFC refrigerants used in stationary refrigeration systems as a GHG explicitly included in AB 32. PFC refrigerants (also explicitly included in AB 32) used in stationary refrigeration systems are also included, but they are in limited use. But, ODS such as CFC typically have GWPs on the order of 2 to 10 times that of HFC, so preventing the emission of CFC result in significant additional societal benefits in terms of climate change.

8. **Minimize the administrative burden of implementing and complying with these regulations.**

   The proposed Regulation affects a large number of facilities, so it has been developed to phase in many requirements based on the refrigerant charge size category of refrigeration systems to reduce the administrative burden of implementation on ARB and stakeholders.

   Table I provides the refrigeration system categories based on the refrigerant charge size, including the estimated number of facilities statewide that the refrigeration system category will apply. The refrigeration system category for a facility is based on the refrigeration system at a facility with the largest refrigerant charge size.

Table I. Proposed Refrigerant Charge Size Categories		
Refrigeration System Category	**Refrigerant Charge Size Category Description**	**Estimated Number of Facilities**
Large Refrigeration System	Refrigeration Systems with a Refrigerant Charge 2,000 pounds or Greater	2,000
Medium Refrigeration System	Refrigeration Systems with a Refrigerant Charge 200 pounds or Greater, but Less than 2,000 pounds	8,500
Small Refrigeration System	Refrigeration Systems with a Refrigerant Charge Greater than 50 pounds, but Less than 200 pounds	15,500

As an example of phased-in requirements, the registration provision will require facilities in the Large Refrigeration System category to register in 2012, in the Medium Refrigeration System category in 2014, and in the Small Refrigeration System category in 2016. The phased in approach reduces the administrative burden of data management and allows time for online reporting systems to be developed.

A similar approach is proposed for the facility reporting provision. Reporting will begin based on the same dates as registration. The primary difference between the reporting and registration requirements is the removal of all reporting for facilities with refrigeration systems requiring between 50 and 200 pounds of a high-GWP refrigerant.

The proposed Regulation requires facilities and refrigerant distributors, wholesalers, and reclaimers to record and report data to facilitate identifying and mitigating emissions of refrigerant. ARB is currently working on an on-line reporting system to reduce the burden of compliance through the allowance of electronic reporting and batch uploading of data from existing refrigerant management software packages currently in use by some facilities.

9. Minimize leakage.

Leakage is not expected to occur as a result of the proposed Regulation. Leakage occurs when an emission limit or regulatory requirement set by the State causes business activities to be displaced outside of California. The focus of the proposed Regulation applies to facilities with refrigeration systems in California. The use of best management practices in a California facility will not create a competitive disadvantage for California facilities because the proposed Regulation provides, on average, a cost savings through reduced consumption of refrigerant.

10. Consider the significance of the contribution of each source or category of sources to statewide emissions of greenhouse gases.

The California GHG emissions inventory shows that high-GWP GHG are a very significant and fast growing sector of the California anthropogenic GHG

inventory. Unless controls are enacted, emissions are expected to more than triple between 2004 and 2020 to reach over 46 $MMTCO_2E$. This increase would result in the high-GWP sector equaling 8 percent of the total estimated 2020 California GHG inventory.

The proposed Regulation will achieve emission reductions of about 7.2 $MMTCO_2E$ per year in Kyoto gases in 2020. See Appendix B for additional details. These emission reductions are an essential component of the statewide emission reduction goal of approximately 169 $MMTCO_2E$ by 2020.

11. The greenhouse gas emission reductions achieved are real, permanent, quantifiable, verifiable, and enforceable by the state board.

The emissions and emission reductions from stationary R/AC appliances were calculated based on data available from reports submitted by facilities in the jurisdiction of the South Coast Air Quality Management District (SCAQMD) pursuant to Rule 1415 (Reduction of Refrigerant Emissions from Stationary Refrigeration and Air-conditioning Systems); this data was extrapolated statewide. The carbon dioxide equivalent GHG emissions and reductions were calculated based on GWP values defined by the Intergovernmental Panel on Climate Change (IPCC).[6] As outlined in Appendix B, additional data was obtained, including data from the U.S. EPA Vintaging Model and California specific Commercial End-Use Survey, to validate and verify emissions data used.

The proposed Regulation requires facilities to record data specific to refrigeration system and refrigerant use. Facilities with large and medium refrigeration systems will be required to annually report this information to the ARB. The reported data will be the basis of emission reduction quantification. Additionally, refrigerant distributors and wholesalers will report high-GWP refrigerant received and sold annually. This information will be used to verify the emission reductions quantified from reports submitted by facilities. As stationary, non-residential refrigeration systems constitute a large single component of all high-GWP emissions, assuming all other refrigerant use trends are held equal or can be estimated based on California high-GWP specific policies, emission reductions will be verified by changes in projected BAU statewide consumption of high-GWP refrigerants.

The reported data will identify facilities with apparent refrigerant leaks that have not been addressed and be the basis for investigation and potential enforcement actions. In addition, the data will inform ARB staff of factors that help to direct inspection and enforcement resources at the greatest risk of GHG emissions and non-compliance.

As a result of detailed research conducted to quantify current emissions and potential emission reductions, as provided in Appendix B, and effective data

[6] Intergovernmental Panel on Climate Change (IPCC), Second Assessment Report (SAR), 1995; IPCC, Fourth Assessment A-3 Report (AR4), 2007.

collection on refrigerant consumption, estimated emission reductions associated with the Refrigerant Management Program will be real, permanent, quantifiable, verifiable, and enforceable.

12. **For regulations…. ….the reduction is in addition to any greenhouse gas emission reduction otherwise required by law or regulation, and any other greenhouse gas emission reduction that otherwise would occur.**

    Regulations relevant to refrigerant management currently are limited to an existing set of requirements specific to ODS refrigerants promulgated by the U.S. EPA under section 608 (Stratospheric Ozone Protection, Stationary Sources) of the Clean Air Act and Amendments (CAAA). In response to the CAAA the SCAQMD adopted Rule 1415. These regulations created the basis of the BAU scenario.

    The proposed Regulation complements federal regulations by recognizing a growing regulatory need to address all high-GWP refrigerants (and specifically non-ODS refrigerants) as production of ODS refrigerants is phased out. The proposed Regulation provides a transition of regulations from ODS refrigerants to ODS substitute refrigerants (HFC) resulting in a consistent management framework throughout the phase out of ODS. The proposed Regulation is also broader than historical federal regulations in that it includes more rigorous leak detection and monitoring requirements, as well as leak repair for any refrigerant leak that is detected.

13. **If applicable, the greenhouse gas emission reduction occurs over the same time period and is equivalent in amount to any direct emission reduction required pursuant to this division.**

    The Regulation achieves its emission reductions from direct emissions.

14. **The state board shall rely upon the best available economic and scientific information and its assessment of existing and projected technological capabilities when adopting the regulations required by the law.**

    ARB staff used the best economic and scientific information available to develop the proposed Regulation. Appendix B describes in detail the scientific and technical information used for the development of estimated BAU emissions and emission reductions. Appendix C describes in detail the economic information used as the basis for determining economic impacts of the proposed Regulation.

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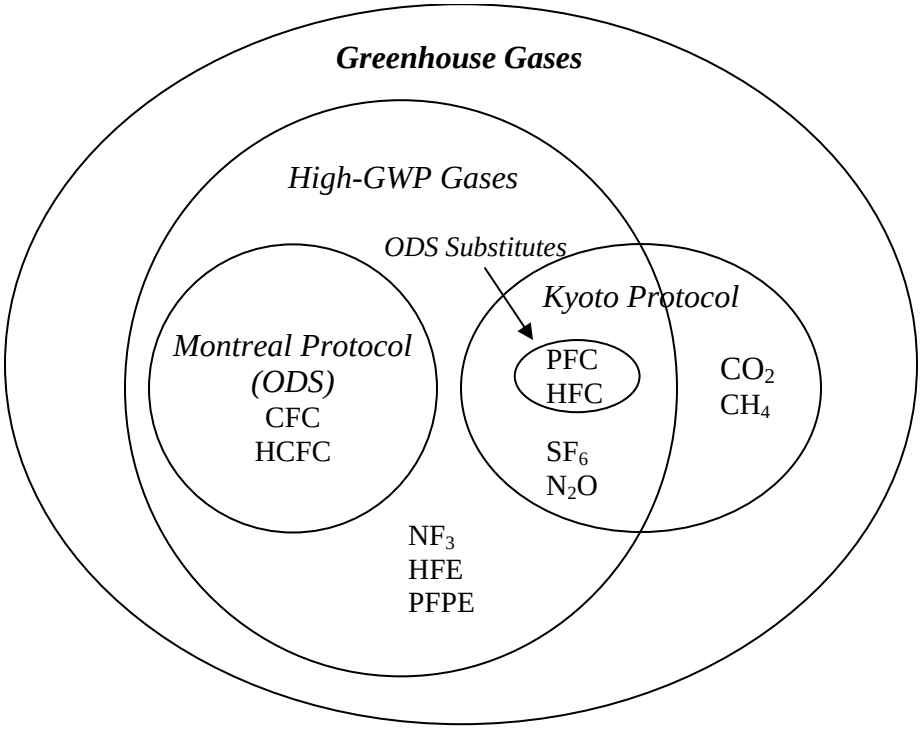
III. BACKGROUND

A. Stationary Source High-GWP GHG Sector

While not a discrete segment of the California economy, the stationary source high-GWP GHG sector consists of a broad range of sources that emit gases that on a pound for pound basis have hundreds to thousands of times the climate impact of carbon dioxide (CO_2). High-GWP refrigerants serve an important purpose as refrigerants in stationary HVAC, mobile vehicle air conditioning (MVAC), and refrigeration. High-GWP gases are also used as foam-blowing agents, in electrical transmission, as fire suppressants, in consumer products, and in the semiconductor industry.

As illustrated in Figure 1, high-GWP GHG used in stationary source R/AC appliances can generally be categorized as Kyoto Protocol gases, Montreal Protocol gases, and several miscellaneous gases not covered under either treaty.[7]

Figure I. High-GWP Greenhouse Gas Categories



An important category of high-GWP GHG is ODS, which include chlorofluorocarbons (CFC) and hydrochlorofluorocarbons (HCFC). ODS production is being phased out under the Montreal Protocol as a result of concerns about stratospheric ozone depletion, but legacy emissions from existing

[7] Figure 1. copied from: California Air Resources Board, Climate Change Scoping Plan Appendices, VOLUME I: SUPPORTING DOCUMENTS AND MEASURE DETAIL, December 2008.

sources are not controlled. Thus, ODS used as refrigerants were regulated as a result of concerns about stratospheric ozone depletion, but not due to concerns about climate change. The underlying assumption of the Montreal Protocol is that the gases produced will eventually be emitted due to equipment refrigerant leaks, servicing, or at end-of-life (EOL).

As a result of the Montreal Protocol's phaseout of ODS, ODS refrigerants used in stationary R/AC appliances have typically been replaced with hydrofluorocarbons (HFC) and perfluorocarbons (PFC), which are hence referred to as ODS substitutes. As an example, alternatives currently being used to replace HCFC-22 as a refrigerant are HFC blends with higher GWPs.[8] While ODS have negative impacts for both climate change and stratospheric ozone, ODS substitutes are not ozone-depleting but are typically potent GHG.

The majority of ODS substitutes are listed in the Kyoto protocol, and emissions of these gases are increasing as ODS refrigerants are replaced by ODS substitute refrigerants. Global HFC emissions in 2050 are estimated to be equivalent to 9 to 19 percent of the projected global BAU GHG emissions, on a CO_2 equivalent basis.[9] Specific to California, the 2002 – 2004 average GHG emissions explicitly identified in AB 32 for the high-GWP GHG sector was estimated to represent 3 percent of the California anthropogenic GHG inventory. However, the sector is growing rapidly due to the increased use of Kyoto gases as substitutes for ODS and is anticipated to reach 8 percent of the total estimated 2020 California BAU GHG inventory. As indicated in Figure II, by 2020 under the California-specific BAU scenario, high-GWP gases will become a much greater component of the California GHG inventory, which pursuant to AB 32 must be reduced to a baseline 1990 target by 2020.

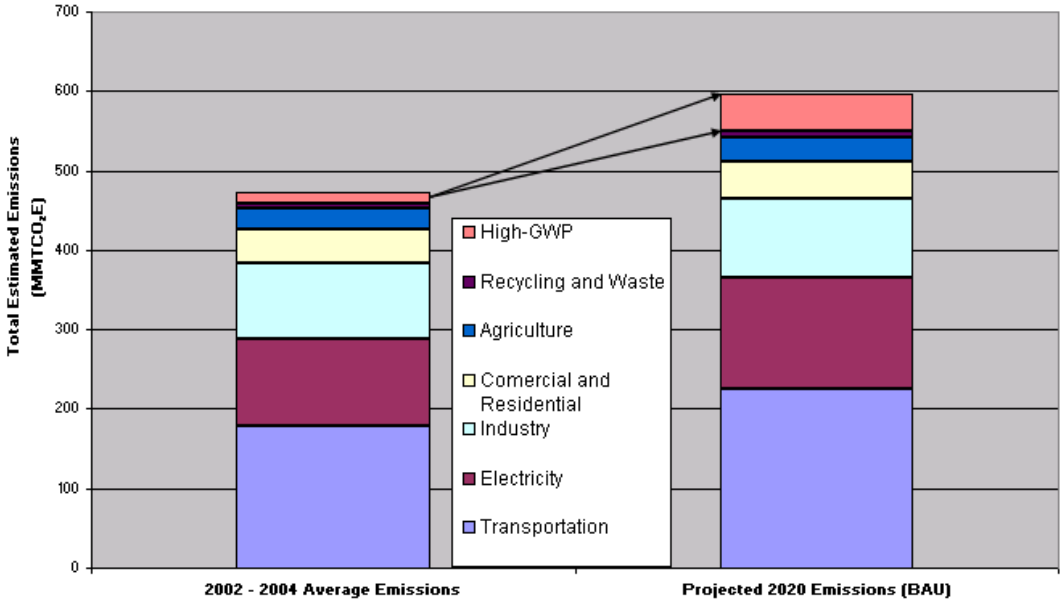
Currently there is a significant gap created in emission control efforts for non-ODS, high-GWP refrigerants. The proposed measure is the first of its kind in the United States to explicitly address emissions of all high-GWP refrigerants.

Figure II provides a comparison of the estimated 2002-2004 average emissions and projected 2020 emissions, and illustrates the significant growth of the high-GWP GHG sector as compared to other sectors of the statewide GHG inventory.

[8] J.M. Velders, S.O. Andersen, J.S. Daniel, D.W. Fahey, and M. McFarland, The importance of the Montreal Protocol in protecting climate, Proceedings of the National Academy of Sciences, USA, March 2007.

[9] J.M. Velders, D.W. Fahey, J.S. Daniel, M. McFarland, and S.O. Andersen, The large contribution of projected HFC emissions to future climate forcing, Proceedings of the National Academy of Sciences, USA, June 2009.

Figure II. Comparison of 2002-2004 Average Emissions and Projected 2020 Emissions (BAU) by Percent of Total California GHG Inventory



Based on most recent available data from Air Resources Board, Climate Change Scoping Plan, December 2008.

Stationary refrigeration is a source of high-GWP refrigerant emissions due to a lack of incentives to reduce emissions. There are many companies that maintain effective refrigerant management practices that reduce emissions and reduce maintenance costs. However, the low cost of many high-GWP refrigerants, as well as a lack of incentives for emission control, has resulted in a common practice of re-charging leaky, poorly designed, or poorly maintained R/AC appliances without attempting a repair. As a result, venting of refrigerant occurs during maintenance or EOL disposal. The Refrigerant Management Program's leak detection and monitoring, leak repair, and retrofit or retirement components are a suite of integrated strategies to address a well documented problem.

In the absence of effective controls, emissions from the high-GWP GHG sector are expected to more than triple over the next several years, resulting in over 46 $MMTCO_2E$ of high-GWP Kyoto gas emissions in 2020; 15.8 $MMTCO_2E$ from stationary, non-residential refrigeration. The proposed Regulation is expected to yield GHG emission reductions of 7.2 $MMTCO_2E$ of Kyoto gases by 2020. Additionally, the proposed Regulation is expected to yield an added benefit of GHG emission reductions of 0.9 $MMTCO_2E$ of non-Kyoto gases, or ODS, by 2020.

B. Stationary Refrigeration and Air-Conditioning Systems

Tens of millions of stationary commercial and industrial R/AC appliances exist in California, ranging from small, tightly sealed refrigerators and air-conditioning units to large parallel rack refrigeration systems (refrigeration systems commonly used in supermarkets) and centrifugal chillers (commonly used in process

cooling and commercial building air-conditioning systems) containing thousands of pounds of refrigerant.

Emissions from stationary R/AC appliances are categorized as direct refrigerant emissions and indirect emissions (CO_2-equivalent emissions resulting from energy use to operate the system). The focus of the Regulation is to minimize direct emissions that occur during the equipment lifetime (i.e., from leaks, ruptures, maintenance, etc.), with an emphasis on large non-residential refrigeration systems. Thus, approximately 26,000 facilities throughout California with refrigeration systems with a refrigerant charge greater than 50 pounds of a high-GWP refrigerant would be affected by the proposed Regulation.

R/AC appliances serve many diverse purposes and, as a result, vary greatly in the type of refrigerant used and the total refrigerant charge. A primary determinant of the potential emissions from a R/AC appliance is the refrigerant charge. Common equipment types can be categorized by refrigerant charge sizes as provided in Table II, which provides refrigerant charge size categories as discussed in the proposed Regulation. Table II does not include R/AC appliances with a refrigerant charge of 50 pounds or less as the proposed Regulation does not establish requirements for these systems with respect to leak detection and repair as they are usually tightly sealed and result in limited refrigerant leaks.

Table II. Equipment Type and Refrigerant Charge Size Categories of R/AC Appliances

Equipment Type	Typical Application and Refrigerant Charge Size
Process cooling and cold storage equipment	Mostly refrigeration systems with refrigerant charge greater than 2,000 pounds A small percentage of refrigeration systems with refrigerant charge between 200 and 2,000 pounds
Centralized refrigeration equipment (i.e. parallel rack and remote condensing refrigeration systems)	Mostly parallel rack refrigeration systems with refrigerant charge between 200 and 2,000 pounds A small percentage of refrigeration systems with refrigerant charge greater than 2,000 pounds
Condensing unit refrigeration equipment (i.e., large walk in refrigeration units, condensing units supporting several refrigerated cabinets)	Nearly 100% of applicable refrigeration systems with refrigerant charge between 50 and 200 pounds
Air-conditioning chillers	Mostly packaged chiller air-conditioning systems with refrigerant charge between 200 and 2,000 pounds A small to moderate percentage of centrifugal chiller air-conditioning systems with refrigerant charge greater than 2,000 pounds
Air-conditioning rooftop units and unitary systems	Nearly 100% of systems with refrigerant charge greater than 50 pounds are between 50 and 200 pounds A small percentage of systems with refrigerant charge between 200 and 2,000 pounds

The facilities types that commonly use R/AC appliances, along with the typical refrigerant charge sizes of R/AC appliances used can be categorized as provided in Table III.

Table III. Facility Types and Typical Refrigeration and Air-conditioning Appliance Refrigerant Charge Sizes	
Facility type	**Typical Refrigerant Charge Size**
Food processing facilities	Greater than 2,000 pounds (Large)
Cold storage warehouses	Greater than 2,000 pounds (Large)
Petroleum industry	Greater than 2,000 pounds (Large)
Manufacturing facilities	Greater than 2,000 pounds (Large)
Grocery stores	Between 200 and 2,000 pounds (Medium)
Small retail food stores	Between 50 and 200 pounds (Small)
Office Buildings	Between 50 and 200 pounds (Small)

C. Typical Refrigeration and Air-conditioning Appliances In Operation

Appendix B provides detailed descriptions of the primary types of R/AC appliances in operation. Table IV provides a brief description and images of typical systems listed in Table II.

Table IV. Typical Refrigeration and Air-conditioning Appliances in Use[10]	
Refrigerant Charge Size Category	**Typical R/AC Appliance**
Large Centralized Cooling System Duty Types: Industrial Process, Comfort Cooling, or Other Refrigeration	

[10] Images provided courtesy of Environmental Support Solutions.

Refrigerant Charge Size Category	Typical R/AC Appliance
Large Centralized Centrifugal Chiller Duty Types: Industrial Process, Comfort Cooling, or Other Refrigeration	
Large or Medium Commercial Refrigeration Duty Types: Refrigeration for Supermarket or Cold Storage	
Medium Packaged Centrifugal Chiller Duty Types: Industrial Process, Comfort Cooling, or Other Refrigeration	

Refrigerant Charge Size Category	Typical R/AC Appliance
Medium or Small Unitary Chillers Duty Types: Industrial Process, Comfort Cooling, or Other Refrigeration	
Small Unitary Industrial Process Chiller Duty Type: Refrigeration	

D. Refrigerant Leaks

Facilities with R/AC appliances will always face the potential for refrigerant leaks, and the sources of leaks vary greatly. A refrigerant leak may occur in a R/AC appliance due to a weakened valve, rust in filter dryers or heat pump accumulator, tiny holes on capillary tubing due to friction, a damaged line set that carries refrigerant from the condenser to the evaporator coil, or a failure of the flare connection.[11] Additional common areas for refrigerant leaks include leaking joints, seals, gaskets and cracked pipes, as well as areas subject to significant vibration.[12] Refrigerant leaks may also include incidents where some aspect of

[11] Stouffer, D., "Refrigerant Leak Creates Environmental Problems for Businesses," February, 2009, http://air.environmental-expert.com/resultEachArticle.aspx?cid=32055&codi=45718&idproducttype=6, (accessed March 9, 2009).
[12] British Refrigeration Association, Code of Practice for Refrigerant Leak Tightness in compliance with the F-Gas Regulation, December 2007.

the refrigerant circuit is breached releasing refrigerant to the atmosphere; significant breaches are typically observed and quickly repaired.

Figure III. Refrigerant Leak Illustration

The image to the left illustrates a leaking expansion valve component in a small direct expansion system. The refrigerant leak is indicated by the stain on the ground.

E. Refrigerant Use, Sale, and Disposal

Refrigerants use, sale, and disposal are based on their varied purposes and their value chain impacts several industries. Stationary HVAC and refrigeration service industries are the primary end users of refrigerants related to refrigerant management.

Refrigerants are distributed and sold in a wide variety of cylinder sizes; common sizes for stationary HVAC and MVAC service are 30 to 50 pounds. Although refillable cylinders are available on the market, non-refillable cylinders are more often used. Without regard to the size of a cylinder or if a cylinder is refillable, residual refrigerant is always present in the cylinder when considered empty by a technician, but may not be useable due to a lack of sufficient pressure in the cylinder. This residual refrigerant, or heel, is a source of GHG emissions.

IV. OVERVIEW OF RELATED FEDERAL, STATE, AND LOCAL LAWS AND REGULATIONS

ARB staff reviewed existing international, federal and local laws and regulations governing high-GWP refrigerants to use as the foundation for this proposed statewide Regulation. In developing the proposed Regulation ARB staff worked with U.S. EPA staff and SCAQMD staff to ensure that the proposed Regulation is complementary to existing rules and can be easily harmonized into one consistent regulatory framework to reduce GHG emissions.

A. International Regulations

The primary international regulation reviewed was the Fluorinated Gas (F-Gas) Regulation (Regulation (European Council) No 842/2006). The objective of the F-Gas regulation is to contain, prevent and thereby reduce emissions of fluorinated greenhouse gases covered by the Kyoto Protocol. The F-gas Regulation became effective in June 2006.[13]

B. Federal Laws and Regulations

The proposed Regulation to a great extent is modeled from existing regulations promulgated under the CAAA section 608. California businesses currently using R/AC appliances requiring more than 50 pounds of an ODS refrigerant are subject to leak repair, required service practices, and recordkeeping requirements under existing U.S. EPA regulations outlined below. The proposed Regulation expands these existing federal regulations to include R/AC appliances using all high-GWP refrigerants.

Federal management of refrigerants is through regulations promulgated under the CAAA; section 608 of the CAAA includes requirements applicable to refrigerant use during stationary HVAC servicing, while Section 609 includes requirements specific to refrigerant use during MVAC servicing. These regulations originate from laws passed to mitigate stratospheric ozone depletion.

Section 608 of the CAAA includes required service practices that maximize the recycling of ODS during the service of stationary HVAC systems. Section 608 includes requirements specific to venting, approved equipment, technician training and certification, recordkeeping, certification requirements, and sales restrictions.

Section 609 of the CAAA is similar to Section 608, but it is specific to management of refrigerants while maintaining, servicing, repairing, or disposing of MVAC systems. Section 609 includes requirements specific to venting, evacuation, reclamation, equipment certification, refrigerant leaks, technician certification, sales restrictions, certification by owners of recycling and recovery equipment, reclaimer certification, safe disposal, and recordkeeping.

[13] Fluorocarbons and Sulphur Hexafluoride, http://www.fluorocarbons.org/en/debate/regulatory_developments/f_gas_regulation.html, (accessed September 24, 2009)

Final regulations promulgated under section 608 of the CAAA, published on May 14, 1993 (58 Federal Register (FR) 28660), established a recycling program for ODS refrigerants recovered during the servicing and maintenance of R/AC appliances. Together with the prohibition on venting during the maintenance, service, repair, and disposal of class I and class II ODS (January 22, 1991; 56 FR 2420), these regulations were intended to substantially reduce the production and emissions of ODS refrigerants. The final rule on venting and sales of refrigerant substitutes (March 12, 2004; 69 FR 11946) sustained the prohibition against venting HFC and PFC refrigerants.

Federal regulations specific to refrigerant cylinder management are based on the CAAA and U.S. Department of Transportation (DOT) cylinder specifications. The CAAA prohibits the sale of ODS refrigerants, except to a U.S. EPA certified technician or the employer of a certified technician. DOT regulations applicable to refrigerant management include: 1) Title 49: Transportation, Part 173, Shippers, General Requirements of Shipments and Packaging; and 2) Title 49, Transportation, Part 178, Specifications for Packagings, Subpart C, Specifications for Cylinders. These regulations outline requirements specific to cylinder type, size, service pressure, test pressure, size limitation, maximum water capacity, pressure of contents, material (steel or aluminum), and markings.

Federal Refrigeration Training and Certification Program

As required by the CAAA, the U.S. EPA has established refrigeration training and certification requirements for management of refrigerants. Section 609 training and certification is required for servicing of MVAC systems. Section 608 training and certification is required for servicing stationary HVAC systems, and includes four types of certification:

1. Type I - for servicing small appliances (e.g., residential refrigerators, household air-conditioning systems, etc.)
2. Type II - for servicing or disposing of high- or very high-pressure appliances (e.g., commercial retail food refrigeration systems), except small appliances and MVAC
3. Type III - for servicing or disposing of low-pressure appliances (e.g., R-123-based chillers)
4. Universal - for servicing all types of equipment

The U.S. EPA training programs focus on issues related to ODS and stratospheric ozone layer protection. The core of the training program includes the following topics:

1. Ozone Depletion
2. Clean Air Act and Montreal Protocol
3. Section 608 Regulations
4. Substitute Refrigerants and Oils

5. Refrigeration
6. Three R's – Recover, Recycle, and Reclaim
7. Recovery Techniques
8. Dehydration Evacuation
9. Safety
10. Shipping

In addition to the core program, the Type II training (High Pressure) includes training specific to high pressure systems in the core program topic categories, and also includes the following additional topics:

1. Leak Detection
2. Leak Repair Requirements
3. Recovery Techniques
4. Recovery Requirements

In addition to the core program, the Type III training (Low Pressure) includes training specific to low pressure systems in the core program topic categories, and also includes the following additional topics:

1. Leak Detection
2. Leak Repair Requirements
3. Recovery Techniques
4. Recharging Techniques
5. Recovery Requirements
6. Refrigeration
7. Safety[14]

In California there are 52 programs[15] that provide instruction in basic engineering principles and technical skills in support of engineers and other professionals engaged in developing and using refrigeration and stationary HVAC and MVAC systems. The instruction includes principles of heating and cooling technology, design and operational testing, inspection and maintenance procedures, installation and operation procedures, and report preparation. A primary purpose for this instruction is to prepare technicians to pass the test to become U.S. EPA certified technicians. A large component of these available training programs is through California's community college network, which provides a partnership

[14] U.S. EPA, "Overview of Issues on EPA Certification Test," U.S. EPA, http://www.epa.gov/Ozone/title6/608/technicians/certoutl.html, (accessed July 15, 2008).
[15] California Employment Development Department, "Training Program Summary," http://www.labormarketinfo.edd.ca.gov/cgi/dataBrowsing/traProgramSummary.asp?menuChoice=&cipcode=150501&geogArea=0601000000, (accessed July 15, 2008).

opportunity between the ARB and community colleges. Currently, ARB is working with community college instructors with a focus on training ARB and air district staff as an initial step in developing a partnership with a goal of evolving into technician training programs for refrigerant best management practices.

These training institutions will be important in the process of outreach and education of certified technicians specific to the requirements of the proposed Regulation and the use of best management practices to reduce high-GWP refrigerant emissions.

C. State Statute, Regulations, and Programs

There currently are few California statewide laws specific to emissions of high-GWP refrigerants from stationary R/AC appliances.

California laws and regulations specific to refrigerant cylinders are limited and generally applicable to cylinder labeling. Although the California Health and Safety Code includes statutes specific to refrigeration manufacturers (Section 19800) and certified appliance recyclers (Sections 25211-25214), there are no laws or regulations specific to the management of refrigerants in cylinders.

The California Code of Regulations (CCR) does include regulations specific to cylinder labeling. CCR, Business Regulations, title 4, Division of Measurement Standards Section 4051 requires that compressed gas cylinders be labeled with the tare weight, net contents, product identity, name and address of responsible company.

California Health and Safety Code Section 25212 provides that materials requiring special handling contained in major appliances (major appliances in this reference is specific to appliances such as household refrigerators) shall not be disposed of at a solid waste facility and shall be removed from major appliances prior to the appliance being processed in a manner that could release materials that require special handling.

Public Resources Code Section 42175 requires that materials requiring special handling be removed from major appliances prior to crushing for transport or transferring to a baler or shredder for recycling.

Public Resources Code Section 42167 provides definitions of "materials that require special handling" to include: PCBs, CFC, HCFC, other non-CFC replacement refrigerants, used oil in major appliances, and mercury found in switches and temperature control devices.

D. South Coast Air Quality Management District Rule 1415

Similar to the U.S. EPA’s requirements under Section 608 of the CAAA, SCAQMD issued Rule 1415 in 1991 aimed at reducing emissions of ODS refrigerants from stationary R/AC appliances.

In addition to being modeled from existing federal regulations, the proposed Regulation has been developed to be consistent with SCAQMD Rule 1415. Businesses in the SCAQMD jurisdiction are subject to leak inspection, leak repair, registration and fee, reporting, and recordkeeping requirements under the SCAQMD's Rule 1415.

The rule requires any person within SCAQMD's jurisdiction, who owns or operates a refrigeration or air-conditioning system, to minimize refrigerant emissions. A refrigeration system is defined for the purposes of the rule, as any non-vehicular equipment used for cooling or freezing, which holds more than 50 pounds of, any combination of class I and/or class II refrigerant, including, but not limited to, refrigerators, freezers, or air-conditioning equipment or systems. Equipment that is found to be leaking any ODS refrigerant must be repaired within 14 days.

The SCAQMD requires biennial reporting from owners and operators of stationary R/AC appliances holding more than 50 pounds of an ODS refrigerant. Specific information collected includes: number of R/AC appliances in operation; type of refrigerant in each R/AC appliances; amount of refrigerant in each R/AC appliance; date of the last annual audit or maintenance performed for each R/AC appliance; and the amount of additional refrigerant charged to each R/AC appliance every year. For the purposes of the rule, additional refrigerant charge is defined as the quantity of refrigerant (in pounds) charged to a refrigeration system in order to bring the system to a full-capacity charge and replace refrigerant that has leaked.

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V. REFRIGERANT MANAGEMENT PROGRAM REGULATION DEVELOPMENT

A. Public Process in Rule Development

As part of ARB's regulatory development, staff made extensive personal contacts with industry representatives, state and local regulatory agencies, and other interested parties through site visits, meetings, telephone calls, and electronic mail. The regulatory development process spanned over 18 months and included several meetings of a technical workgroup and drafting of regulatory proposals with stakeholder review and comments.

The public process specific to the Refrigerant Management Program was initiated with a February 15, 2008 public workshop to present all measures being considered by the ARB in the stationary source high-GWP GHG sector. A primary action during this meeting was to solicit the attending public and industry representatives to join technical workgroups to assist and guide the ARB staff in the research and regulation development process.

Technical workgroup meetings specific to the proposed Regulation were held starting in April 2008, with the first Commercial Refrigeration Technical Workgroup meeting. In May 2008, the first Stationary Source High-GWP Refrigerant Tracking/Reporting/Repair Program technical workgroup meeting was conducted; the second was held in July 2008. The July 2008 technical workgroup meeting introduced the concept to integrate the Specification for New Commercial and Industrial Refrigeration Systems measure and High-GWP Refrigerant Tracking/Reporting/Repair Program for Stationary Sources measure resulting in the Refrigerant Management Program measure. Based on stakeholder input and to ensure the ARB and CEC do not have potentially confusing and duplicative regulations related to energy efficiency and the resulting GHG impacts, ARB and CEC will collaborate to incorporate direct GHG emission reductions and whole-building energy efficiency in the next phase of updates to the California Building Standards Code (Title 24). Thus, the focus of the proposed Regulation that is the subject of this report is existing refrigeration systems. A fourth technical work group meeting was held in January 2009 followed by a fifth technical work group meeting in July 2009.

Public workshops were conducted in September, 2008, in the cities of Sacramento, Fresno, and El Monte. Additional public workshops were conducted in February, 2009, in the cities of Sacramento, Modesto, and Diamond Bar. All Sacramento public workshops were also webcast to ensure access by a broader audience. A webcast public workshop to present current staff recommendations was held in Sacramento in August 2009.

In late 2008 ARB staff conducted refrigeration and air-conditioning contractor and technician surveys. In July and August 2009, ARB staff conducted a facility survey to research common characteristics of R/AC appliances used commercially and to outreach to the business communities that could be impacted by the proposed Regulation.

In summary, ARB staff visited several businesses as well as held private meetings with stakeholders, technical workgroup meetings, and public workshops throughout the state of California. In addition to these meetings and workshops ARB staff conducted extensive outreach efforts via phone and e-mail to approximately 67 trade organizations, 600 individual businesses, 20 state and local government agencies, and several e-mail list serves.

Outreach to potentially impacted facilities and persons were extensive and are described in detail in Appendix D.

B. Stationary Source High-GWP BAU Emissions Inventory and Potential Emissions Reductions

The estimate of total stationary source high-GWP emissions is a range established based on several data sources. The estimates include a "top-down" approach based on national estimates from the U.S. EPA Vintaging Model as well as a "bottom-up" approach using facility reporting from the SCAQMD. The Vintaging Model was developed as a tool for estimating the annual chemical emissions from industrial sectors that have historically used ODS in their products[16]. Both approaches were refined with additional data obtained from ARB staff research and research conducted through contract on behalf of the ARB.

Potential 2020 emissions based on a BAU scenario from stationary, non-residential R/AC appliances is 17.2 $MMTCO_2E$ – 15.8 $MMTCO_2E$ from refrigeration systems and 1.4 $MMTCO_2E$ from air-conditioning systems. The potential 2020 emission reductions estimate is 8.1 $MMTCO_2E$ from refrigeration systems - 7.2 $MMTCO_2E$ of Kyoto gases (HFC refrigerants) and 0.9 $MMTCO_2E$ of non-Kyoto gases.

As described in Appendix B, BAU emissions and potential emission reductions were determined based on emissions data reported by businesses to the SCAQMD pursuant to Rule 1415. BAU emission rates were based on average leak rates determined for specific categories of refrigeration systems. These emission rates were extrapolated statewide and emission estimates were based on the estimated number of facilities and refrigeration systems in each category.

ARB conducted a comprehensive study to determine the possible 2020 average achievable leak rates obtainable through the use of best management practices. The potential emission reductions are equal to the difference in the statewide emissions estimated using the average BAU leak rates and the statewide emissions estimated using the leak rates obtainable using best management practices.

The 2020 BAU emissions inventory and post-implementation GHG emission reductions estimates are outlined in Table V.

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16 Godwin, D. (U.S. EPA), Martin Van Pelt, M. and Peterson, K. (ICF Consulting), Modeling Emissions of High Global Warming Potential Gases from Ozone Depleting Substance Substitutes, 2003. http://www.epa.gov/ttn/chief/conference/ei12/green/godwin.pdf, retrieved December 1, 2008.

Table V. Potential Emissions and Emission Reductions Associated with the Proposed Regulation in 2020.				
	Emissions			Emission Reductions
Refrigeration System Category	**2010 BAU**	**2020 BAU**	**2020 Post-Rule**	**2020 Total GHG Reduction**
Small Refrigeration System	1.2	1.4	0.5	0.9 (0.8 HFC, 0.1 ODS)
Medium Refrigeration System	5.7	7.9	4.6	3.3 (3.0 HFC, 0.3 ODS)
Large Refrigeration System	5.0	6.5	2.6	3.9 (3.3 HFC, 0.6 ODS)
Total Emissions and Potential Emission Reductions	11.9	15.8	7.7	8.1 (7.2 HFC, 0.9 ODS)

Notes:
All emissions and emission reductions are expressed in $MMTCO_2E$.
Totals may not sum due to rounding.
See Appendix B for detailed discussion of estimates.

The full description of the analyses conducted to determine the BAU emissions inventory and potential emission reduction estimates, including the uncertainty in the estimates, is provided in Appendix B.

Data reported to the SCAQMD pursuant to Rule 1415 served as the primary source of data to estimate BAU emissions and potential emission reductions. The statewide estimates were based on extrapolations of Rule 1415 data. As detailed in Appendix B, several other sources of data were used to assist in validating statewide estimates.

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VI. REFRIGERANT MANAGEMENT PROGRAM PROPOSED REGULATORY PROVISIONS

The proposed Regulation consists of several primary components outlining applicability and specific requirements. The purpose and the applicability of the proposed Regulation are outlined in sections 95380 and 95381. Definitions used in the proposed Regulation are outlined in section 95382.

The general requirements for facilities with stationary refrigeration systems are included in the following provisions:

- Registration Requirements for Facilities with Stationary Refrigeration Systems (section 95383)
- Implementation Fees for Facilities with Stationary Refrigeration Systems (section 95384)
- Leak Detection and Monitoring Requirements for Facilities with Stationary Refrigeration Systems (section 95385)
- Leak Repair Requirements for Facilities with Stationary Refrigeration Systems (section 95386)
- Requirements to Prepare Retrofit or Retirement Plans for Facilities with Leaking Stationary Refrigeration Systems (section 95387)
- Reporting Requirements for Facilities with Stationary Refrigeration Systems (section 95388)
- Recordkeeping Requirements for Facilities with Stationary Refrigeration Systems (section 95389)

The general requirements for persons installing or servicing R/AC appliances using high-GWP refrigerants are included in the Required Services Practices for High-GWP Appliances provision (section 95390).

The general requirements specific to refrigerant sales and refrigerant distributors, wholesalers, and reclaimers are included in the following provisions:

- Prohibitions (section 95391)
- Reporting Requirements for Refrigerant Distributors, Wholesalers, and Reclaimers (section 95392)
- Recordkeeping Requirements for Refrigerant Distributors, Wholesalers, and Reclaimers (section 95393)

Additional provisions describe implementation and enforcement issues:

- Confidentiality (section 95394)
- Enforcement (section 95395)
- Equivalent Local Rules (section 95396)
- Approval of Exemptions (95397)
- Severability (95398)

This section discusses the general requirements and rationale for each provision of the proposed Regulation.

95380. Purpose

Summary of Proposed Regulation

This section states the purpose of the Regulation. The purpose of this Regulation is to reduce emissions of high-GWP refrigerants from stationary, non-residential refrigeration equipment and from the installation and servicing of refrigeration and air-conditioning appliances using high-GWP refrigerants.

Rationale for Proposed Regulation

This section is necessary to ensure the regulated public understands that the proposed Regulation is an emission reduction measure to reduce emission of high-GWP refrigerants, which are GHG, pursuant to Health & Safety Code section 38562, in accordance with the approved Scoping Plan prepared pursuant to Health & Safety Code section 38561.

95381. Applicability

Summary of Proposed Regulation

This section outlines that the proposed rule requirements are applicable to 1) a person who owns or operates a stationary refrigeration system that uses more than 50 pounds of a high-GWP refrigerant; 2) a person who installs, repairs, maintains, services, replaces, recycles, or disposes of a R/AC appliance; and 3) a person who distributes or reclaims high-GWP refrigerants.

Rationale for Proposed Regulation

This section is necessary to identify the persons to which the Regulation would apply.

95382. Definitions

Summary of Proposed Regulation

This section defines the terms used in the Regulation.

Rationale for Proposed Regulation

It is necessary that ARB defines these terms as they apply to the Refrigerant Management Program. Many of the terms are used in other Articles and Titles in the California Code of Regulations, Government Code sections or statutes, and the Code of Federal Regulations, and it is necessary that ARB be consistent with existing definitions to the extent that they apply to this Regulation.

Description of Proposed Regulation

The proposed Regulation has many definitions to provide clarity. A primary factor in the development of proposed definitions and use of terms is consistency with 1) international conventions for reporting GHG emissions, 2) existing federal

and local regulations, and 3) current understanding of terms by the regulated community based on existing federal regulation guidelines and industry standards.

The following terms warrant a detailed discussion to set out their meaning within the context of existing conventions, laws and regulations, and industry use of terms.

Global Warming Potential Value: The “global warming potential value” or “GWP value” definition is provided to ensure that estimated emission reductions resulting from the proposed Regulation are consistent with the international convention for reporting GHG emissions. With respect to the GWP of a high-GWP refrigerant, the Fourth Assessment Report (AR4) published by the Intergovernmental Panel on Climate Change (IPCC) represents the latest scientific thinking. However, to calculate emissions and potential emission reductions, the IPCC’s Second Assessment Report (SAR) is still used by international convention for reporting GHG emissions. The U.S. EPA uses the SAR GWP values for reporting the United States’ GHG emissions under the United Nations Framework Convention on Climate Change (UNFCC). The Climate Action Reserve (CAR) and the International Council for Local Environmental Initiatives (ICLEI) both reference use of the SAR GWPs as well.

This is a long-standing issue since the IPCC’s third assessment report (TAR, 2001) - the decision was made to base the Kyoto Protocol on the GWP values published in the SAR. As a result, those GWPs were locked in. A decision to update to more scientifically correct GWPs has not yet been made. Thus, the annual U.S. reporting and ARB are being consistent in using SAR as the source of GWPs.

Additionally, and most significantly, the California GHG baseline inventory, and thus the 2020 GHG emission target, is based on GWP values published in the SAR. Analysis and reporting for regulatory measures must be based on the GWP values published in the SAR in order to ensure an apples-to-apples comparison with the California GHG baseline inventory and emission reduction target.

There are several definitions that are copied, in whole, or in part from, or are provided by reference to, existing federal regulations to ensure that the meanings of the definitions are consistent with the language of federal regulatory text, guidance provided by the U.S. EPA, and the common understanding of the regulated community based on over a decade of complying with existing federal regulations. Definitions that are copied or referenced from existing federal regulations include the following:

Appliance	Normal operating characteristics and conditions
Certified reclaimer	Reclaim
Certified refrigerant recovery or recycling equipment	Recover
Certified technician	Recycle
Commercial refrigeration	Retire

Follow-up verification test	Retrofit
Industrial process refrigeration	System mothballing

In the above list of definitions developed based on consistency with existing federal regulations there is one definition that warrants further discussion.

Follow-up Verification Test: The definition of a follow-up verification test is important as it reflects the varied applications of such a test for a refrigerant leak. This test is required for a variety of refrigeration systems but may be foregone under some conditions, as such it requires flexibility. As an example, the definition includes the term, "except in cases where sound professional judgment dictates." This language is consistent with existing federal regulations and provides a required flexibility understood by the regulated community. It is provided to ensure a test that provides limited benefit in some circumstances is not required, and does not add unnecessary costs. Conversely, if reasonable professional judgment would find that the test is appropriate under the specific circumstance and it provides a benefit of preventing refrigerant emissions, then it is required.

95383. Registration Requirements for Facilities with Stationary Refrigeration Systems

Summary of Proposed Regulation

This section describes the facilities required to register based on their use of a refrigeration system with more than 50 pounds of a high-GWP refrigerant. Additionally, this section sets out the registration schedule and the information that must be provided during registration.

Rationale for Proposed Regulation

Registration is necessary to identify facilities that have potential GHG emissions from their stationary refrigeration systems, and to identify the characteristics of the refrigeration systems that can be indicators of potential GHG emissions that are targeted for reduction pursuant to Health & Safety Code section 38562.

The average lifetime of the commercial refrigeration equipment applicable under the facility registration provision, according to U.S. EPA Vintaging Model technical data sheet estimates, is between 15 and 25 years, with most equipment expected to last about 20 years before replacement. The expected annual turnover rate based on the equipment lifetime is estimated to be in the range of 4% - 7% based on the system type. Based on the long useful lifetime of refrigeration systems having registration of facilities with these systems in operation is necessary to assist in enforcement activities and to identify the characteristics of the refrigeration systems that can be indicators of potential GHG emissions.

The phased-in approach proposed for registration is necessary to ensure that requirements for each facility reflect the potential GHG emission risks from each facility based on the refrigeration system(s) used.

Description of Proposed Regulation

The potential high-GWP refrigerant emission risk from stationary, non-residential refrigeration systems is directly related to the refrigerant charge size of the refrigeration system. The phased-in approach for registration is based on refrigerant charge size categories according to the following titles:

A. Large Refrigeration Systems: refrigerant charge greater than or equal to 2,000 pounds

B. Medium Refrigeration Systems: refrigerant charge greater than or equal to 200 pounds, but less than 2,000 pounds

C. Small Refrigeration Systems: refrigerant charge greater than 50 pounds, but less than 200 pounds

The refrigerant charge size categories were developed to focus requirements on facilities with refrigeration systems with the greatest potential emissions, while also reducing the administrative burden of implementation. A principal rationale for the refrigerant charge size lower limit of greater than 50 pounds is consistency with requirements pursuant to existing U.S. EPA regulations, and the SCAQMD Rule 1415. Additionally, R/AC appliances with a refrigerant charge of 50 pounds and less are commonly tightly sealed to prevent the escape of air or any other gases and result in limited refrigerant emissions.

Owners and operators of facilities with stationary, non-residential refrigeration systems with a refrigerant charge size of more than 50 pounds of a high-GWP refrigerant will have to register with the ARB.

Registration is required based on schedule provided in Table VI.

Table VI. Registration Requirement Schedule

Refrigeration System Category	Initial Registration Due Date
Large Refrigeration Systems	March 1, 2012
Medium Refrigeration Systems	March 1, 2014
Small Refrigeration Systems	March 1, 2016

Registration will include the following information pertaining to the facility and to the refrigeration equipment.

Table VII. Registration Requirement Data Submitted

Facility Information	Equipment Information
Name of operator	System identification number
Operator federal tax ID number	Equipment type
Facility NAICS business type code	Equipment manufacturer
Facility SIC code	Equipment model or description
Name of facility, including a facility identifier such as store number	Equipment model year

Facility Information	Equipment Information
Facility mailing address	Equipment serial number. An equipment serial number is not required if a refrigeration system is assembled with multiple components with individual serial numbers, the serial number is inaccessible after assembly, or the appliance does not otherwise have an serial number
Facility physical location address	Physical location of the refrigeration system
Facility contact person	Refrigeration system temperature classification – low temperature system, medium temperature system, or other
	Full charge of the refrigeration system
Facility contact person phone number	Type of high-GWP refrigerant used
Facility contact person e-mail address	

In the registration process a facility will obtain a facility identification number. If they use the web-based registration process to be developed by the ARB, then the facility identification number will be auto-generated in the process of starting a new registration. Alternately, a facility can contact ARB staff and they will be provided a facility identification number. All other data will be specific to the facility registering.

The average lifetime of commercial refrigeration equipment that is applicable under the facility registration provision, according to U.S. EPA Vintaging Model technical data sheet estimates, is between 15 and 25 years, with most equipment expected to last about 20 years before replacement. The expected annual turnover rate based on the equipment lifetime is estimated to be in the range of 4% - 7% based on the system type. Based on the long useful lifetime of the refrigeration systems having registration of facilities with these systems in operation is necessary to assist in enforcement activities and to identify the characteristics of the refrigeration systems that can be indicators of potential GHG emissions.

95384. Implementation Fees for Facilities with Stationary Refrigeration Systems

Summary of Proposed Regulation

This section describes the initial and annual implementation fee a facility with a refrigeration system that uses 200 pounds or more of a high-GWP refrigerant will be required to pay.

Rationale for Proposed Regulation

Implementation fees are necessary to fund the implementation and enforcement of this Regulation and cost-effectively achieve specified GHG reductions pursuant to Health & Safety Code section 38562.

The imposition of fees only on facilities with medium or large refrigeration systems reflects the greater environmental impact posed by a leak at such a facility. A leak from a small refrigeration system presents a much smaller environmental impact.

The average lifetime of commercial refrigeration equipment that is applicable under the facility registration provision, according to U.S. EPA Vintaging Model technical data sheet estimates, is between 15 and 25 years, with most equipment expected to last about 20 years before replacement. The expected annual turnover rate based on the equipment lifetime is estimated to be in the range of 4% - 7% based on the system type. Based on the long useful lifetime of the refrigeration systems, requiring registration of facilities with these systems in operation is necessary to assist in enforcement activities and to identify the characteristics of the refrigeration systems that can be indicators of potential GHG emissions.

The proposed implementation fee exemption provides an incentive for facilities to use refrigeration systems that utilize advanced strategies and practices reducing refrigerant charges and emissions of ozone-depleting substances and greenhouse gases.

Description of Proposed Regulation

Implementation fees are proposed annually for facilities with a large or medium refrigeration system to be paid with the initial registration and annually thereafter. No implementation fee is proposed for facilities with only a small refrigeration system(s).

The amounts of the proposed implementation fees are based on discussions with CAPCOA and the ARB Enforcement Division staff related to their time and materials that would be needed to conduct inspections. The time needed includes pre-inspection time for facility reports review; on-site equipment inspection; review of equipment service records and leak repair records; review of refrigerant purchase, use, and shipping records; travel planning; and report writing. It is anticipated that compliance can be maintained with periodic enforcement inspections prioritized on facilities' potential or demonstrated leak risk, i.e. those facilities with a refrigeration system with a larger refrigerant charge size (greater potential emissions in the case of a leak) and equipment type(s) that is more prone to leaks or with a higher leak rate demonstrated by their annual report.

Implementation fees will fund staff to conduct inspection and enforcement activities, implement the program, provide outreach, assist the regulated community, and establish and maintain an on-line payment and reporting system to streamline all reporting requirements.

The implementation fees specific to each refrigerant charge size category are based on the average staff costs for administration of the proposed Regulation. The staff costs are related to the potential GHG emissions per facility as the time required for enforcement activities is estimated based on the need to focus on

the facilities with the greatest potential GHG emissions. The implementation fees proposed for a facility with a medium and large refrigeration system are justified by the greater environmental impact posed by systems with a larger charge size. Facilities with large refrigeration systems represent approximately 8 percent of all facilities, but 41 percent of projected 2020 BAU GHG emissions. Facilities with medium refrigeration systems represent approximately 33 percent of all facilities, but 50 percent of projected 2020 BAU GHG emissions. Conversely, facilities with small refrigeration systems represent approximately 60 percent of all facilities, but only 9 percent of projected 2020 BAU GHG emissions.

A facility with multiple refrigeration systems will be required to pay fees based only on the largest refrigeration system in operation at the facility. For example if a facility has one large refrigeration system and two medium refrigeration systems they will pay a single implementation fee of $370.

The implementation fee structure is provided in Table VIII.

Table VIII. Proposed Implementation Fee

Refrigeration System Category	Annual Implementation Fee
Large Refrigeration Systems	$370
Medium Refrigeration Systems	$170
Small Refrigeration Systems	$0

Additional detailed information on the development of the implementation fee amount is provided in Appendix C.

The proposed implementation fee exemption provides an exemption from paying either an initial or annual implementation fee to incentivize facilities to use, or install in newly constructed facilities, refrigeration systems that decrease the environmental impact posed by a refrigeration system through the use of advanced strategies and practices to reduce emissions of ozone-depleting substances and greenhouse gases.

95385. Leak Detection and Monitoring Requirements for Facilities with Stationary Refrigeration Systems

Summary of Proposed Regulation

This section describes the leak detection and monitoring systems or practices that will be required for refrigeration systems that use over 50 pounds of a high-GWP refrigerant.

Rationale for Proposed Regulation

Leak detection and monitoring is necessary to ensure detection of high-GWP refrigerant emissions and allow expedited refrigerant leak repair. High-GWP refrigerant leaks can be on-going for long periods of time without detection or loss of apparent operational efficiency. The Regulation's leak monitoring and inspection requirements are the primary means of achieving the emission reductions required by Health & Safety Code section 38562.

The tiered requirements for leak detection and monitoring and the specific performance standards for automatic leak detection systems are necessary to ensure that requirements for each facility relate to the potential emission risks from each facility based on the refrigeration system(s) used.

Description of Proposed Regulation

Starting in January 2011, leak detection and monitoring for high-GWP refrigerant leaks will be required for any system that requires more than 50 pounds of a high-GWP refrigerant. The requirements and frequency will depend on the refrigerant charge size category of the individual refrigeration system(s) in operation as summarized in Table IX.

Table IX. Proposed Leak Detection and Monitoring Requirements

Refrigeration System Category	Monitoring Requirement
Large Refrigeration Systems	Automatic leak detection system with continuous monitoring
Medium Refrigeration Systems	Quarterly leak inspections
Small Refrigeration Systems	Annual leak inspections

Automatic leak detection is required only for facilities with a large refrigeration system. Due to the time required to obtain funding for new equipment the automatic leak detection system requirement will be effective beginning in 2012, with monthly refrigerant leak inspections required in 2011 if an automatic leak detection system is not in operation.

The automatic leak detection systems that will be required are based on existing technology as described in ANSI/ASHRAE Standard 15-2001 Safety Standard for Refrigeration Systems. The proposed Regulation is consistent with this industry standard in that the detector must be continuously operated and provides real-time information. The detector required is not specified, but rather the function of the detector is specified to allow the system designer to select the type of detector based on the application.[17]

Facilities that use large commercial and industrial refrigeration systems can vary greatly ranging from petroleum refineries to a neighborhood supermarket. Similar types of facilities may have very different refrigerant monitoring requirements. In one scenario, a 50,000 square foot supermarket may have a machine room with one chiller that houses the entirety of high-GWP refrigerant used at the facility; this may be effectively monitored with only one or two sensors. Alternatively, the same market may have a machine room with refrigerant distributed to several compressors and many display cases throughout the entire facility; this will likely require many more than two sensors to be effectively monitored.

[17] American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. User's Manual for ANSI/ASHRAE Standard 15-2001 Safety Standard for Refrigeration Systems, 2003

Other factors that must be included in the design of a refrigerant monitoring system include the vapor density of the specific refrigerant used and the airflow pattern of the facility in areas with potential refrigerant leaks.[18] Due to the many factors involved, application-specific design for refrigeration systems and the necessary refrigerant leak detection systems is required. This requires a flexible regulatory framework.

The proposed regulatory language seeks to balance the need for exacting clarity in requirements with the need for flexibility to accommodate the varied, application-specific designs of refrigeration systems and refrigerant monitoring systems. Imprecise terms such as “proximity to principal components” and “areas of high potential for a refrigerant leak” are necessary to achieve this practical balance. ARB staff considered being more specific and prescriptive, for example requiring a minimum of three sensors. But, in some cases this would be overly prescriptive and add costs without the benefit of more effective monitoring, and in other cases this would not provide effective monitoring.

Any facility that installs an automatic leak detection system with continuous monitoring that directly detect the presence of refrigerant in air must place sensors or intakes such that they will measure the refrigerant concentrations in air in proximity to principal components of the refrigeration system (e.g., compressor, evaporator, condenser).

Automatic leak detection systems that directly detect the presence of refrigerant in air will be required to meet performance standards including the following:

1. Ability to accurately detect the presence of 10 ppm of refrigerant in the atmosphere.
2. Generate an alarm signal when the level of refrigerant in the atmosphere exceeds 100 ppm.

Automatic leak detection systems that use an indirect system (i.e. interpreting measurements that indicate a refrigerant leak) must alert the operator when measurements indicate a loss of 10 percent of the refrigerant charge or 50 pounds, whichever is less.

Some large refrigeration systems are intended to operate less than 12 months per year, or outside an enclosed building or structure. For these systems an automatic leak detection system is not required, but a leak inspection is required within 30 days of each initial operation of the refrigeration system, and at least quarterly during continued operations.

Medium or small facilities that are not required to have an automatic detection system must respectively use a calibrated refrigerant leak detection device, bubble test, or observation of oil residue. Facilities with small refrigeration systems only must do so annually, facilities with medium refrigeration systems

[18] Ibid.

must do so quarterly. Any leaks initially detected by observation of oil residue must then be confirmed by a calibrated refrigerant leak detection device or bubble test. If a medium or small refrigeration system is monitored via an automatic leak detection system that meets the proposed standards, them the facility owner or operator will not be required to conduct quarterly or annual leak inspections.

As the loss of refrigerant in a refrigeration system is an indication of a refrigerant leak, a leak inspection is required for all refrigeration systems that require more than 50 pounds of a high-GWP refrigerant any time an additional refrigerant charge is required that is equal to or greater than 5 pounds, or one percent of the refrigeration system full charge, whichever amount is greater.

95386. Leak Repair Requirements for Facilities with Stationary Refrigeration Systems

Summary of Proposed Regulation

This section describes the leak repair requirements for refrigeration systems that use over 50 pounds of a high-GWP refrigerant.

Rationale for Proposed Regulation

Leak repair is necessary to ensure emissions of high-GWP refrigerants are reduced pursuant to Health & Safety Code section 38562.

Description of Proposed Regulation

Leaks repair must be completed within either 14, 45, or 120 days of leak detection. The applicable time-limit depends upon the nature of the system, and the circumstances surrounding the leak.

ARB is proposing that any refrigerant leak from a stationary, non-residential refrigeration system requiring more than 50 pounds of a high-GWP refrigerant be repaired by a U.S. EPA certified technician within 14 days of initial leak detection. Based on communications with representatives of facilities using best management practices, refrigerant leaks are commonly corrected within several hours or days of leak detection depending on the severity of the leak. This repair time-frame is primarily due to the economic cost of a continued refrigerant leak in terms of refrigerant consumption. The proposed Regulation provides up to 14 days to complete a refrigerant leak repair, although under certain circumstances, such as the unavailability of a certified technician or a required part, or if a refrigerant leak repair requires an industrial process shutdown, addition time for repair may apply. A facility owner or operator has 45 days to repair a refrigerant leak any of the following conditions applies:

1. Additional time is required to order components or secure the services of a U.S. EPA certified technician.
2. The ARB has approved an exemption, or there is a pending exemption request.

3. The leak repair requires the shutdown of an industrial process.

A facility owner or operator has 120 days to repair a refrigerant leak if all of the following conditions apply:

1. The facility owner or operator is an entity subject to Mandatory Greenhouse Gas Emissions Reporting requirements pursuant to section 95101 of the Health and Safety code.
2. The refrigeration system is an industrial process refrigeration appliance.
3. The refrigerant leak repair requires an industrial process shutdown.
4. Written records are maintained to document that all the above conditions were met.

Following any leak repair of a system subject to the Regulation initial and follow-up verification tests will be required.

If the refrigerant leak cannot be repaired and verified within the applicable 14, 45, or 120 days then the system owner or operator must prepare and implement a retrofit or retirement plan within a specified time period.

The following points are relevant to the functional need for the lengthy 120 day repair period that will be applicable under certain circumstances. As noted above, to qualify for the 120 day repair period a facility must be subject to Mandatory Greenhouse Gas Emissions Reporting under section 95101 of the Health and Safety code. Such facilities include electricity generating facilities, electricity retail providers and power marketers, oil refineries, hydrogen plants, cement plants, cogeneration facilities, and industrial sources that emit over 25,000 $MTCO_2E$ per year from stationary source combustion. For example, a facility that may be subject to the 120-day provision would be a petroleum refinery as it is required to annually report their GHG emissions and would likely also have to comply with the proposed Regulation.

The 120-day provision for leak repair at such facilities is provided to mitigate the Regulation's potential to require the shutdown of an industrial process due to a refrigerant leak with the related significant energy-related economic impacts. Repair of a refrigerant leak must ultimately be accomplished, but this provision seeks a balance between the importance of mitigating refrigerant leaks and the potential economic impact of the shutdown of facilities producing petroleum or other resources for California's consumers industries.

The 120-day provision for leak repair allows time for the specific life-cycle emissions and economic impact of the refrigerant leak. The determination of the net benefit of repairing the refrigerant leak and the economic costs that may result would be required if a facility applies for a conditional exemption under the proposed Regulation.

95387. Requirements to Prepare Retrofit or Retirement Plans for Facilities with Leaking Stationary Refrigeration Systems

Summary of Proposed Regulation

This section describes the refrigeration system retrofit or retirement plan for refrigeration systems that use over 50 pounds of a high-GWP refrigerant and are shown to have unrepairable refrigerant leaks.

Rationale for Proposed Regulation

Retrofit or retirement plans for refrigeration systems that continually leak high-GWP refrigerants are necessary to reduce GHG emissions, pursuant to Health & Safety Code section 38562.

Description of Proposed Regulation

If a refrigerant leak persists, the refrigeration system owner or operator will be required to prepare a retrofit or retirement plan that establishes a schedule to retrofit or retire the system within six months of the initial leak detection.

The retrofit or retirement plan will not be submitted to the ARB, but will be maintained in a facility's on-site records, and will be required to include the following information pertaining to the facility and to the retrofitted or newly installed refrigeration systems.

Equipment Information

1. System Identification Number.
2. Equipment type.
3. Equipment manufacturer.
4. Equipment model or description.
5. Intended physical location of the refrigeration system through schematic or floor plan with location clearly noted.
6. Refrigeration system temperature classification – low temperature system, medium temperature system, or other.
7. Full charge of the refrigeration system.
8. Type of high-GWP refrigerant used.
9. A plan for the old refrigeration system disposition.
10. A detailed timetable including: the anticipated dates to begin and complete the installation, construction, or retrofit.
11. Date and signature of responsible facility representative.

95388. Reporting Requirements for Facilities with Stationary Refrigeration Systems

Summary of Proposed Regulation

This section describes the reporting requirements for facilities with refrigeration systems that use 200 pounds or more of a high-GWP refrigerant.

Rationale for Proposed Regulation

Facility reporting is necessary to quantify GHG emission reductions that result from the proposed Regulation as required pursuant Health & Safety Code section 38562.

The reporting requirements are proposed only for facilities with large and medium refrigeration systems to minimize the administrative burden upon ARB in implementing the proposed Regulation and upon stakeholders in complying with the proposed Regulation as required pursuant to Health & Safety Code section 38562.

Reporting is not necessary for facilities with small refrigeration systems as nearly 90 percent of total GHG emission reductions are expected to result from facilities with large and medium refrigeration systems. Total statewide emissions that result from the proposed Regulation can be quantified based on reports from facilities with large and medium refrigeration systems extrapolated to quantify GHG emission reductions from all refrigeration systems using more than 50 pounds of a high-GWP refrigerant.

Description of Proposed Regulation

ARB is proposing that owners or operators of stationary, non-residential refrigeration systems that use 200 pounds or more of a high-GWP refrigerant report to the ARB annually by March 1 after the end of each calendar year.

Reporting will be phased in based on the schedule provided in Table X.

Table X. Proposed Facility Reporting Schedule

Refrigeration System Category	Initial Annual Report
Large Refrigeration Systems	March 1, 2012
Medium Refrigeration Systems	March 1, 2014
Small Refrigeration Systems	No Reporting Required

The information required in an annual Facility Stationary Refrigeration report falls into the following broad categories: facility refrigeration system(s), refrigeration system service and leak repairs, and refrigerant purchases and use. Each of these categories must respectively include the information described below.

Refrigeration System Information

1. System identification number.
2. Equipment type.
3. Equipment manufacturer.
4. Equipment model or description.
5. Equipment model year.

6. Equipment serial number. The serial number(s) of the affected equipment or component must be recorded when present and accessible. When the affected equipment or component is part of an assembly without a serial number or does not have an individual serial number or is not accessible after assembly, the physical location of the affected equipment must be recorded in enough detail to permit positive identification.
7. Physical location of a refrigeration system through schematic or floor plan with equipment locations clearly noted.
8. Temperature classification – The refrigeration system must be identified as a low temperature system, a medium temperature system, or other.
9. Full charge of the refrigeration system.
10. Type of high-GWP refrigerant(s) used.
11. Date of initial installation.

<u>Refrigeration System Service and Leak Repair Information</u>

1. Date leak detected, if applicable.
2. Date service provided or leak repair completed.
3. Cause of refrigerant leak, if applicable.
4. Description service provided or leak repair completed.
5. Date(s) of initial verification test(s), if applicable.
6. Date(s) of follow-up verification test(s), if applicable.
7. Total additional refrigerant charge of each type of high-GWP refrigerant, if applicable.
8. Purpose for additional refrigerant charge (leak repair, topping off, initial refrigerant charge, or seasonal adjustment), if applicable.
9. Name of certified technician completing leak repair, if applicable.
10. The certified technician's identification number issued by an approved technician certification program pursuant to Title 40 of the Code of Federal Regulation, Part 82, §82.161, if applicable.
11. The certified technician's certification type(s) issued by an approved technician certification program pursuant to Title 40 of the Code of Federal Regulation, Part 82, §82.161, if applicable.

Refrigerant Purchase and Use

1. The total weight in pounds of each type of high-GWP refrigerant that was purchased.
2. The total weight in pounds of each type of high-GWP refrigerant that was charged into a refrigeration system.
3. The total weight in pounds of each type of high-GWP refrigerant that was recovered from a refrigeration system.
4. The total weight in pounds of each type of high-GWP refrigerant that was stored in inventory at the facility, or stored at a different location for use by the facility, on the last day of the calendar year.
5. The total weight in pounds of high-GWP refrigerant that was shipped by the owner or operator for reclamation and destruction.

95389. Recordkeeping Requirements for Facilities with Stationary Refrigeration Systems

Summary of Proposed Regulation

This section describes the recordkeeping requirements for facilities with refrigeration systems that use over 50 pounds of a high-GWP refrigerant.

Rationale for Proposed Regulation

Facility recordkeeping is necessary to verify reported data and to ensure the Regulation is enforceable, pursuant to Health & Safety Code section 38562, based on findings from the review of facility records.

Description of Proposed Regulation

Facilities will be required to keep records and to retain records for a minimum of five years; recordkeeping must include the following:

1. Registration required by section 95383.
2. Documentation of all leak detection systems, leak inspections, and automatic leak detection system annual audit and calibrations required by section 95385.
3. Records of all refrigeration system and refrigeration system service and refrigerant leak repairs, and documentation of any conditions allowing repair of a refrigerant leak to be conducted more than 14 days after leak detection, as required by section 95386. Refrigeration system and refrigeration system service and refrigerant leak repair records must include documentation of all items reported pursuant to section 95388.
4. Retrofit or retirement plans required by section 95387.
5. All reports required by section 95388.
6. Invoices of all refrigerant purchases.

7. Records on of all shipments of refrigerants for reclamation or destruction.
8. Records of all refrigeration systems component data, measurements, calculations, and assumptions used to determine the full charge.

95390. Required Service Practices for High-GWP Appliances

Summary of Proposed Regulation

This section describes the required service practices to reduce emissions resulting from the installation and servicing of R/AC appliances using high-GWP refrigerants.

Rationale for Proposed Regulation

The required service practices are necessary to ensure emissions of high-GWP refrigerants are reduced pursuant to Health & Safety Code section 38562. Additionally, the required service practices are modeled from Title 40, Part 82 of the Code of Federal regulations to ensure consistency with federal regulations specific to ODS refrigerants.

Description of Proposed Regulation

ARB is proposing the following set of requirements as part of the Regulation to reduce emissions resulting from the installation and servicing of R/AC appliances using high-GWP refrigerants.

Required service practices proposed are rooted in the foundation of the CAAA, although they will be expanded to include all high-GWP refrigerants. The required service practices include the following:

1. In preparing an appliance for recycling or disposal, the person must not intentionally disrupt the refrigerant circuit of the appliance resulting in a discharge of refrigerant into the atmosphere, unless an attempt to recover refrigerant is made using specified equipment.
2. A person must make a recovery attempt using specified equipment for the specific type of appliance prior to opening an appliance to atmospheric conditions.
3. A person must not add refrigerant to an appliance during manufacture or service, unless such refrigerant is an ODS refrigerant, or a refrigerant approved under the U.S. EPA's Significant New Alternatives Policy (SNAP) program or is otherwise approved by the Executive Officer for the specific end use.
4. A person must not add an additional refrigerant charge to any appliance known to have a refrigerant leak, except that it is permissible to add an additional refrigerant charge for seasonal adjustment or to maintain operations while complying with refrigerant leak repair requirements.
5. A person servicing an appliance must hold a current, valid, and applicable certificate issued in accordance with Title 40 of the Code of Federal Regulations, Part 82, section 82.161.

6. A person must employ procedures approved by the U.S. EPA or Executive Officer for the certified refrigerant recovery or recycling equipment used. .
7. A person must use certified refrigerant recovery or recycling equipment as specified by the equipment manufacturer, unless the manufacturer's specifications conflict with the procedures approved by the U.S. EPA or Executive Officer.
8. A person must evacuate refrigerant from a non-refillable cylinder to a vacuum of 15 inches of mercury, relative to standard atmospheric pressure of 29.9 inches of mercury, prior to recycling or disposal.
9. A person must satisfy job site evacuation of refrigerants during recycling, recovering, reclaiming, or disposing in accordance with Title 40 of the Code of Federal Regulations, Part 82, §82.156.

In general, required service practices are based on Title 40 of the CFR, Part 82. The primary impact of placing these service practices in the proposed Regulation is to expand the existing requirements for ODS refrigerants (CFC and HCFC refrigerants) to cover all high-GWP refrigerants (CFC, HCFC, HFC, and PFC refrigerants).

The required service practices provision is an another area of the Regulation where language is copied from existing federal regulations. The terms, “attempt to recover refrigerant”, “reasonably be expected”, “recovery attempt”, and “reason to believe” are from existing federal regulations and proposed to match federal regulatory text (so as to be consistent with industry’s common understanding of the terms based on the U.S. EPA past guidance).

Title 40 of the CFR, Part 82 does not specify an evacuation requirement for non-refillable refrigerant cylinders. In researching non-refillable refrigerant cylinder evacuation standards several options were reviewed. Evacuation levels of a vacuum of 4 inches of mercury below atmospheric pressure and 15 inches of mercury, relative to standard atmospheric pressure of 29.9 inches of mercury, were considered. The standard of 4 inches is consistent with the CFR Appendix D to Subpart B of Part 82—Standard for HFC-134a Recover-Only Equipment. This requirement is specific to the use of extraction equipment for MVAC systems that must be capable of ensuring removal of refrigerant from the system being serviced by reducing the system pressure to a minimum of 102 mm (4 in) of mercury below atmospheric pressure (i.e., vacuum).

The standard of 15 inches is consistent with the CFR, Subpart F of Part 82, section 82.156. This requirement is specific to required levels of evacuation for appliances and specifies that when using recovery or recycling equipment manufactured or imported on or after November 15, 1993 evacuation is required at the following levels: 1) high-pressure appliance, or isolated component of such appliance, normally containing 200 pounds or more of refrigerant (10 inches of mercury); 2) medium-pressure appliance, or isolated component of such appliance, normally containing less than 200 pounds of refrigerant (10 inches of mercury); and medium-pressure appliance, or isolated component of such

appliance, normally containing 200 pounds or more of refrigerant (15 inches of mercury).

Based on these requirements, certified refrigerant recovery and recycling equipment has been developed to meet the specified evacuation requirements. The AHRI certified product directory lists a wide variety of certified refrigerant recovery and recycling equipment available. The equipment ratings in the product directory provide a "Shut Off Vacuum" rating. The vast majority of the certified equipment listed is designed and tested to obtain a vacuum of 15 inches or higher before reaching the shut off vacuum rating.[19] Thus, the proposed evacuation requirements are technologically feasible with current equipment manufactured and required for use by existing U.S. EPA regulations.

95391. Prohibitions

Summary of Proposed Regulation

This section describes specific prohibitions of refrigerant sale, use, and disposal practices.

Rationale for Proposed Regulation

The prohibitions are necessary to ensure emissions of high-GWP refrigerants are reduced, pursuant to Health & Safety Code section 38562, by ensuring proper use of high-GWP refrigerants by qualified persons. Additionally, the prohibitions are modeled from Title 40, Part 82 of the Code of Federal regulations to ensure consistency with federal regulations specific to ODS refrigerants.

Description of Proposed Regulation

The Prohibitions provision is focused on reducing emissions caused by the distribution or reclamation of high-GWP refrigerants. The regulatory concept would place restrictions on refrigerant cylinder use that are consistent with Required Service Practices (section 95390), and would only allow refrigerant sales to qualified technicians.

Federal requirements and prohibitions specific to the purchase of refrigerants, recycling and reuse of refrigerants, and/or sale of reclaimed refrigerants are currently specific only to ODS refrigerants; the proposed Regulation will extend the requirements to all high-GWP refrigerants thus requiring emissions control on ODS refrigerants as well as ODS substitute refrigerants. Additional prohibitions focus on the use of approved refrigerants and reduction of refrigerant emissions from refrigerant cylinders.

The prohibitions include the following:

1. A person, effective January 1, 2011, must not sell, distribute, offer for sale or distribution, or purchase any high-GWP refrigerant for use as a refrigerant in a container of two pounds or greater to a person unless: 1)

[19] Air-Conditioning, Heating and Refrigeration Institute, Certified Product Directory, January 2009, http://www.ahridirectory.org/ahridirectory/pages/rrr/RRRE%2015%20January%2009_Directory.pdf, (accessed April 7, 2009).

the buyer is a certified technician; 2) the buyer is an employer of a certified technician; 3) the refrigerant is sold only for eventual resale to certified technicians, to air-conditioning or refrigeration appliance manufacturers, or the refrigerant is being sent for reclamation; or 4) the refrigerant is contained in a R/AC appliance.

2. A person must not sell used refrigerant to a new owner for use as a refrigerant unless the used refrigerant has first been reclaimed by a U.S. EPA-certified refrigerant reclaimer.
3. A person must not sell or distribute or offer to sell or distribute any refrigerant for any R/AC appliance unless such refrigerant is an ODS refrigerant, or a refrigerant approved under the U.S. EPA's Significant New Alternatives Policy (SNAP) program or the Executive Officer for the specific end use.
4. A person must not recycle or dispose of a non-refillable cylinder before the non-refillable cylinder has been evacuated to a vacuum of 15 inches of mercury, relative to standard atmospheric pressure of 29.9 inches of mercury.
5. A person must not distribute or sell certified refrigerant recovery or recycling equipment unless such equipment meets the levels of evacuation to be achieved by recovery or recycling equipment as specified in Title 40 of the Code of Federal Regulations, Part 82.
6. A person must not refill a non-refillable cylinder or use it as a temporary receiver during service.
7. A person must not repair or modify a non-refillable cylinder in any way to allow the non-refillable cylinder to be refilled.

95392. Reporting Requirements for Refrigerant Distributors, Wholesalers, and Reclaimers

Summary of Proposed Regulation

This section describes the reporting requirements for refrigerant distributors, wholesalers, and reclaimers.

Rationale for Proposed Regulation

Distributors, wholesalers, and reclaimers reporting is necessary to verify GHG emission reductions that result from the proposed Regulation as required pursuant to Health & Safety Code section 38562.

Description of Proposed Regulation

ARB is proposing that refrigerant distributors, wholesalers, and certified reclaimers report specified information to the ARB annually by March 1, beginning March 1, 2012.

The refrigerant distributor or wholesaler annual reports will include: the refrigerant distributor or wholesaler company name, address, and contact person information; a listing of all California facilities; and the following aggregated information (on a company-wide basis):

1. The total annual aggregated weight in pounds of each type of high-GWP refrigerant that was purchased or received for the purpose of subsequent resale or delivery, or for any purpose other than reclamation or destruction.
2. The total annual aggregated weight in pounds of each type of high-GWP Refrigerant that was sold or distributed:

The certified reclaimer annual reports will include: the certified reclaimer company name, address, and contact person information; a listing of all California facilities, and the following aggregated information (on a company-wide basis):

1. The total annual aggregated weight in pounds of high-GWP refrigerant that was received for reclamation or destruction.
2. The total annual aggregated weight in pounds of each type of high-GWP refrigerant that was reclaimed in California.
3. The total annual aggregated weight in pounds of high-GWP refrigerant that was shipped out of California for reclamation.
4. The total annual aggregated weight in pounds of high-GWP refrigerant that was destroyed or shipped out of California for destruction.

A primary requirement of AB 32 is that emission reductions s can be quantified and verified. The primary quantification of emission reductions is based on facility reporting. The direct GHG emissions reported by each facility statewide are summed to quantify the emissions from facilities with large and medium refrigeration systems. As only facilities with large and medium refrigeration system report, the total statewide emissions reported from facilities with large and medium refrigeration systems would be extrapolated to encompass the entire stationary, non-residential refrigeration sector statewide, including facilities with small refrigeration systems. Emission reductions are quantified as the difference between current emissions, as outlined in Appendix B, and the quantified statewide emissions based on annual facility reports.

Statewide emission reductions are verified using data obtained through refrigerant distributor and wholesaler reporting. For each $MTCO_2E$ emission reduced there is a corresponding reduction in pounds of refrigerant emitted, for example based on the GWP of 1,500 for each $MTCO_2E$ emission reduced of R-22 refrigerant approximately 1.5 pounds of refrigerant is not emitted. The 1.5 pounds of R-22 that is not emitted also does not need to be purchased and charged into a refrigeration system to bring the system to its full refrigerant charge. Thus, the emission reductions result in reduced refrigerant consumption statewide, as compared to BAU.

The statewide emission verification process is a broad comparison of refrigerant emissions based on facility reporting and the overall impact on high-GWP refrigerant consumption. On a statewide basis there are many factors impacting refrigerant sales, so a one-to-one mass balance of emissions as compared to refrigerant consumption is not possible. But, as stationary, non-residential

refrigeration systems constitute approximately 20 percent of all high-GWP emissions, the relationship between refrigerant sales and emission reductions does enable a verification of total emission reductions through refrigerant consumption trends and should be detected given the significant reductions anticipated as a result of the proposed Regulation.

95393. Recordkeeping Requirements for Refrigerant Distributors, Wholesalers, and Reclaimers

Summary of Proposed Regulation

This section describes the recordkeeping requirements for high-GWP refrigerant distributors, wholesalers, and reclaimers.

Rationale for Proposed Regulation

Distributors, wholesalers, and reclaimers recordkeeping is necessary to verify reported data and to ensure the Regulation is enforceable, pursuant to Health & Safety Code section 38562, based on findings from the review of distributors, wholesalers, and reclaimers records.

Description of Proposed Regulation

Refrigerant distributors, wholesalers, and reclaimers will be required to maintain on-site records and to retain records for a minimum of five years; recordkeeping must include the following:

1. Annual reports required by section 95392.
2. Invoices of all High-GWP refrigerant received through sale or transfer and all High-GWP refrigerant distributed through sale or transfer.

95394. Confidentiality.

Summary of Proposed Regulation

This section describes the confidentiality requirements for all reports and information provided by a facility or refrigerant distributor, wholesaler, or reclaimer to the ARB.

Rationale for Proposed Regulation

This section is necessary to ensure the regulated public understands how reports and information are managed to ensure compliance with title 17 of the California Code of Regulations, sections 91000 to 91022.

Description of Proposed Regulation

All information submitted to the Executive Officer in a Facility Refrigerant Purchase and Use report shall not be designated as confidential.

Except for data reported specifically designated as a public record, a person submitting information to the Executive Officer may designate the information as confidential because it is a trade secret or otherwise exempt from public disclosure. All such requests for confidentiality shall be handled in accordance

with the procedures specified in title 17, California Code of Regulations, sections 91000 to 91022.

95395. Enforcement

Summary of Proposed Regulation

This section describes the legal basis of the enforcement of the proposed Regulation.

Rationale for Proposed Regulation

This section is necessary to ensure the Regulation is enforceable as required pursuant to Health & Safety Code section 38562.

Description of Proposed Regulation

If the Executive Officer finds that any facility owner or operator, certified technician, non-certified technician, certified reclaimer, refrigerant distributor, refrigerant wholesaler, or other person does not comply with the requirements of this subarticle, the Executive Officer may seek an injunction or otherwise assess penalties to the extent permissible under Chapter 1.5 of Part 5, Division 26 of the Health and Safety Code commencing with Section 42400.

95396. Equivalent Local Rules

Summary of Proposed Regulation

This section describes the mechanism for ensuring all regions of the state are subject to similar requirements, regardless of whether it is subject to a local air-district rule.

Rationale for Proposed Regulation

This section is necessary to ensure the regulated public understands how the Regulation will be implemented in a specific air district in which they operate a facility and to minimize the administrative burden of compliance, as required pursuant to Health & Safety Code section 38562, with the potential for a statewide regulation and a rule adopted by a local air district.

Description of Proposed Regulation

If the Executive Officer formally determines that an air district has adopted regulations that will achieve emission reductions from stationary, non-residential refrigeration systems that are equivalent or greater to those that would be achieved via sections 95383 through 95389 of this Regulation, and enforcement and resulting benefits are demonstrated, then the requirements specified in sections 95383 through 95389 will be considered as having been satisfied.

95397. Approval of Exemptions

Summary of Proposed Regulation

This section describes the conditions upon which a facility may be exempted from specific sections of the proposed Regulation.

Rationale for Proposed Regulation

This section is necessary to ensure there is a mechanism to consider broader societal benefits, as required pursuant to Health & Safety Code section 38562, including economic impacts such as energy related economic impacts as well as total life cycle emissions specific to an individual facility.

Description of Proposed Regulation

The primary purpose of this provision is to provide flexibility in implementation of the proposed Regulation to address significant hardship that may be created by the leak repair and retrofit or retirement requirements of the Regulation. The Executive Officer may provide an exemption to the leak repair and retrofit or retirement plan requirements described above based on: life cycle emissions of a refrigeration system, economic hardship, or emissions caused by a natural disaster. Such exemptions would only be granted following a facility owner or operator's written application.

95398. Severability

Summary of Proposed Regulation

This section describes the severability of each part of the proposed Regulation and that if any part is held invalid, the remainder will continue in full force and effect.

Rationale for Proposed Regulation

This section is necessary to ensure that if any part of the proposed regulation is held invalid emissions of high-GWP refrigerants are still reduced based on other parts remaining in effect.

VII. REFRIGERANT MANAGEMENT PROGRAM IMPLEMENTATION AND ENFORCEMENT

A. Implementation

The proposed Regulation will impact approximately 26,000 California facilities. The greatest focus in implementation will be outreach to impacted facilities and training for compliance assistance. The Refrigerant Management Program will require significant planning to ensure successful implementation.

B. Implementation Activities

The success of this regulatory effort depends upon a well executed outreach and implementation plan that includes an effective electronic reporting system, outreach to facilities, implementation assistance to air districts and impacted facilities, enforcement training for air district and other personnel, and best practices technician training.

Upon Board approval of the proposed Regulation, staff will initiate outreach and implementation efforts. Primary implementation planning components will include:

- Facility Outreach and Compliance Training and Assistance Plan
- Reporting and Payment System Development
- Air District Enforcement Agreement Development and Assistance
- Inspection and Enforcement Guidelines Development

The time frame for implementation activities is January 2010 (post adoption) through January 2011. However, even after this date it is anticipated that there will be an ongoing need to reach out to impacted businesses to assist with implementation and compliance.

As described in Appendix D, based on outreach efforts conducted during the rule development process, staff determined a primary outreach challenge will be to provide clear and easy to understand instructions to facility owners on how to determine the refrigerant charge size of refrigeration systems used in their business. This is especially important for facilities with smaller refrigeration systems that need to determine if their refrigeration system uses more than 50 pounds of refrigerant, making it subject to the registration, refrigerant leak detection and monitoring, leak repair, and facility recordkeeping provisions of the proposed Regulation. This will be a primary task in the early part of developing outreach material.

<u>Facility Outreach and Compliance Training and Assistance Plan</u>

ARB staff will develop a plan to first focus on ensuring that facilities subject to the requirements are aware of the Regulation and that they can easily determine the full refrigerant charge of their refrigeration systems to understand which

provisions are applicable to their business. The plan for post-regulation adoption outreach is explained in detail in Appendix D.

Reporting and Payment System Development

In order to manage the data generated from facilities, and allow facilities to submit reports and pay implementation fees online, a reporting and payment system will be developed. The system will facilitate efficient recording and tracking of information related to this Regulation and will have the following features:

1. Full database management system for recordkeeping, data reporting, storage, and retrieval that allows affected businesses to efficiently record data, submit reports, and pay implementation fees.
2. Web-accessible interface that provides selective and secure access.
3. User-friendly interface with pull-down screens and help-based tools to facilitate accurate and efficient data entry and transfer.
4. Internal checks so that data is screened for reasonableness and applicability.
5. Report generation for compliance determination and inspection prioritization.
6. Standard reports to evaluate program performance and estimate emission reductions.
7. Capability to allow batch data entry from refrigerant management software programs used currently by facilities.
8. Provide recordkeeping templates to assist facilities and enforcement personnel allowing them to better ensure compliance with recordkeeping requirements and report the benefits of reduced refrigerant consumption.

The development of an effective and efficient reporting and payment system will be integral to the success of the Refrigerant Management Program. Data will be made available to ARB and air district staff based on specified security rules to ensure data remains secure and is available only to appropriate persons authorized to review the information.

The data required to be reported will also provide facilities information specific to refrigerant leak frequency and the total refrigerant used and help them in determining the cost-effectiveness of refrigerant management and any savings from reduced refrigerant consumption.

Air District Enforcement Agreement Development and Assistance

It is anticipated that air districts will provide the primary mechanism for enforcing the program and be supported by implementation fees. ARB staff conducted a survey to determine how local air districts are likely to participate in the Refrigerant Management Program. Based on survey responses, air districts

representing 94 percent of the State's population are likely to enforce the proposed Regulations in their jurisdiction. This can be accomplished by establishing a Refrigerant Management Program Enforcement agreement with air districts and/or by the district adopting an equivalent program.

Upon Board approval of the proposed Regulation, staff will work with a committee including representatives of CAPCOA and local air districts to develop a model Refrigerant Management Program Enforcement agreement. The agreement between the ARB and air districts will outline all roles and responsibilities, enforcement performance requirements, and the amount and methods of payments that ARB will remit to the air districts.

Staff will also develop guidelines and materials to assist air districts in the implementation of the Refrigerant Management Program including guidelines and protocols to ensure proper revenue accounting and payment remitted to air districts.

Assistance to air districts will include development of training materials for air district staff (as well as ARB staff) to ensure that enforcement staff have a clear technical understanding of the Regulation and the inspection and enforcement guidelines developed. Because there are numerous facility and system types subject to the proposed Regulation requirements staff will require broad knowledge of these systems. Training materials will be developed that include guidelines and materials to direct enforcement staff to ensure inspections are effective. It will also include review and use of reports that facilities have filed or the on-site records that they are required to maintain.

Inspection and Enforcement Guidelines Development

A multi-division team of ARB staff will develop inspection and enforcement guidelines for the Regulation and develop training materials on how to implement the guidelines. The guidelines will provide a mechanism to develop consistent standards for use statewide whether inspections and enforcement are conducted by ARB staff or local air district staff.

Program Implementation

Upon Board approval of the proposed Regulation, staff will initiate outreach activities and implementing the Regulation.

As outlined in Appendix D, the focus of program implementation will be to provide clear and concise information on the applicability of the proposed Regulation and how to comply, as well as how to most effectively reduce refrigerant emissions. The primary implementation outreach topics anticipated include:

- How to determine the refrigeration system full charge
- How to comply with the Regulation provisions applicable to your facility
- How to benefit from use of refrigerant best management practices for all high-GWP appliances
- How to effectively conduct leak inspections

C. Enforcement

The proposed Refrigerant Management Program affects GHG sources statewide. However, local and regional air districts have extensive expertise in enforcement, and already have relationships with many of the facilities that will be regulated. It is ARB's goal to leverage the expertise of the air districts in the administration of the proposed Regulation. Air districts may elect to assume the lead in enforcing the Regulation two ways.

1. Entering a collaborative agreement between air districts and ARB. The agreement between the ARB and air district will outline all roles and responsibilities, enforcement performance requirements, and the amount and methods of payments that ARB will remit to the air district.
2. Adopting and implementation of a regulation that is functionally equivalent to the statewide Regulation.

ARB staff has conducted a survey to determine which air districts are likely to participate in the proposed Refrigerant Management Program. Air districts representing approximately 94 percent of the State's population have indicated that they are likely to enforce the Regulation in their jurisdiction.

Without regard to the enforcement options chosen by an air district, the ARB will have a statewide, on-line reporting and payment system that is anticipated to be used by ARB and air district staff to conduct analysis of reported data and determine potential areas of non-compliance. The goal is to ensure a consistent statewide reporting system to reduce the impact on businesses with facilities in multiple air districts and to provide ARB and air district staff a consistent perspective of reported data to identify facilities not in compliance with the Regulation and to inform enforcement staff of where the greatest risk of GHG emissions and non-compliance could be based on the data submitted.

VIII. AFFECTED INDUSTRIES

The scope of affected industries is framed by the type of refrigerant (all high-GWP refrigerants) used by industries including facilities and certified technicians that use applicable refrigerants, and refrigerant distributors, wholesalers, and reclaimers that buy, sell, distribute, or reclaim applicable refrigerants.

Industries regulated by this action include those who: 1) own or operate facilities with a stationary, non-residential refrigeration system using more than 50 pounds of a high-GWP refrigerant; 2) service any appliance using a high-GWP refrigerant; or 3) distribute or reclaim a high-GWP refrigerant. Such entities include, but are not limited to, owners or operators of facilities using commercial refrigeration systems such as refrigerated warehouses; retail food stores, including supermarkets, grocery stores, wholesale markets, supercenters, and convenience stores; beverage and food manufacturers, distributors, and packagers; ice rinks; and other industrial process refrigeration applications. Additionally, the proposed Regulation will apply to any individual who distributes or reclaims high-GWP refrigerants.

The scope of facilities regulated specific to facilities with stationary refrigeration systems is outlined in Table XI with the facilities' related North American Industry Classification System (NAICS) code.

Table XI. Scope of Facilities and NAICS Codes Applicable to Registration for Facilities with Stationary Refrigeration Systems Provision

Category	North American Industry Classification System (NAICS) Code	Examples of regulated entities
Industrial Process Refrigeration	311, 325, 3254, 31212, 31211, 312113, 324110	Owners or operators of refrigeration equipment used in the manufacture of pharmaceuticals, frozen food, dairy products, baked goods, food and beverage, petrochemicals, chemicals, ice manufacturing
Commercial Refrigeration	493120, 452910, 445110, 446110, 445120	Owners or operators of refrigerated warehousing and storage facilities supermarket, grocery, warehouse clubs, supercenters, convenience stores.
Other Refrigeration	622110, 812220, 611310	Owners or operators of large hospitals, mortuaries/crematories, universities

U.S. EPA Certified Technicians and Refrigerant Reclaimers, Wholesalers and Distributors

It is estimated that there are 60,000 HVAC and refrigeration technicians in California that are certified by the U.S. EPA. This estimate is based on the number of licensed air-conditioning and refrigeration contractors in California

obtained from the Contractors State License Board. There are approximately 10,000 contractors with a valid and active California business license in the Warm-Air Heating, Ventilating & Air Conditioning category, an additional 600 with a license in the Refrigeration category, and 1,400 with a license in both categories. Based on the U.S. Census data for HVAC businesses it was determined that HVAC firms have on average 10 paid employees. It was assumed that 50 percent of paid employees would require certification. Not all technicians require certification as a contractor's employees have many roles. As an example, an installer that installs an appliance prior to being charged with refrigerant or an employee that specializes in electronic components does not require certification. Certification is required only for those employees that maintain or service an appliance in a way that has a reasonable potential to emit a high-GWP refrigerant – or those working on refrigerant circuit components of an appliance. Assuming each contractor has on average five employees that require certification then there would be approximately 60,000 technicians in California. The proposed Regulation will require that any refrigerant leak be repaired by technicians certified pursuant to the CFR, Title 40, Part 82, § 82.161.

The proposed Regulation also applies to U.S. EPA certified reclaimers, as well as refrigerant distributors and wholesalers. The U.S. EPA maintains a national list of certified reclaimers including 40 reclaimers that provide services in California. A complete list of U.S. EPA approved reclaimers is available at: http://www.epa.gov/Ozone/title6/608/reclamation/reclist.html. Based on information from Heating, Air Conditioning & Refrigeration Distributors International (HARDI), a trade organization representing refrigerant wholesalers, there are approximately 230 companies in California that distribute refrigerants.

IX. ENVIRONMENTAL IMPACTS OF THE PROPOSED REGULATION

The ARB staff has conducted an analysis of the potential environmental impacts of the proposed Regulation. Based on our analysis, we have determined that the proposed Regulation will have no significant adverse environmental impacts.

A. Air Quality Impacts of the Proposed Regulation

The proposed Regulation is expected to reduce direct emissions of high-GWP GHG with no associated increases in criteria pollutants or air toxics. Total estimated GHG emission reductions in 2020 is about 8 $MMTCO_2E$.

The full description of the analysis to determine the potential high-GWP GHG emission reductions estimates is provided in Appendix B.

B. Legal Requirements Applicable to the Environmental Impact Analysis

The California Environmental Quality Act (CEQA) and ARB policy require an analysis to determine the potential environmental impacts of proposed regulations. The Secretary of Resources, pursuant to Public Resources Code section 21080.5, has certified the ARB rulemaking process. Consequently, the CEQA environmental analysis requirements may be included in the ISOR for this rulemaking. The ISOR serves as a functionally equivalent document to an initial study, a Negative Declaration, and an Environmental Impact Report. In addition, staff will respond, in the Final Statement of Reasons for the Regulation, to all significant environmental issues raised by the public during the public review period or at the ARB public hearing. Public Resources Code section 21159 requires that the environmental impact analysis conducted by the ARB include the following:

1. An analysis of the reasonably foreseeable environmental impacts of the methods of compliance.
2. An analysis of reasonably foreseeable feasible mitigation measures.
3. An analysis of reasonably foreseeable alternative means of compliance with any amendments to the proposed Regulation.

Regarding mitigation measures, CEQA requires an agency to identify and adopt feasible mitigation measures that would minimize any significant adverse environmental impacts described in the environmental analysis.

1. <u>Reasonably Foreseeable Environmental Impacts of the Methods of Compliance</u>

   The ARB staff has not identified any significant adverse environmental impacts from complying with the proposed Regulation.

2. <u>Reasonably Foreseeable Feasible Mitigation Measures</u>

   CEQA requires an agency to identify and adopt feasible mitigation measures that would minimize any significant adverse environmental

impacts described in the environmental analysis. ARB staff has concluded that no significant adverse environmental impact would occur from adoption of, and compliance with, the Regulation. Therefore, no mitigation measures would be necessary.

3. Reasonably Foreseeable Alternative Means of Compliance with the Amendments to the Refrigerant Management Program

   The ARB is required to do an analysis of reasonably foreseeable alternative means of compliance with the proposed amendments to the Regulation. The ARB staff concluded that the proposed Regulation provides the most effective measure that is cost-effective and results in verifiable, enforceable GHG emission reductions. Alternatives considered are outlined in detail in the "Alternatives Considered" discussion in the Economic Impacts of the Proposed Regulation section (Section X) of this Staff Report.

C. Environmental Justice

ARB is committed to evaluating community impacts of proposed regulations including environmental justice concerns. Given that some communities experience higher exposure to air pollutants, it is a priority of ARB to ensure that full protection is afforded to all Californians. The proposed Regulation is not expected to result in significant negative impacts in any community.

To ensure that everyone has had an opportunity to stay informed and participate fully in the development of this regulation, staff has held multiple workshops and workgroup meetings, provided opportunities to participate in meetings by internet webcasting and phone, widely distributed all materials, and maintained consistent contact with interested stakeholders.

X. ECONOMIC IMPACTS OF THE PROPOSED REGULATION

ARB staff has reviewed the costs of the proposed Regulation for calendar years 2011 through 2020.

Table XII provides the cost estimated for 2020, to reflect the average annual total cost of the proposed Regulation once fully implemented.

Table XII. Statewide Annual Cost of the Proposed Rule in 2020

Proposed Rule Components	Annual Cost (HFC plus ODS systems) ($ millions)	Annual Cost (HFC systems only) ($ millions)
Net Costs: Sections 95383 through 95390	$19.1 savings	$12.8 savings
Net Costs: Sections 95391 through 95393	$0.2	$0.1
Entire Rule Net cost	$18.9 savings	$12.7 savings
Proposed Rule Emissions Reductions	8 $MMTCO_2E$	7 $MMTCO_2E$
Proposed Rule Cost-effectiveness	$2/$MTCO_2E$ savings	$2/$MTCO_2E$ savings

Note: all costs are estimated in constant 2008 dollars.

The majority of costs are related to the general requirements for facilities with stationary refrigeration systems including the following provisions: Registration Requirements for Facilities with Stationary Refrigeration Systems (section 95383), Implementation Fees for Facilities with Stationary Refrigeration Systems (section 95384), Leak Detection and Monitoring Requirements for Facilities with Stationary Refrigeration Systems (section 95385), Leak Repair Requirements for Facilities with Stationary Refrigeration Systems (section 95386), Requirements to Prepare Retrofit or Retirement Plans for Facilities with Leaking Stationary Refrigeration Systems (section 95387), Reporting Requirements for Facilities with Stationary Refrigeration Systems (section 95388), and Recordkeeping Requirements for Facilities with Stationary Refrigeration Systems (section 95389). The total costs of these provisions combined are a savings of approximately $19 million annually.

Additional costs are associated with provisions related to refrigerant distributors, wholesalers, and reclaimers including the following provisions: Prohibitions (section 95391), Refrigerant Distributor, Wholesaler and Reclaimer Reporting (section 95392), and Refrigerant Distributor, Wholesaler and Reclaimer Recordkeeping (section 95393). The total costs of these provisions combined are less than $200,000 annually.

The total cost-effectiveness of the proposed Regulation is a savings of $2/$MTCO_2E$ for the emission reductions of Kyoto gases and Non-Kyoto gases combined, and Kyoto gases only. A detailed analysis of costs and economic impacts is provided in Appendix C.

The cost and economic impacts analysis was conducted by determining average costs for each component of the proposed Regulation, including:

- Implementation fees

- Average capital and operating cost for automatic leak detection system
- Average leak inspection costs
- Average leak repair costs
- Average recordkeeping cost
- Average reporting costs
- Average refrigerant costs

The costs for each component of the proposed Regulation was multiplied by the estimated number of facilities and refrigeration systems outlined in Appendix B to determine a total cost for the proposed Regulation. These estimates were done separately for the ODS and HFC refrigerants and the total combined refrigerants.

Leak repair costs attributed to the proposed Regulation are a percentage of the total actual repair costs. Average leak repair costs represent the difference between immediate repairs as required under the proposed Regulation and BAU repairs at an estimated time when a repair would likely be conducted in any case to maintain operations. The time for repairs to occur to maintain operations is estimated as the point at which the loss of refrigerant exceeds 35 percent of the refrigerant charge at the charge loss rate indicated by staff research for specific equipment categories based on refrigeration system type and refrigerant charge size.

Example equipment categories include cold storage requiring over 2,000 pounds of a high-GWP refrigerant or refrigerant condensing units requiring between 50 and 200 pounds of a high-GWP refrigerant. The interest cost (or lost opportunity cost) at 5 percent per year of the gross repair cost (parts, labor, and refrigerant recharge) is attributed to the proposed Regulation. As an example, the average annual leak for medium refrigeration systems is approximately 17 percent, so it would take slightly over 2 years to leak 35 percent (17 percent per year for slightly over 2 years equals approximately 35 percent) of the refrigerant charge. At 5 percent per year for two years, the leak repair cost attributed to the proposed Regulation would be approximately 10 percent of the total leak repair cost.

The annual discount rate of 5% used in this analysis is representative of the cost of money when high-risk technologies and activities are not involved and is consistent with cost assumption of the AB 32 Scoping Plan. The Scoping Plan's analysis of costs and savings used a uniform real discount rate of 5% to estimate the cost of money for all proposed measures and provided the first step towards annualizing the upfront or capital expenditures. ARB staff conducted a sensitivity analysis to determine how sensitive the average cost-effectiveness of the proposed rule is to the discount rate used. A range of discount rates were used to determine their impact on the average cost-effectiveness of the proposed rule. This analysis resulted in a net savings or net cost depending on the discount rate used with all results within the range of cost-effectiveness for measures approved by the Board in 2009, which have ranged from over $100 in savings to a cost of $21 per $MTCO_2E$.

A detailed analysis of costs and economic impacts attributed to the proposed Regulation is provided in Appendix C.

The proposed Regulation cost-effectiveness was calculated by dividing the total cost by the emissions reductions outlined in Appendix B.

A. Legal Requirements for Fiscal Analysis

In proposing to adopt or amend any administrative regulation Section 11346.3 of the Government Code requires that State agencies must assess the potential for adverse economic impacts on California business enterprises and individuals, including the ability of California businesses to compete with businesses in other states. The assessment must also include the potential impact of the regulation on California jobs; business expansion, elimination or creation; and the ability of California business to compete with businesses in other states.

Also, State agencies are required to estimate the cost or savings to any state or local agency and school district in accordance with instructions adopted by the Department of Finance. The estimate shall include any non-discretionary cost or savings to local agencies, and the cost or savings in federal funding to the State.

The economic impacts analysis of the proposed Regulation was conducted to meet current legal requirements under the Administrative Procedure Act (APA) and the results are detailed in the required Form 399.

B. Potential Impact on California Businesses

California businesses having facilities with refrigeration systems that require more than 50 pounds of a high-GWP refrigerant will be impacted by the proposed Refrigerant Management Program through registration and the imposition of implementation fees, and leak monitoring and detection, leak repair, retrofit or retirement plan, reporting, and recordkeeping requirements. It is important to note that currently the majority of applicable R/AC appliances in operation use ODS refrigerants. California businesses currently using refrigeration systems requiring more than 50 pounds of an ODS refrigerant are subject to leak repair, required service practices, and recordkeeping requirements under existing U.S. EPA regulations. The same California businesses in the SCAQMD jurisdiction are subject to leak inspection, leak repair, registration and implementation fee, reporting, and recordkeeping requirements under the SCAQMD's Rule 1415. Thus, the recordkeeping and leak repair provisions of the proposed Regulation are consistent with existing requirements for California businesses, though certain elements of the proposal such as the facility implementation fees and reporting are new for businesses outside of the SCAQMD's jurisdiction.

Refrigeration and air-conditioning service contractors will be impacted through required service practices. The majority of these businesses, approximately 12,000, are refrigeration and air-conditioning service contractors that will be only minimally impacted by the required service practices provision, which in most

cases are common business practices already required for ODS refrigerants pursuant to existing U.S. EPA regulations.

C. Potential Impact on Small Businesses

To the extent that small businesses have refrigeration systems requiring more than 50 pounds of a high-GWP refrigerant they will be subject to the proposed Regulation. Approximately 64 percent of the estimated 26,000 facilities affected by the proposed Regulation are small businesses (i.e., businesses having fewer than 100 employees). Approximately 90 percent of the 12,000 refrigeration and air-conditioning contractors are small businesses. The number of small businesses was estimated using census data describing the distribution of business size (by number of employees) for the industries affected by the proposed Regulation. The estimate of small business impacted is based on a legal definition of 100 employees, as compared to what many may perceive as a small business, which would be as few as 10 employees.

In the regulation development process, ARB staff developed several provisions specifically to minimize the impact to small businesses while still delivering the vast majority of potential emission reductions, including the following:

1. Set refrigerant charge size threshold at more than 50 pounds – eliminates most bars and restaurants, gas stations, bakeries, and liquor stores.
2. Apply leak inspection, repair, reporting, and recordkeeping requirements only to refrigeration systems, as compared to all R/AC appliances – eliminates facilities with only air-conditioning appliances.
3. Develop reduced requirements for facilities with small refrigeration systems only
    a. Annual leak inspection, as compared to quarterly
    b. No reporting
    c. No implementation fee.
4. Ensure requirements are consistent with existing rules already applicable to small businesses
    a. Consistency with federal regulations specific to ODS refrigerants
    b. Consistency with SCAQMD Rule 1415 requirements.

One alternative reviewed by ARB staff was to include all refrigeration systems with a refrigerant charge equal to or greater than 30 pounds. One result of recommending the threshold to be set at more than 50 pounds of a high-GWP refrigerant is a significant reduction in the number of small businesses impacted. In several cases facilities that tend to be owned or operated by small businesses will not be impacted based on the 50-pound refrigerant charge size threshold. Research conducted for the ARB indicates that the refrigerant charge size for

refrigeration systems (condensing units) for bars and restaurants, gas stations, bakeries, and liquor stores are all generally below 50 pounds.[20]

One alternative selected that resulted in a significant cost reduction to small businesses is the focus on refrigeration systems only as compared to all R/AC appliances. As discussed further in the "Alternatives Considered" discussion in the Economic Impacts of the Proposed Regulation section (Section X) of this report, this alternative resulted in substantially reduced costs, including reduced costs for small businesses.

The types of facilities impacted tend to be highly represented in market segments dominated by large companies. As an example, the facilities using small refrigeration systems are dominated by large companies as about 30 percent of the over 15,500 facilities using small refrigeration systems are pharmacies and 63 percent of pharmacies are represented by only three major chains (CVS, Rite-Aid, Walgreens).

The potential impact of the proposed Regulation on small businesses will depend on the specific refrigeration systems used at a facility and their current refrigerant management practices. Based on ARB staff research, use of the best management practices described in the proposed Regulation resulting in meeting a 10 percent annual leak rate, on average, will result in a net savings to these small businesses.

The refrigerant sale, use, and disposal provisions of the Regulation will primarily affect small businesses in the refrigerant distribution, wholesale, and reclamation business sectors. This will include an estimated 230 refrigerant distributors and wholesalers and 40 refrigerant reclaimers.

One sector of positively impacted small businesses will be service contractors that specialize in refrigeration systems; there are approximately 2,000 in California. The provisions of the proposed Regulation provide business opportunities for these contractors as they will be needed to perform leak repairs and will likely conduct additional leak inspections.

D. Potential Impact on Business Creation, Elimination, or Expansion

No negative change is expected for California businesses as a result of this Regulation. This is because the proposed Regulation will impose requirements on businesses serving California clients, and the proposed Regulation is not anticipated to impact the level of services required by these clients.

The proposed Regulation requires that all refrigerant leak repairs be conducted by a U.S. EPA certified technician to be consistent with existing U.S EPA regulations specific to ODS refrigerants. Industry stakeholders have stated that there is a limited pool of certified technicians, so the proposed Regulation may have a positive business impact by creating greater demand for U.S. EPA certified technicians. It is anticipated that growth may occur in business for

[20] ARMINES, Inventory of Direct and Indirect GHG Emissions from Stationary Air conditioning and Refrigeration Sources, with Special Emphasis on Retail Food Refrigeration and Unitary Air conditioning, Final Report, March 2009.

current certified technicians as well as encourage current non-certified technicians to become certified to fill the increased demand.

The proposed Regulation will also result in potential business expansion including increased sales and service agreements for automatic leak detection systems.

E. Potential Impact on Business Competitiveness

The proposed Regulation will have little or no impact on the ability of California businesses to compete with businesses in other states. Many of the businesses affected by the Regulation are local businesses serving California clients, and may not be strongly subject to interstate competition. Additionally, as the proposed Regulation will uniformly impact any company providing services in California, there is no anticipated adverse impact resulting from out-of-state competition. Based on reduced refrigerant consumption, on average, the proposed Regulation is anticipated to result in a savings of $2 per $MTCO_2E$ in emissions reduced, which may provide a benefit to many businesses.

F. Potential Impact on California Consumers

No noticeable change in consumer prices is expected from the proposed Regulation; although initially some potential increased refrigerant distributor business costs may be passed to the consumer through price changes for refrigeration and air-conditioning repair services.

As businesses begin to use greater refrigerant best management practices required by the proposed Regulation and obtain the resulting cost benefits of reduced refrigerant consumption, the net savings of the proposed Regulation may also be passed on to consumers, though any savings would be expected to be quite small.

G. Potential Impact on California Employment

ARB staff expects no significant change in employment due to the compliance costs.

The proposed Regulation requires that all refrigerant leak repairs be conducted by a U.S. EPA certified technician to be consistent with existing U.S EPA regulations specific to ODS refrigerants. Industry stakeholders have stated that there is a limited resource of certified technicians, so the proposed Regulation may have a positive employment impact on creating greater demand for businesses and employment requiring U.S. EPA certified technicians. It is anticipated that growth may occur in business for current certified technicians as well as encourage current non-certified technicians to become certified to fill the increased demand.

H. Potential Impacts to California State and Local Agencies

Potential impacts to California state and local agencies are specific to either state and local agency compliance costs or implementation costs.

State and Local Agency Compliance Costs

The fiscal impact on state government related to compliance with the proposed Regulation is due to the registration, leak detection and monitoring, leak repair, reporting and recordkeeping provisions for state owned and leased buildings (including state universities).

Data characterizing the number of refrigeration systems used by state colleges and universities was obtained from the SCAQMD Rule 1415 dataset. This refrigeration system inventory was extrapolated statewide based on the total number of community colleges, state colleges and state universities present in California.

The annual impact on colleges and universities is estimated to be a net savings, on average, of approximately $122,000 ($3,500 savings per facility). The estimates include the statewide inventory of refrigeration systems (not including air-conditioning systems) of state government buildings and state university buildings.

There is limited expected fiscal impact on state government buildings since most are not expected to have impacted facilities. The impact to state facilities was dramatically reduced based on the selected alternative to focus on refrigeration systems only, as compared to refrigeration and air-conditioning systems.

There are no reports of state owned or operated facilities in the SCAQMD that could be extrapolated statewide. But, based on reports of county facilities including correctional and medical facilities, it is assumed state correctional and medical facilities may be impacted by the proposed Regulation. Any impacts are anticipated to be minimal.

The local government and state agencies that could be subject to required service practices include some cities, counties, public utility districts, school districts, or other agencies that maintain and service facilities that include refrigeration and air-conditioning appliances. But, these requirements are substantially the same as currently required under existing federal regulations specific to ODS refrigerants.

There are a few county owned facilities with small and medium size refrigeration systems that will have impacts. This cost is estimated to be approximately $700 statewide annually; approximately, on average, $20 per facility. County facilities applicable to the proposed Regulation will include facilities such as correctional facilities, medical facilities, and morgues.

There are no expected fiscal impacts on cities and local schools (K-12) in relation to the registration, leak detection and monitoring, leak repair, reporting and recordkeeping provisions since they are not expected to have impacted facilities.

The inventory of refrigeration equipment used by local governments and local schools was estimated using data obtained from the SCAQMD Rule 1415 dataset and a survey of local governments conducted by ARB staff. Refrigeration inventories for representative cities and counties were extrapolated statewide based on the total number of cities and counties in California. Existing data available from the SCAQMD Rule 1415 dataset indicated that no local schools in California use refrigeration systems with more than 50 pounds of refrigerant.

State and Local Agency Implementation Costs

State and local agency costs incurred to administer and enforce the Refrigerant Management Program will be related to activities of the ARB or local air districts. An air district may decide to enforce the proposed Regulation, which will result in additional expenses. These expenses will be compensated based on agreements between the respective air district and the ARB. Funding for these expenses is anticipated from the collection of implementation fees collected under the proposed Regulation, which were planned to cover the costs of program administration and enforcement. No enforcement costs to the state, beyond those covered by fees, are expected. Where air districts do not enforce the Regulation, the ARB staff will be required to enforce the Regulation.

Based on a phased implementation approach, the proposed regulatory action potential cost impact for implementation of the program (including cost of agreements with local air districts) is estimated at $0.4 million starting in fiscal year 2010-11, an additional $0.7 million starting in fiscal year 2012-13, and an additional $1.2 million starting in fiscal year 2014-15 to reach a total of 2.3 million in fiscal year 2014-15 and each year thereafter. Implementation fees are set to cover the estimated costs of implementing and enforcing the Regulation.

The costs of the program are associated with required staff positions (estimated at $175,000 per position with approximately 2 positions required in fiscal year 2010-11, and each year thereafter, prior to any receipt of implementation fees. The cost per position used in the calculations ($175,000) is based on the average ARB fully loaded cost per position (typical positions used for inspections in Enforcement division of ARB are Air Pollution Specialists and/or Air Resources Engineers).The primary role of these positions will be program administration, reporting and payment system development and maintenance, training for air district staff and facility owners and operators, and outreach to impacted facilities. After fiscal year 2011-12, additional staff will be required. The primary role of these positions will be program enforcement and administration, although they will also be involved in training for air district staff and facility owners and operators, and outreach to impacted facilities. Starting in fiscal year 2012-13, additional costs will be due to the need for an additional 4 positions. Starting in fiscal year 2014-15, additional costs will be due to the need for an additional 7 positions for a total of 13 positions required for fiscal year 2014-15 and each year thereafter. Costs for positions starting in fiscal year 2012-13 and after will be funded through the receipt of implementation fees.

The ARB anticipates that cost will include ARB staffing costs as well as funds for fee-for-service agreements with local air districts for administration and enforcement activities. It is anticipated that the majority of these positions will be air district staff compensated through the Regulation implementation fees to assist with program implementation and enforcement. ARB will require two administrative positions and one enforcement position. All other positions are anticipated to be required throughout local air districts.

Anticipated staffing allocations are based on a preliminary survey of air districts to determine how each air district is likely to participate in the Refrigerant Management Program. Air districts representing approximately 94 percent of the State's population responded that they are likely to enforce the Regulation in their jurisdiction, although final determinations by air districts are likely to occur after adoption of the proposed Regulation.

I. Alternatives Considered

Government Code section 11346.2 requires ARB to consider and evaluate reasonable alternatives to the proposed Regulation and provide reasons for rejecting those alternatives.

The ARB staff considered alternatives for all components of the proposed Regulation to ensure that the proposed Regulation achieves the maximum technologically feasible and cost-effective GHG emission reductions from stationary R/AC appliances. The discussion that follows is organized by alternatives that were considered for key components of the program (e.g., applicable refrigerant charge size subject to the Regulation).

Refrigerant Charge Size Criteria

The owner or operator of a facility with a stationary refrigeration system with a full charge of more than 50 pounds of high-GWP refrigerant will be subject to the provisions of the proposed Regulation. ARB staff also considered a minimum refrigerant charge threshold of 30 pounds for all refrigeration systems to capture smaller roof top units, walk-in coolers, and other smaller equipment. One commenter in the technical working group argued that smaller equipment accounts for significant refrigerant emissions and therefore should not be excluded from regulatory control. Other working group members, however, commented that smaller R/AC equipment tends to be tightly sealed and would therefore not result in significant emissions on a per-unit basis. These commenters agreed with ARB staff that by lowering the threshold to less than 50 pounds, tens of thousands of additional California facilities would be impacted, which would increase the administrative burden of the proposed Regulation while not resulting in significant emission reductions.

Further, because existing U.S. EPA regulations as well as SCAQMD regulations are based on R/AC appliances with a refrigerant charge of more than 50 pounds of ODS as the regulatory threshold, a different threshold in California could create confusion.

ARB estimates that lowering the refrigerant charge threshold to 30 pounds for refrigeration systems would increase the total number of impacted facilities by a factor of 4 or more (from 26,000 facilities to 108,000 facilities). Further, the refrigeration systems that use less than 50 pounds of refrigerant tend to be small tightly sealed appliances with very low per unit refrigerant leak rates.

Using a minimum refrigerant charge of 30 pounds or greater is estimated to have a net total cumulative cost of $96 million for 10 years, an increase of $284 million (difference between a net savings of $188 million in the Regulation and a net cost of $96 million in this alternative) ($27 million increase in 2020) over the proposed Regulation, but would have limited additional emission reductions and unduly burden small businesses. The cost effectiveness of the proposed regulation would change from a savings of $2 per $MTCO_2E$ to savings of $1 per $MTCO_2E$. Additionally, due to the increased number of facilities, administrative cost for the program would likely be substantially increased.

ARB also considered using a threshold of 200 pounds of refrigerant. But, there was significant concern regarding the issue of consistency with existing federal and local regulations being based on a 50-pound refrigerant threshold. This proposal would also reduce possible emission reductions by approximately 0.9 $MMTCO_2E$.

ARB will monitor changes in technologies that would warrant a revised threshold.

Leak Detection and Monitoring

ARB is proposing that by January 1, 2012, owners or operators of a stationary refrigeration system with a full charge greater than or equal to 2,000 pounds of high-GWP refrigerant, and which operates, or is intended to be operated, year-round must have an automatic leak detection system with continuous monitoring.

ARB staff had considered requiring continuous monitoring for all systems with a full charge greater than 600 pounds of high-GWP refrigerant. This lower threshold was based primarily on consistency with the Fluorinated Gas, or F-gas, regulations recently adopted by the European Commission that requires continuous monitoring for comparably sized-systems (>300 kg [approximately 660 pounds] refrigerant charge).[21]

ARB staff concluded that 2,000 pounds is a more appropriate threshold. The greatest risk for large refrigerant leaks is from large systems used for cold storage and process cooling. These risks are derived from the large refrigerant charge sizes contained within these systems and, in some cases, high existing refrigerant leak rates. See Appendix B for a detailed review of existing refrigerant leak rates.

[21] Official Journal of the European Union, REGULATION (EC) No 842/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 17 May 2006 on certain fluorinated greenhouse gases, http://www.fluorocarbons.org/documents/library/Legislation/JO_L161_1_842_2006_Regulation.pdf, (accessed September 3, 2009).

Further, ARB believes that it is more appropriate to require continuous monitoring for systems that are operating year-round, and not for systems that operate on a seasonal or intermittent cycle. For these latter systems, leak inspections are required any time the system is re-activated and quarterly thereafter, rather than requiring an automatic leak detection system.

Requiring all refrigeration systems with more than 600 pounds of high-GWP refrigerant charge to be fitted with an automatic leak detection system would have a total net cumulative cost of $255 million for 10 years, an increase of $443 million (difference between a net savings of $188 million in the Regulation and a net cost of $255 million in this alternative) ($46 million increase in 2020) over the proposed Regulation. The cost effectiveness of the proposed regulation would change from a savings of $2 per $MTCO_2E$ to cost of $3 per $MTCO_2E$.

Include all Refrigeration and Air-conditioning Systems

Staff considered including all stationary, non-residential R/AC appliances containing more than 50 pounds of a high-GWP refrigerant. Staff received comments that the emissions profiles of refrigeration and air-conditioning systems as two distinct sectors were quite different and that it would result in very different impacts in regards to cost-effectiveness and emission reductions. Staff obtained additional data that addressed these concerns.

Table XIII clearly illustrates why staff concluded that refrigeration systems should be the focus of the proposed Regulation. A regulation focused on refrigeration will include an estimated 26,000 facilities to address 2020 BAU emissions of 15.8 $MMTCO_2E$ and reduce emissions by about 8.1 $MMTCO_2E$ of GHG, including Kyoto and non-Kyoto GHG. Including air-conditioning systems at a similar cost structure per facility would expand the scope of the program by including 23,000 more facilities to address 2020 BAU emissions of 1.4 $MMTCO_2E$ while only providing additional emission reductions of 0.5 $MMTCO_2E$.

Table XIII. Refrigeration and Air-Conditioning GHG Emission Profiles Summary

R/AC System Charge Size	Estimated Facilities	Estimated 2020 BAU Emissions (MMTCO2E)	Potential 2020 Emission Reductions (MMTCO2E)
	REFRIGERATION		
Small Refrigeration Systems	~ 15,500	1.4	0.9
Medium Refrigeration Systems	~ 8,500	7.9	3.3
Large Refrigeration Systems	~ 2,000	6.5	3.9
Total Facilities with Refrigeration Systems	~ 26,000	15.8	8.1

R/AC System Charge Size	Estimated Facilities	Estimated 2020 BAU Emissions (MMTCO2E)	Potential 2020 Emission Reductions (MMTCO2E)
	AIR CONDITIONING		
Small Air-Conditioning Systems	~ 14,000	0.7	0.4
Medium Air-Conditioning Systems	~ 6,300	0.3	0.1
Large Air-Conditioning Systems	~ 2,700	0.4	*0.0
Total Facilities with Air-Conditioning Systems	~ 23,000	1.4	0.5

Notes:
Totals may not sum due to rounding.
* See Appendix B for detailed discussion of estimates.

The difference in the emission profile between refrigeration and air-conditioning systems would have a significant impact on cost-effectiveness.

It was found that including these systems would result in an estimated net cumulative cost of the Regulation of $57 million in 10 years; an increase of $245 million (difference between a net savings of $188 million in the Regulation and a net cost of $57 million in this alternative) ($26 million increase in 2020) over the proposed Regulation.

The majority of these systems are either small tightly sealed systems or chiller systems which, as a group, have very low leak rates. Annual emissions reductions as a result of including air-conditioning systems were approximately 0.5 $MMTCO_2E$ greater than the current proposal. The cost effectiveness of the proposed regulation including all R/AC systems would change from a savings of $2 per $MTCO_2E$ to cost of $1 per $MTCO_2E$, but the cost-effectiveness in the year 2020 specific to the approximately 23,000 facilities with only air-conditioning appliances would be approximately $43 per additional $MTCO_2E$ reduced.

Leak Repair Limit

The proposed Regulation will require repair of any refrigerant leak in a stationary refrigeration system with a full charge of more than 50 pounds of high-GWP refrigerant. ARB staff also considered adoption of the current U.S. EPA requirement that repairs be made when the annual leak rate of ODS refrigerant exceeds 35 percent in commercial or industrial refrigeration appliances, or 15 percent for comfort cooling appliances.

ARB staff chose not to propose a leak rate trigger for a number of reasons. First, ARB staff believes that any detected refrigerant leak should be investigated and repaired. Although one indication of a refrigerant leak is the need to add refrigerant, adding refrigerant alone does not confirm a leak. If refrigerant is required, it should be assumed that the system is leaking, and a leak inspection should be conducted. Exceptions to this general rule are additions of refrigerant required for seasonal adjustment, or an additional refrigerant charge into a R/AC appliance evacuated for repair.

Second, ARB staff believes that calculating an annual leak rate creates an additional compliance and recordkeeping burden that could be avoided without compromising environmental protection. For example, to determine if a leak requires repair, under the federal regulation, a refrigeration appliance owner or operator would have to calculate the leak rate based on monitoring over 12-consecutive months before adding refrigerant to an appliance. This may not be possible if there is no recorded use of refrigerant in this 12-month period. Without determining a leak rate, they would have no means of determining if the appliance's leak rate was kept beneath 35 percent, and would not know if further action was warranted.

ARB staff did consider requiring the calculation of the leak rate (as defined in CFR, Title 40, Part 82, § 82.152) upon each addition of refrigerant to the system, unless the addition is made in order to recharge refrigerant immediately following a retrofit or the addition is made as a seasonal adjustment. ARB staff views these revisions to be reasonable alternatives, but unnecessary compared to the simpler approach that is proposed.

Additionally, if the proposed Regulation allowed a 35 percent leak rate for refrigeration systems prior to leak repair, and this target leak rate applied to all systems during the year, then the GHG emission reductions compared to BAU are substantially reduced from 7.2 $MMTCO_2E$ to less than 1 $MMTCO_2E$ for Kyoto gases.

Finally, the SCAQMD Rule 1415 requires all leaks to be repaired. A similar statewide requirement would better ensure clarity and consistency with this existing program.

Banning of Non-refillable Refrigerant Cylinders

Alternatives staff reviewed specific to refrigerant cylinder are similar to concepts proposed, but not enacted, in U.S. EPA regulations. U.S. EPA regulations do not prohibit the use of non-refillable refrigerant cylinders, although this regulatory concept has been reviewed in the context of the management of 30-pound non-refillable refrigerant cylinders. Options the U.S. EPA had considered included: 1) a complete ban of non-refillable containers, 2) evacuation of cylinders, using industry guidelines, prior to disposal, and 3) a ban on importation of Class 1 ODS refrigerants in non-refillable cylinders.[22]

The banning of non-refillable cylinders could result in a GHG emission reduction benefit from refrigerant cylinders, although criteria pollutant emissions including diesel particulates from transportation may increase. Additionally, there may be other business impacts such as additional personnel injuries resulting from the use of heavier cylinders.

[22] ARI's Policy and Public Affairs - Executive Branch, http://ariadman.tempdomainname.com/ga/executive-branch/index.html, retrieved on May 13, 2008.

The banning of non-refillable cylinders would require substantial changes in the refrigerant distribution industry, and additional costs.

Placing restrictions on the sale of non-refillable cylinders would require capital expenditures for the manufacture of refillable cylinders to replace currently used non-refillable cylinders.

Based on a literature review of the U.S. market for common refrigerants such as R-22 and R-134a the total number of non-refillable cylinders sold in California is estimated at 720,000 annually. This is based on national sales estimates of one million 30-pound cylinders in the MVAC market and five million in the stationary HVAC market scaled down to the California population – 12 percent of six million 30-pound cylinders.[23] If non-refillable cylinders are banned, then these non-refillable cylinders must be replaced with refillable cylinders, which will increase manufacturing costs. These one-time replacement manufacturing costs would be recovered over time as non-refillable cylinders are manufactured each year while refillable cylinders are not required to be manufactured each year.

The proposed option would also require infrastructure development for refilling refrigerant cylinders. There is no existing data available specific to the cost of infrastructure development for cylinder refilling.

In the alternative scenario of a non-refillable cylinder ban there are other cost issues that may be a barrier. The tare weight of a 30-pound refillable cylinder may be 300 percent or greater than the tare weight of a non-refillable cylinder. Based on manufacturer data a non-refillable cylinder's tare weight would be around 6 pounds, while a refillable cylinder's tare weight may be as high as 21 pounds.[24] As the servicing locations for R/AC appliances are often up stairs or on rooftops, increased weight may increase workers' injuries or create the need for a lighter refillable cylinder, which would increase the number of times a technician may need to carry a cylinder to a servicing location. These costs are not quantified due to a lack of data, but may be extensive.

The requirement for refrigerant cylinders to be returned to a refrigerant distributor for refilling may result in additional vehicle miles traveled (VMT). Currently most refilling is completed at refrigerant manufacturing plants in southeastern United States. Until a high-GWP refrigerant refilling infrastructure is established in California VMT for refrigerant cylinders could increase substantially, requiring travel back to plants in or around Baton Rouge, Louisiana. Additionally, as refillable cylinders are heavier, the total tons per mile for local service vehicles would increase, which would increase total transportation related cost and emissions.

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[23] Batt, J. Attachment 1: Description of Emission Reduction Measure Form, http://www.arb.ca.gov/cc/scopingplan/submittals/other/carb_solicitation_for_ideas_use_of_refillable_refrigerant_cylinders.pdf, (accessed March 16, 2009.

[24] Based on cylinder specifications from Amtrol Inc., http://www.amtrol.com/pdf/refrigrec.pdf, (accessed September 1, 2009), and Worthington Cylinders, http://www.worthingtoncylinders.com/Specifications/Refrigerant.aspx, (accessed September).

Requiring a Deposit on Non-refillable Refrigerant Cylinders

ARB staff considered requiring a $35 deposit on all non-refillable cylinders to ensure they are returned to a distributor for final evacuation and disposal.

The ARB received stakeholder comments and concerns regarding the need to understand the entire life cycle emissions and related transportation emissions associated with requiring a $35 deposit on non-refillable cylinders. There were concerns related to potential increases in GHG emissions related to increased transportation while transporting empty cylinders back to a central site.

Additionally, the distribution network currently is not developed to collect and process these cylinders for recycling or disposal, so the concept may result in third party contracts with other companies to provide this service. This service would require additional transportation from a refrigerant distributor to a third party service contractor facility.

The proposed alternative regulatory option would require infrastructure development for refrigerant cylinder evacuation and final recycling or disposal.

Prior to recommending any final action specific to a requirement to use refillable cylinders or to place a deposit on non-refillable cylinders, the total lifecycle GHG emissions impact of refrigerant cylinders including direct heel emissions as well as indirect emissions related to increased VMT must be further reviewed. ARB staff will continue to conduct research in this area and work with industry to find additional regulatory or voluntary solutions that will have a net GHG emissions reductions impact.

Analysis to estimate the cost, emissions, and potential emission reductions related to refrigerant cylinder management is a component of a research contract approved by the ARB with ICF International to investigate the costs and benefits of recovering and destroying or recycling high-global warming potential greenhouse gases. The contract began in June 2008, and is titled “Lifecycle Analysis of High-Global Warming Potential Greenhouse Gas Destruction”. A final report is expected in late 2010.

Requiring new commercial and industrial refrigeration systems to meet specified performance standards.

ARB staff considered including general requirements for specification for new commercial and industrial refrigeration to reduce leaks and to increase energy efficiency. The alternative considered would have required that: 1) a facility with a new commercial and industrial refrigeration system use best available refrigeration technology - defined as any available technology used in a commercial refrigeration system that has a maximum refrigerant charge equivalent to 1.75 pounds of high-GWP refrigerant per 1000 British Thermal Units (Btu) per hour, or 2) a facility be designed to have a “total carbon footprint” 25 percent less than a specified baseline facility carbon footprint.

Emissions from commercial and industrial refrigeration systems are categorized as direct refrigerant emissions and indirect emissions (CO_2-equivalent emissions resulting from energy use). Commercial and industrial refrigeration systems exist in California, ranging from small, tightly sealed refrigerators to large direct expansion (DX) refrigeration systems containing hundreds or thousands of pounds of refrigerant. This measure was proposed to apply to a portion of new commercial and industrial refrigeration systems, including large DX refrigeration systems used in supermarkets, cold storage warehouses, and industrial processes, including food processing.

Staff concluded that a more holistic look at both direct and indirect emissions is the most appropriate way to ensure the greatest impact on GHG emission reduction benefits. To accomplish this the ARB and California Energy Commission (CEC) are collaborating to incorporate the new commercial and industrial refrigeration systems specifications based on direct GHG emission reductions and whole-building energy efficiency in the next phase of updates to the California Building Standards Code (Title 24).

A significant focus of the California Building Standards Code approach is to allow flexibility as long as a specific performance standard is met in the form of an energy budget. Energy use has a significant impact on the Life Cycle Climate Performance (LCCP) of a refrigeration system and buildings. One concept that will be reviewed in this process is the integration of a building energy budget and direct refrigerant emission impacts – or a building's LCCP.

To better understand the balance of direct and indirect emissions in terms of LCCP the ARB entered into a contract to inventory the direct and indirect GHG emissions from stationary refrigeration sources. The Final Report titled "Inventory of Direct and Indirect GHG Emissions from Stationary Air Conditioning and Refrigeration Sources, with Special Emphasis on Retail Food Refrigeration and Unitary Air Conditioning" is available at: **http://www.arb.ca.gov/cc/commref/commref.htm**.

Additional research is under consideration by the ARB titled, "Greenhouse Gas Performance Analysis for Commercial Buildings with Large Refrigeration/Air Conditioning Systems" to initiate a review of possible performance specifications.

Requirements for Best Practices Certified Technician Program

During the rulemaking process for the Refrigerant Management Program staff received comments regarding the need for better technician training. This need was discussed in detail with trade associations representing heating and air-conditioning equipment distributors and refrigeration and air-conditioning service contractors.

In reviewing the potential for a Best Practices Certified Technician regulatory or voluntary component it is important to note that there is already some activity in this general work area, although it is specific to energy efficiency. As a result of work being conducted by the California Public Utilities Commission (CPUC) and CEC, an HVAC Technician subcommittee has been created to discuss technician

training opportunities to increase energy efficiency. Any further activity to address a potential Best Practices Certified Technician program would need to be in collaboration with the HVAC Workgroup to avoid duplication.

The general concept of a potential Best Practices Certified Technician regulatory or voluntary component would be based on the following principles:

- All certified technicians are to be certified to understand best practices to reduce refrigerant emissions as outlined in ANSI/ASHRAE standard 147, or similar standards or guidelines.
- Certification is developed by the current network of HVAC & Refrigeration training programs in California; there are currently 52.
- The ARB role is to certify/approve a training program training and certification plan for each institution.

J. Plans for the Future

Plans for the future include consulting with current technical workgroup members on the possibility of establishing regulatory and/or voluntary programs specific to two alternatives considered that would serve to complement the Refrigerant Management Program:

1. Requiring new commercial and industrial refrigeration systems to meet specified performance standards
2. Requirement for Best Practices Certified Technician Program

As discussed previously, the new commercial and industrial refrigeration systems performance standards will be coordinated with the CEC. The Potential Best Practices Certified Technician program option will be important to ensuring that the emission reductions anticipated from the proposed Refrigerant Management Program are realized.

These two components will be important in furtherance of achieving the total statewide emission reductions target, but they will be considered separately from the proposed Refrigerant Management Program.

Additional plans for the future include a proposed high-GWP mitigation fee. The Climate Change Scoping Plan recommends applying a mitigation fee to high-GWP compounds with high potency, such as high-GWP refrigerants. High-GWP gases are used in a broad range of applications, including significant usage in stationary HVAC, MVAC, and refrigeration. High-GWP gases are also used in a wide range of other applications, such as foam-blowing agents, electrical transmission, fire suppressants, consumer products, and the semiconductor industry. In concept, a mitigation fee would address all high-GWP gases in a consistent manner and serve to decrease GHG emissions in several ways. It could change behavior by increasing price (e.g. improve leakage reduction efforts), induce new lower GWP alternative products, or provide fees to mitigate GHG emissions elsewhere within or outside of a given sector. The mitigation fee approach would be used to address emissions that are difficult to address via

traditional regulatory approaches due to 1) many small uses that would require complicated regulations, 2) new gases and new or evolving usages, and 3) uses with no current alternative and a lack of incentive to either develop an alternative or reduce leakage beyond regulatory standards. High-GWP specific fees are already in place in several other countries including Australia, Norway, and Denmark.

If a mitigation fee is applied to high-GWP gases in the future, it would be harmonized with this Regulation. This may include the deletion of the implementation fee if a potential high-GWP fee would fully fund required enforcement and administration costs to ensure the emission reductions anticipated from the Refrigerant Management program are maintained.

XI. CONCLUSIONS AND RECOMMENDATIONS

ARB staff proposes a new regulation to address GHG emissions attributable to stationary R/AC appliances, with a focus on stationary, non-residential refrigeration systems.

The proposed Regulation fulfills the requirements applicable to AB 32 direct emission reduction measures to “achieve the maximum technologically feasible and cost-effective reductions in greenhouse gas emissions” and helps meet the goals of reducing GHG emissions to 1990 levels by 2020.

No alternatives considered by the Board would be more effective in achieving the goals of this proposal, nor would they be less burdensome to facilities that use refrigeration systems.

Staff recommends that the Board approve its proposal to adopt Sections 95380 through 95398 of title 17, California Code of Regulations.

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XII. REFERENCES

Air-Conditioning, Heating and Refrigeration Institute, Certified Product Directory, January 2009, http://www.ahridirectory.org/ahridirectory/pages/rrr/RRRE%2015%20January%2009_Directory.pdf, retrieved April 7, 2009.

Air-conditioning and Refrigeration Institute, Policy and Public Affairs - Executive Branch, http://ariadman.tempdomainname.com/ga/executive-branch/index.html, retrieved on May 13, 2008.

American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. User's Manual for ANSI/ASHRAE Standard 15-2001 Safety Standard for Refrigeration Systems, 2003.

Amtrol, Inc. Refrigerant Recovery Cylinders, http://www.amtrol.com/pdf/refrigrec.pdf, retrieved September 14, 2009.

ARMINES, Inventory of Direct and Indirect GHG Emissions from Stationary Air conditioning and Refrigeration Sources, with Special Emphasis on Retail Food Refrigeration and Unitary Air conditioning, Final Report, March 2009.

Batt, J. Attachment 1: Description of Emission Reduction Measure Form, http://www.arb.ca.gov/cc/scopingplan/submittals/other/carb_solicitation_for_ideas_use_of_refillable_refrigerant_cylinders.pdf, retrieved March 16, 2009.

British Refrigeration Association, Code of Practice for Refrigerant Leak Tightness in compliance with the F-Gas Regulation, December 2007.

California Air Pollution Control Officers Association, Memo to Anthony Andreoni, November 4, 2008.

California Air Resources Board, Fact Sheet – The Greenhouse Effect and California. http://www.arb.ca.gov/cc/factsheets/ccbackground.pdf. Accessed September 14, 2009.

California Air Resources Board, Climate Change Scoping Plan, December 2008.

California Air Resources Board, Climate Change Scoping Plan Appendices, VOLUME I: SUPPORTING DOCUMENTS AND MEASURE DETAIL, December 2008.

California Air Resources Board, Refrigerant Management Best Practices, July 21, 2009, http://www.arb.ca.gov/cc/reftrack/best_management_practices_pamphlet_electronic_version.pdf

California Air Resources Board, Refrigerant Management Program Frequently Asked Questions, July 21, 2009, http://www.arb.ca.gov/cc/reftrack/refrigerant_management_program_faq.pdf

California Air Resources Board. Refrigerant Management Program. Technician survey results. December 2008.

California Air Resources Board, STAFF REPORT: INITIAL STATEMENT OF REASONS FOR RULEMAKING PROPOSED REGULATION FOR MANDATORY REPORTING OF GREENHOUSE GAS EMISSIONS PURSUANT TO THE CALIFORNIA GLOBAL WARMING SOLUTIONS ACT OF 2006 (ASSEMBLY BILL 32), October 2007.

California Climate Change Center, Projecting Future Sea Level, March 2006.

California Employment Development Department, "Training Program Summary," http://www.labormarketinfo.edd.ca.gov/cgi/dataBrowsing/traProgramSummary.asp?menuChoice=&cipcode=150501&geogArea=0601000000, retrieved July 15, 2008.

California Energy Commission, California Commercial End-Use Survey (CEUS), March 2006. http://www.energy.ca.gov/ceus/ (accessed August 27, 2009).

California Environmental Protection Agency and California Resources Agency, Environmental Protection Indicators for California, 2004 update.

Energy Information Administration, Commercial Buildings Energy Consumption Survey (CBECS), 2003, http://www.eia.doe.gov/emeu/cbecs/

Energy Information Administration. Commercial Buildings Energy Consumption Survey (CBECS). Heating Equipment, Number of Buildings for Non-Mall Buildings. 2003. http://www.eia.doe.gov/emeu/cbecs/

Enhanced Capital Allowances, ECA ENERGY TECHNOLOGY CRITERIA LIST 2008 – REFRIGERATION EQUIPMENT Automated Permanent Refrigerant Leak Detection Systems, July 29, 2008, http://www.eca.gov.uk/NR/rdonlyres/286051AC-63CC-4199-BF20-7A083E220070/0/08Refrigeration_AutomatedPermanentRefrigerantLeakDetectionSystems.pdf, retrieved February 24, 2009.

European Fluorocarbons Technical Committee, Fluorocarbons and Sulphur Hexafluoride, http://www.fluorocarbons.org/en/debate/regulatory_developments/f_gas_regulation.html, (accessed September 24, 2009)

Godwin, D. (U.S. EPA), Martin Van Pelt, M. and Peterson, K. (ICF Consulting), Modeling Emissions of High Global Warming Potential Gases from Ozone Depleting Substance Substitutes, 2003. http://www.epa.gov/ttn/chief/conference/ei12/green/godwin.pdf, retrieved December 1, 2008.

ICF International, Memo to ARB, October 21, 2008.

ICF International, Memo to ARB, November 10, 2008.

Intergovernmental Panel on Climate Change and Technology and Economic Assessment Panel, Special Report on Safeguarding the Ozone Layer and the Global Climate System, Issues related to Hydrofluorocarbons and Perfluorocarbons, 2005.

http://www.ipcc.ch/publications_and_data/publications_and_data_reports_safeguarding_the_ozone_layer.htm (accessed September 24, 2009)

Intergovernmental Panel on Climate Change, Climate Change 2007: The Physical Science Basis, Chapter 2, Changes in Atmospheric Constituents and in Radiative Forcing, IPCC Working Group 1 Fourth Assessment Report, 2007, http://www.ipcc.ch/ipccreports/ar4-wg1.htm

Intergovernmental Panel on Climate Change, Climate Change 2001: The Scientific Basis, Chapter 6, Radiative Forcing of Climate Change, IPCC Working Group 1 Third Assessment Report, 2001. http://www.grida.no/publications/other/ipcc_tar/ (accessed January 28, 2009).

Intergovernmental Panel on Climate Change, Climate Change 1995: IPCC Second Assessment, 1995, http://www1.ipcc.ch/ipccreports/assessments-reports.htm

Intergovernmental Panel on Climate Change 2006 Guidelines for National Greenhouse Gas Inventories, Volume 3 (Industrial Processes and Product Use). http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol3.html (accessed July 6, 2009).

Lewis, Kimberly, Guidelines for Refrigerant Leak Monitor Installation, RSES Journal, April, 2002.

Official Journal of the European Union, REGULATION (EC) No 842/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 17 May 2006 on certain fluorinated greenhouse gases.

South Coast Air Quality Management District (SCAQMD) Rule 1415 (Reduction of Refrigerant Emissions from Stationary Refrigeration and Air Conditioning Systems) dataset, 2000-2005.

Stouffer, D., Refrigerant Leak Creates Environmental Problems for Businesses, February, 2009, available at: http://air.environmental-expert.com/resultEachArticle.aspx?cid=32055&codi=45718&idproducttype=6, retrieved March 9, 2009.

Troy, Eugene F, Options for Reducing Refrigerant Emissions from Supermarket Systems, EPA-600/R-97-039, April 1997.

United Nations Environment Programme 1998 Report of the Refrigeration, Air Conditioning and Heat Pumps Technical Options Committee, October 1998; Annex III-Refrigerant Data. http://ozone.unep.org/teap/Reports/RTOC/index.shtml (accessed September 30, 2009).

United Nations Environment Programme 2006 Report of the Refrigeration, Air Conditioning and Heat Pumps Technical Options Committee, January 2007. http://ozone.unep.org/teap/Reports/RTOC/index.shtml (accessed September 30, 2009).

U.S. Census Bureau censtats (census statistics) database: http://censtats.census.gov/cbpnaic/cbpnaic.shtml (Accessed August 17, 2009).

U.S. Census Bureau North American Industrial Classification System (NAICS) code guide. http://www.census.gov/eos/www/naics/ (accessed August 17, 2009).

U.S. EPA Vintaging Model national greenhouse gas emission estimates, 2010-2030; November 2008

U.S. EPA Vintaging Model refrigerant distribution for refrigeration equipment, 2010 and 2020, November 2008.

U.S. EPA Vintaging Model Alternative Fluorocarbons Environmental Acceptability Study Comparison for Common Refrigerants, April 2007.

J.M. Velders, S.O. Andersen, J.S. Daniel, D.W. Fahey, and M. McFarland, The importance of the Montreal Protocol in protecting climate, Proc. Natl. Acad. Sci. USA, March 2007.

J.M. Velders, D.W. Fahey, J.S. Daniel, M. McFarland, and S.O. Andersen, The large contribution of projected HFC emissions to future climate forcing, Proc. Natl. Acad. Sci. USA, June 2009.

Worthington Industries, Refrigerant Cylinders, http://www.worthingtoncylinders.com/Specifications/Refrigerant.aspx, retrieved September 14, 2009.

Proposed Regulation Order

REGULATION FOR THE MANAGEMENT OF HIGH GLOBAL WARMING POTENTIAL REFRIGERANTS FOR STATIONARY SOURCES

Adopt new Subarticle 6, sections 95380 to 95398 in Subchapter 10, Article 4, title 17, California Code of Regulations, to read as follows:

Subarticle 6: MANAGEMENT OF HIGH GLOBAL WARMING POTENTIAL REFRIGERANTS FOR STATIONARY SOURCES

95380. Purpose

The purpose of this subarticle is to reduce emissions of high global warming potential refrigerants from stationary, non-residential refrigeration equipment and from the installation and servicing of refrigeration and air-conditioning appliances using high-GWP refrigerants.

NOTE: Authority cited: Health and Safety Code Sections 38501, 38510, 38560, 38562, 38563, 38580, 38597, 39600, 39601, and 41511. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 38562, 38563, 38597, 38580, 39600, 39601, and 41511.

95381. Applicability

This subarticle applies to any person who owns or operates a stationary refrigeration system, as defined in this subarticle. This subarticle also applies to any person who installs, repairs, maintains, services, replaces, recycles, or disposes of a refrigeration or air-conditioning appliance, and to any person who distributes or reclaims refrigerants with high global warming potential.

NOTE: Authority cited: Health and Safety Code Sections 38501, 38510, 38560, 38562, 38563, 38580, 38597, 39600, 39601, and 41511. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 38562, 38563, 38597, 38580, 39600, 39601, and 41511.

95382. Definitions

(a) For the purposes of this subarticle, the following definitions shall apply:

(1) “Additional refrigerant charge” means the quantity, in pounds, of refrigerant added to a refrigeration system or appliance in order to bring the system to a full charge. “Additional refrigerant charge” does not include an initial refrigerant charge.

(2) “AHRI” means the Air-Conditioning, Heating and Refrigeration Institute.

(3) “Air-conditioning” means any stationary, non-residential appliance, including a computer-room air conditioner, that provides cooling to a space to an intended temperature of not less than 68°F for the purpose of cooling objects or occupants.

(4) “Air district” means an air quality management district or air pollution control district created or continued in existence under Health and Safety Code sections 40000-41357.

(5) “Air Pollution Control Officer” or “APCO" means the appointed head of a local air quality management district or air pollution control district whose appointment and duties are set forth in Health and Safety Code sections 40750-40753.

(6) “Appliance” means any device which contains and uses a high-GWP refrigerant, including any air conditioner, refrigerator, chiller, freezer, or refrigeration system.

(7) “ASHRAE” means the American Society of Heating, Refrigerating and Air-Conditioning Engineers.

(8) “Automatic leak detection system” means a calibrated device using continuous monitoring for detecting leakage of refrigerants that on detection, alerts the operator, and may be either:

(A) A direct system that automatically detects the presence in air of refrigerant leaked from a refrigeration system; or

(B) An indirect system that automatically interprets measurements (e.g. temperature or pressure) within a refrigeration system that indicate a refrigerant leak (e.g., in refrigerated cases and other locations in the system) and alerts the operator to the presence of a refrigerant leak.

(9) “Certified reclaimer” means a person who is a certified reclaimer in accordance with Title 40 of the Code of Federal Regulations, Part 82, §82.164.

(10) “Certified refrigerant recovery or recycling equipment” means any refrigerant recovery or recycling equipment that meets the standards specified in Title 40 of the Code of Federal Regulations, Part 82, §82.152.

(11) “Certified technician” means a person who holds a current, valid, and applicable certificate pursuant to Title 40 of the Code of Federal Regulations, Part 82, §82.40 or §82.161.

(12) “Change of ownership” means a transfer of the title of a facility subject to this subarticle.

(13) “Chlorofluorocarbon” or “CFC” means a class of compounds primarily used as refrigerants, consisting of only chlorine, fluorine, and carbon.

(14) “Commercial refrigeration” means a refrigeration appliance utilized in the retail food and cold storage warehouse sectors. “Retail food” includes the refrigeration equipment found in supermarkets, convenience stores, restaurants and other food service establishments. “Cold storage” includes the equipment used to store meat, produce, dairy products, and other perishable goods.

(15) “Component” means a part of a refrigeration system or appliance (including condensing units, compressors, condensers, evaporators, receivers) and all of its connections and subassemblies, without which the refrigeration system or appliance will not properly function or will be subject to failures.

(16) "Computer-room air conditioner" means a central air conditioner specifically designed for use in data processing areas, maintaining an ambient temperature of approximately 72°F and a relative humidity of approximately 52 percent.

(17) “Continuous monitoring” means measuring the ambient concentration of refrigerant using electronic or mechanical sensors or interpreting measurements (e.g. temperature or pressure) within a refrigeration system that indicate a refrigerant leak in real time.

(18) “Detected refrigerant leak” means a refrigerant leak that is known to the owner or operator, or should reasonably have been known to the owner or operator.

(19) “Direct emissions” means high-GWP refrigerant emissions from a facility that are emitted by refrigeration systems under the operational control of a facility owner or operator. Direct emissions are calculated as the total weight in pounds of each type of high-GWP refrigerant that was charged into a refrigeration system minus the total weight in pounds of each type of high-GWP refrigerant that was recovered from a refrigeration system, as reported in the annual Facility Stationary Refrigeration report pursuant to section 95388.

(20) “Enclosed building or structure" means a building or structure with a roof and walls that prevent wind from entering the facility.

(21) “Equipment type” means commercial refrigeration, industrial process refrigeration, or other refrigeration.

(22) “Executive Officer” means the Executive Officer of the California Air Resources Board, or his or her delegate.

(23) “Facility” means any property, plant, building, structure, stationary source, stationary equipment or grouping of stationary equipment or stationary sources located on one or more contiguous or adjacent properties, in actual physical contact or separated solely by a public roadway or other public right-of way, and

under common operational control, that includes one or more refrigeration systems or appliance subject to this subarticle. Operators of military installations may classify such installations as more than a single facility based on distinct and independent functional groupings within contiguous military properties.

(24) “Facility identification number” means a unique identification number provided by the Executive Officer for each facility with one or more refrigeration systems in operation, pursuant to section 95383.

(25) “Follow-up verification test” means those tests that involve checking the repairs within 30 days of the refrigeration system’s returning to normal operating characteristics and conditions. “Follow-up verification tests” for a refrigeration system from which the refrigerant charge has been evacuated means a test conducted after the refrigeration system or portion of the refrigeration system has resumed operation at normal operating characteristics and conditions of temperature and pressure, except in cases where sound professional judgment dictates that these tests will be more meaningful if performed prior to the return to normal operating characteristics and conditions. “Follow-up verification test” for a refrigeration system from which the refrigerant charge has not been evacuated means a reverification test conducted after the initial verification test and usually within 30 days of returning to normal operating characteristics and conditions. Where a refrigeration system is not evacuated, it is only necessary to complete any required changes to return the refrigeration system to normal operating characteristics and conditions.

(26) “Full charge”, “optimal charge”, or “critical charge” means the amount of refrigerant required in the refrigerant circuit for normal operating characteristics and conditions of a refrigeration system or appliance, as determined by using one of the following three methods:

(A) Use of the equipment manufacturer's specifications of the full charge;

(B) Use of calculations based on component sizes, density of refrigerant, volume of piping, seasonal variances, and other relevant considerations; or

(C) The midpoint of an established range for full charge based on the best available data regarding the normal operating characteristics and conditions for the system.

(27) “Global warming potential” or “GWP” means the radiative forcing impact of one mass-based unit of a given greenhouse gas relative to an equivalent unit of carbon dioxide over a given period of time.

(28) “Global warming potential value” or “GWP value” means the 100-yr GWP value first published by the IPCC in its Second Assessment Report (SAR) (IPCC, 1995); or if a 100-yr GWP value was not specified in the IPCC SAR, it means the GWP value published by the IPCC in its Fourth Assessment A-3 Report (AR4) (IPCC, 2007); or if a 100-yr GWP value was not specified in the IPCC AR4, then the GWP value will be determined by the Executive Officer based on data, studies and/or good engineering or scientific judgment. Both the 1995 IPCC SAR values and the 2007 IPCC AR4 values are published in table 2.14 of the 2007 IPCC AR4. The SAR GWP values are found in column “SAR (100-yr)” of Table 2.14.; the AR4 GWP values are found in column “100 yr” of Table 2.14.”

(29) “High-GWP refrigerant” means a compound used as a heat transfer fluid or gas that is: (A) a chlorofluorocarbon, a hydrochlorofluorocarbon, a hydrofluorocarbon, a perfluorocarbon, or (B) any compound or blend of compounds, with a GWP value equal to or greater than 150, or (C) any ozone depleting substance as defined in Title 40 of the Code of Federal Regulation, Part 82, §82.3.

(30) “Hydrochlorofluorocarbon” or “HCFC” means a class of compounds primarily used as refrigerants, consisting of only hydrogen, chlorine, fluorine, and carbon.

(31) “Hydrofluorocarbon” or “HFC” means a class of compounds primarily used as refrigerants, consisting of only hydrogen, fluorine, and carbon.

(32) “Indirect emissions“ means any emissions that are a consequence of the activities of a facility but occur at sources owned or controlled by another person related to energy consumed for electricity, heat, steam, and cooling.

(33) “Industrial process refrigeration” means complex customized appliances used in the chemical, pharmaceutical, petrochemical and manufacturing industries that are directly linked to the industrial process. “Industrial process refrigeration” includes industrial ice machines, appliances used directly in the generation of electricity, and ice rinks. Where one appliance is used for both industrial process refrigeration and other applications, it will be considered industrial process refrigeration equipment if 50 percent or more of its operating capacity is used for industrial process refrigeration.

(34) “Industrial process shutdown” means that an industrial process or facility temporarily ceases to operate or manufacture whatever is being produced at that facility.

(35) “Initial refrigerant charge” means the quantity, in pounds, of high-GWP refrigerant added to a refrigeration system or appliance in order to bring the system to a full charge upon initial installation of a refrigeration system or appliance.

(36) “Initial verification test” means a leak test that is conducted as soon as practicable after the repair is completed. “Initial verification test” with regard to leak repairs that require the evacuation of the refrigeration system or portion of the refrigeration system, means a test conducted prior to the replacement of the full charge and before the refrigeration system or portion of the refrigeration system has reached operation at normal operating characteristics and conditions of temperature and pressure. “Initial verification test” with regard to repairs conducted without the evacuation of the full charge means a test conducted as soon as practicable after the conclusion of the repair work.

(37) “Intended to be operated year round” means a refrigeration system at a facility that is not a seasonal facility.

(38) “Leak inspection” means an inspection of a refrigeration system to detect a leak of a high-GWP refrigerant.

(39) “Low temperature refrigeration system” means a commercial or industrial refrigeration system used for frozen products.

(40) “Medium temperature refrigeration system” means a commercial or industrial refrigeration system used for chilled products.

(41) “Newly constructed” means a facility that is not yet operational, or that has been operational for less than 6 months.

(42) “Non-certified technician” means a person who installs, maintains, services, repairs, modifies, or disposes of refrigeration or air-conditioning appliances that does not hold a current, valid, and applicable certificate pursuant to Title 40 of the Code of Federal Regulation, Part 82, §82.161.

(43) “Non-refillable cylinder” means a cylinder with a refrigerant capacity of two pounds or greater that is designed not to be refilled and is used in the servicing, maintenance or filling of a refrigeration system, appliance, motor vehicle air-conditioning system, or heat pump equipment.

(44) “Normal operating characteristics and conditions” means a refrigeration system operating temperatures, pressures, fluid flows, speeds, and other characteristics, including full charge of the refrigeration system that would be expected for a given process load and ambient condition during operation. Normal operating characteristics and conditions are marked by the absence of atypical conditions affecting the operation of the refrigeration system.

(45) “Operating” means the use of a refrigeration system for cooling or freezing. A refrigeration system is considered to be operating or in operation for the entirety of

any calendar month where it is used for cooling or freezing in any manner for more than a total of 24 hours.

(46) “Operator” means the entity having operational control of a facility.

(47) “Other refrigeration” means any stationary, non-residential appliance that is used for an application other than industrial process refrigeration, commercial refrigeration, or air-conditioning, or is used for two or more applications including industrial process refrigeration, commercial refrigeration, or air-conditioning.

(48) “Owner” means the entity having title of the facility which is subject to this subarticle.

(49) “Perfluorocarbon” or “PFC” means a class of compounds consisting only of carbon and fluorine.

(50) “Person” means any person, firm, association, organization, partnership, business trust, corporation, limited liability company, company, federal, state, or local governmental agency or public district.

(51) “Reclaim” means to reprocess refrigerant to all of the specifications specified in Title 40, Code of Federal Regulations, Part 82, §82.152.

(52) “Recover” means to remove refrigerant in any condition from an appliance and to store it in an external container without necessarily testing or processing it in any way.

(53) “Recycle” means to extract refrigerant from an appliance and clean refrigerant for reuse without meeting all of the requirements for reclamation. In general, recycled refrigerant is refrigerant that is cleaned using oil separation and single or multiple passes through devices, such as replaceable core filter-driers, which reduce moisture, acidity, and particulate matter.

(54) “Refillable cylinder” means a cylinder with a refrigerant capacity of two pounds or greater that is designed to be refilled and is used in the servicing, maintenance

or filling of a refrigeration system, appliance, motor vehicle air-conditioning system, or heat pump equipment.

(55) “Refrigerant circuit” means the parts of a refrigeration system that are normally connected to each other (or are separated by isolation valves) and are designed to contain a high-GWP refrigerant. A single refrigerant circuit is defined by all piping and components that use refrigerant from a common reservoir of a high-GWP refrigerant.

(56) “Refrigerant distributor or wholesaler” means a person to whom a product is delivered or sold for purposes of export, subsequent resale, or delivery to a certified technician, employer of a certified technician, appliance manufacturer, or another refrigerant distributor or wholesaler. “Refrigerant distributor or wholesaler” includes any person who imports refrigerant from outside of this state to distribute or sell refrigerant to a certified technician, employer of a certified technician, appliance manufacturer, or another refrigerant distributor or wholesaler, or who acts as an agent or broker in buying refrigerant.

(57) “Refrigerant leak” means any discharge of refrigerant into the atmosphere from an appliance, certified refrigerant recovery or recycling equipment, refrigerant cylinder, or other container.

(58) “Refrigerant leak detection device” means a device that can be calibrated to accurately detect and measure the ambient concentration of refrigerant at a minimum concentration level of 10 parts per million of vapor of a specific refrigerant or selection of refrigerants.

(59) “Refrigeration system” means stationary, non-residential equipment that is an industrial process refrigeration, commercial refrigeration, or other refrigeration appliance with a single refrigerant circuit that requires more than 50 pounds of any combination of high-GWP refrigerant to maintain normal operating characteristics and conditions. “Refrigeration system” does not include an air-conditioning appliance. A single refrigeration system is defined by a single refrigerant circuit.

(60) “Residential” means a residential dwelling containing four or fewer dwelling units on one lot or parcel.

(61) “Retire” means the permanent removal from service of a refrigeration system, or component, rendering it unfit for use by the current or any future owner or operator.

(62) “Retrofit” means the replacement of the refrigerant used in a refrigeration system with a refrigerant approved under the Significant New Alternatives Policy (SNAP) program pursuant to Title 40 of the Code of Federal Regulation, Part 82, §82.170, or a refrigerant approved by the Executive Officer, and related refrigeration system changes required to maintain the refrigeration system operation and reliability following refrigerant replacement.

(63) “Seasonal adjustment” means the need to add refrigerant to a refrigeration system due to a change in ambient conditions caused by a change in season, followed by the subsequent removal of refrigerant in the corresponding change in season, where both the addition and removal of refrigerant occurs within one consecutive 12-month period after the initial installation of a refrigeration system or a repair of a refrigeration system requiring evacuation or partial evacuation of the refrigerant circuit.

(64) “Seasonal facility” means a facility where the purpose of the refrigeration system(s) at a facility ceases to be required during certain seasons of the year.

(65) “Stationary” means meeting at least one of the following conditions:

(A) Is installed in a building, structure, or facility.

(B) Is attached to a foundation, or if not so attached, will reside at the same location for more than 12 consecutive months.

(C) Is located at the same single location on a permanent basis (at least two consecutive years) and that operates at that single location at three months each year.

(66) “System identification number” means a unique identification number for each refrigeration system at a facility. The system identification number is comprised of the facility identification number followed by a hyphen, followed by a three digit number starting at 001 sequentially assigned to each unique refrigeration system at a facility. For example, if a facility has a facility identification number of ARB000001, then the system identification number for the first refrigeration system would be ARB000001-001.

(67) “System mothballing” means the intentional shutting down of a refrigeration system for a period of time greater than 60 days by the owners or operators of that facility, where the refrigerant has been evacuated from the refrigeration system or the affected component of the refrigeration system, at least to atmospheric pressure.

(68) “Temperature classification” means low temperature refrigeration system, medium temperature refrigeration system, or other.

(69) “Topping off” means adding refrigerant to a refrigeration system or appliance in order to bring the system to a full charge.

(70) Total Evaporator Cooling Load” means the total cooling in British thermal units (Btus) per hour required to maintain a facility’s refrigeration systems at the temperature for which they are designed. The total cooling for the evaporator cooling load does not include the cooling load of a facility’s heating, ventilation, and air-conditioning systems, sub-cooling, heat of rejection, or pump heat.

(71) “U.S. EPA” means the United States Environmental Protection Agency.

NOTE: Authority cited: Health and Safety Code Sections 38501, 38510, 38560, 38562, 38563, 38580, 38597, 39600, 39601, and 41511. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 38562, 38563, 38597, 38580, 39600, 39601, and 41511.

95383. Registration Requirements for Facilities with Stationary Refrigeration Systems

(a) *Refrigeration Systems with a Full Charge Greater Than or Equal to 2,000 Pounds.* On or before March 1, 2012, the owner or operator of a facility with a refrigeration system that begins operation before January 1, 2012, with a full charge greater than or equal to 2,000 pounds of a high-GWP refrigerant, must register with the Executive Officer by providing the information specified in subsection (e). The owner or operator of a facility with a refrigeration system that begins operation on or after January 1, 2012, with a full charge greater than or equal to 2,000 pounds of a high-GWP refrigerant, must register with the Executive Officer by March 1 of the calendar year after the calendar year in which the refrigeration system begins operating at the facility.

(b) *Refrigeration Systems with a Full Charge Greater Than or Equal to 200 Pounds, but Less Than 2,000 Pounds.* On or before March 1, 2014, the owner or operator of a facility with a refrigeration system that begins operation before January 1, 2014, with a full charge greater than or equal to 200 pounds, but less than 2,000 pounds, of a high-GWP refrigerant must register with the Executive Officer by providing the information specified in subsection (e). The owner or operator of a facility with a refrigeration system that begins operation on or after January 1, 2014, with a full charge greater than or equal to 200 pounds, but less than 2,000 pounds, of a high-GWP refrigerant must register with the Executive Officer by March 1 of the calendar year after the calendar year in which the refrigeration system begins operating at the facility.

(c) *Refrigeration Systems with a Full Charge Greater Than 50 Pounds, but Less Than 200 Pounds.* On or before March 1, 2016, the owner or operator of a facility with a refrigeration system that begins operation before January 1, 2016, with a full charge greater than 50 pounds, but less than 200 pounds, of a high-GWP refrigerant, must register with the Executive Officer by providing the information specified in subsection (e). The owner or operator of a facility with a refrigeration system that begins operation on or after January 1, 2016, with a full charge greater

than 50 pounds, but less than 200 pounds, of a high-GWP refrigerant must register with the Executive Officer by March 1 of the calendar year after the calendar year in which the refrigeration system begins operating at the facility.

(d) *New Owners of Facilities*. If there is a change of ownership of a facility that has been registered pursuant to this section, the new owner or operator, by March 1 of the calendar year after the change of ownership has occurred, must register with the Executive Officer by providing the information specified in subsection (e).

(e) *Registration Information Requirements*. To register, the owner or operator must provide the following information to the Executive Officer:

(1) Facility information:

(A) Name of operator.

(B) Operator Federal Tax Identification Number.

(C) Facility North American Industry Classification System (NAICS) Business Type Code based on the 2007 NAICS United States structure.

(D) Facility Standard Industrial Classification (SIC) code.

(E) Name of facility, including a facility identifier such as store number.

(F) Facility mailing address including a street address, city, state, and zip code.

(G) Facility physical location address including a street address, city, state, and zip code.

(H) Facility contact person.

(I) Facility contact person phone number.

(J) Facility contact person e-mail address.

(2) Refrigeration system information – provided for each refrigeration system:

(A) System identification number (assigned by the facility owner or operator).

(B) Equipment type.

(C) Equipment manufacturer.

(D) Equipment model or description.

(E) Equipment model year.

(F) Equipment serial number. The serial number(s) of the affected equipment or component must be recorded when present and accessible. When the affected equipment or component is part of an assembly without a serial number or does not have an individual serial number or is not accessible after assembly, the physical location of the affected equipment must be recorded in enough detail to permit positive identification.

(G) Physical location of a refrigeration system through schematic or floor plan with equipment locations clearly noted.

(H) Temperature classification – The refrigeration system must be identified as a low temperature system, a medium temperature system, or other.

(I) Full charge of the refrigeration system.

(J) Type of high-GWP refrigerant(s) used.

(f) *Change of Ownership Requirements*. Before any change of ownership, a person selling a refrigeration system must insure that it is free of refrigerant leaks through a leak inspection performed by a certified technician. In addition, a person selling a refrigeration system that has been registered pursuant to this section must inform the buyer of the registration requirements specified in this section and must submit a change of ownership notification to the Executive Officer. The change of ownership notification must include the following information:

(1) Seller information:

(A) Facility identification number.

(B) Name of owner or operator.

(C) Name of facility, including a facility identifier such as store number.

(2) Buyer information:

(A) Name of owner or operator.

(B) Name of facility, including a facility identifier such as store number.

(C) Facility mailing address including a street address, city, state, and zip code.

(D) Facility contact person.

(E) Facility contact person phone number.

(F) Facility contact person e-mail address.

NOTE: Authority cited: Health and Safety Code Sections 38501, 38510, 38560, 38562, 38563, 38580, 38597, 39600, 39601, and 41511. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 38562, 38563, 38597, 38580, 39600, 39601, and 41511.

95384. Implementation Fees for Facilities with Stationary Refrigeration Systems

(a) *Initial Implementation Fee Upon Registration*. An implementation fee must be paid by each owner or operator of a facility with a refrigeration system with a full charge greater than or equal to 200 pounds of a high-GWP refrigerant. The fee is due and payable to the Executive Officer on the same date that the owner or operator is required to register pursuant to section 95383. The amount of the fee is specified in subsection (c).

(b) *Annual Implementation Fee*. An annual implementation fee must be paid by each owner or operator of a facility with a refrigerator system with a full charge greater than 200 pounds of a high-GWP refrigerant. The annual fee is due and

payable to the Executive Officer no later than March 1 of each calendar year after the calendar year in which registration is required under section 95383. The amount of the implementation fee is specified in subsection (c).

(c) *Amount of Implementation Fee*. The amount of the initial and annual implementation fee is based on the refrigeration system with the largest full charge that is operating at the facility, and is as follows:

(1) The initial and annual implementation fee for a facility with a refrigeration system with a full charge of 2,000 pounds or greater is $370.

(2) The initial and annual implementation fee for a facility with a refrigeration system with a full charge of 200 pounds or greater, but less than 2,000 pounds is, $170.

(d) Facilities Exempt from Paying Fees. Notwithstanding subsections (a), (b), (c), and (f) of this section, the owner or operator is not required to pay the initial or annual implementation fee for any calendar year if during the previous calendar year all of the refrigeration systems at the facility have been maintained using the following advanced strategies and practices to reduce refrigerant charges and emissions of ozone-depleting substances and greenhouse gases.

(1) If the facility is not a newly constructed facility, all of the following criteria must be met:

(A) The facility must use only refrigerants with zero ozone-depleting potential; and

(B) The facility must use only refrigerants found acceptable by the U.S EPA Significant New Alternatives Policy (SNAP) program pursuant to Title 40 of the Code of Federal Regulation, Part 82, §82.170 for the specific end use; and

(C) The facility must achieve an average HFC full charge equal to or less than 1.25 lbs. of refrigerant per 1000 Btu per hour total evaporator cooling load; and

(D) The facility must achieve a facility-wide annual refrigerant leak rate, as defined in Title 40 of the Code of Federal Regulation, Part 82, §82.152, of 10% or less; and

(E) The owner or operator must swear under penalty of perjury that the criteria specified in subsection (d)(1) have been met.

(2) If the facility is a newly constructed facility, all of the following criteria must be met:

(A) The facility must use only refrigerants with zero ozone-depleting potential; and

(B) The facility must use only refrigerants found acceptable by the U.S EPA Significant New Alternatives Policy (SNAP) program pursuant to Title 40 of the Code of Federal Regulation, Part 82, §82.170 for the specific end use; and

(C) The facility must achieve an average HFC full charge equal to or less than 1.25 lbs. of refrigerant per 1000 Btu per hour total evaporator cooling load; and

(D) The owner or operator must swear under penalty of perjury that the criteria specified in subsection (d)(2) have been met.

(e) Upon request by an authorized representative of the Executive Officer including a local Air Pollution Control Officer, the owner or operator claiming that the facility meets the criteria of subsection (d) must provide documentation to demonstrate that the criteria are met, and must provide a written statement as provided in subsection (d)(1)(E) or (d)(2)(D).

(f) Summary of Requirements to Pay Implementation Fees. The following table summarizes the requirements of section 95384 to pay implementation fees.

	Initial Implementation Fee Upon Registration	**Annual Implementation Fee**
Facilities with a refrigeration system that begin operation before January 1, 2012 with a full charge of 2,000 pounds or greater.	Amount: $370 Due Date: The owner or operator must register and pay the fee by March 1, 2012.	Amount: $370 Due Date: Fee is due by March 1, 2013, and each year thereafter.
Facilities with a refrigeration system that begin operation on or after January 1, 2012 with a full charge of 2,000 pounds or greater.	Amount: $370 Due Date: The owner or operator must register and pay the fee by March 1 of the calendar year after the refrigeration system begins operating.	Amount: $370 Due Date: By March 1 of the calendar year after the refrigeration system is required to be registered, and each year thereafter.
Facilities with a refrigeration system that begin operation before January 1, 2014 with a full charge of 200 pounds or greater, but less than 2,000 pounds.	Amount: $170 Due Date: The owner or operator must register and pay the fee by March 1, 2014.	Amount: $170 Due Date: Fee is due by March 1, 2015, and each year thereafter.
Facilities with a refrigeration system that begin operation on or after January 1, 2014 with a full charge of 200 pounds or greater, but less than 2,000 pounds.	Amount: $170 Due Date: The owner or operator must register and pay the fee by March 1 of the calendar year after the refrigeration system begins operating.	Amount: $170 Due Date: By March 1 of the calendar year after the refrigeration system is required to be registered, and each year thereafter.

(g) Fees collected pursuant to this section shall be deposited into the California Air Pollution Control Fund.

NOTE: Authority cited: Health and Safety Code Sections 38501, 38510, 38560, 38562, 38563, 38580, 38597, 39600, 39601, and 41511. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 38562, 38563, 38597, 38580, 39600, 39601, and 41511.

95385. Leak Detection and Monitoring Requirements for Facilities with Stationary Refrigeration Systems

(a) *Refrigeration Systems with a Full Charge Greater Than or Equal to 2,000 Pounds.* The owner or operator of a refrigeration system with a full charge greater than or equal to 2,000 pounds of a high-GWP refrigerant must do the following:

(1) After January 1, 2011, the owner or operator of a refrigeration system that operates year round, or is intended to be operated year round, must conduct a leak inspection of the refrigeration system monthly using a refrigerant leak detection device, a bubble test, observation of oil residue. If oil residue is observed, a leak inspection must be conducted using a calibrated refrigerant leak detection device or bubble test to confirm a refrigerant leak. A monthly leak inspection of the refrigeration system is not required if an automatic leak detection system meeting the specifications provided in subsections 95385(a)(5) or 95385(a)(6) is used to monitor the refrigeration system.

(2) By January 1, 2012, the owner or operator of a refrigeration system, that operates year round, or is intended to be operated year-round, must install an automatic leak detection system if:

(A) The refrigerant circuit is located entirely within an enclosed building or structure, or

(B) The compressor, evaporator, condenser, or any other component of the refrigeration system(s) with a high potential for a refrigerant leak is located inside an enclosed building or structure.

(3) After January 1, 2012, the owner or operator of a refrigeration system that does not operate with the refrigerant circuit located entirely within an enclosed building or structure must conduct a leak inspection every three months using a calibrated refrigerant leak detection device, a bubble test, or observation of oil residue of all refrigerant circuit components that are not located within an enclosed building or structure. If oil residue is observed, a

leak inspection must be conducted using a calibrated refrigerant leak detection device or bubble test to confirm a refrigerant leak.

(4) If a facility has installed an automatic leak detection system which directly detects the presence in air of a high-GWP refrigerant, sensors or intakes must be placed so that they will continuously monitor the refrigerant concentrations in air in proximity of the compressor, evaporator, condenser, and other areas with a high potential for a refrigerant leak.

(5) If a facility has installed an automatic leak detection system which detects the presence in air of a high-GWP refrigerant, the owner or operator must annually audit and calibrate the system using manufacturer recommended procedures, so that it:

(A) Accurately detects a concentration level of 10 parts per million of vapor of the specific refrigerant or refrigerants used in the refrigeration system(s), and

(B) Alerts the operator when a refrigerant concentration of 100 parts per million of vapor of the specific refrigerant or refrigerants used in the refrigeration system(s) is reached.

(6) If a facility has installed an automatic leak detection system that automatically interprets measurements to indicate a refrigerant leak, the owner or operator must annually audit and calibrate the system, so that it will automatically alert the operator when measurements indicate a loss of refrigerant of 50 pounds or 10 percent of the refrigeration system full charge, whichever is less.

(7) If an automatic leak detection system alerts the owner or operator pursuant to subsections 95385(a)(5) or 95385(a)(6), the owner or operator must ensure that a leak inspection is conducted within 24 hours after the system alert. The leak inspections must be conducted using a calibrated refrigerant leak detection device or a bubble test to confirm a refrigerant leak and determine the refrigerant leak location(s).

(8) The owner or operator of a refrigeration system that does not operate, or is not intended to operate, year-round must conduct a leak inspection within 30 days after starting each operation of the refrigeration system, and every three months thereafter until the refrigeration system is shut down. The leak inspection must be conducted using a calibrated refrigerant leak detection device, a bubble test, or observation of oil residue. If oil residue is observed, a leak inspection must be conducted using a calibrated refrigerant leak detection device or bubble test to confirm a refrigerant leak. A leak inspection is not required after starting operation if there has been a leak inspection of the refrigeration system conducted within the preceding 90 days.

(b) *Refrigeration Systems with a Full Charge Greater Than or Equal to 200 Pounds, but Less Than 2,000 Pounds.* After January 1, 2011, the owner or operator of a refrigeration system with a full charge greater than or equal to 200 pounds, but less than 2,000 pounds, of a high-GWP refrigerant, and that is intended to be operated year round, must conduct a leak inspection of the refrigeration system every three months. The leak inspection must be conducted using a calibrated refrigerant leak detection device, a bubble test, or observation of oil residue. If oil residue is observed, a leak inspection must be conducted using a calibrated refrigerant leak detection device or bubble test to confirm a refrigerant leak. A leak inspection of the refrigeration system is not required pursuant to this subsection (b) if an automatic leak detection system meeting the specifications provided in subsections 95385(a)(5) or 95385(a)(6) is used to monitor the refrigeration system.

(c) *Refrigeration Systems with a Full Charge Greater Than 50 Pounds, but Less Than 200 Pounds.* After January 1, 2011, the owner or operator of a refrigeration system with a full charge greater than 50, but less than 200 pounds, of a high-GWP refrigerant, and that is intended to be operated year round, must annually conduct a leak inspection of the refrigeration system. The leak inspection must be conducted using a calibrated refrigerant leak detection device, a bubble test, or observation of oil residue. If oil residue is observed, a leak inspection must be

conducted using a calibrated refrigerant leak detection device or bubble test to confirm a refrigerant leak. A leak inspection of the refrigeration system is not required pursuant to this subsection (c) if an automatic leak detection system meeting the specifications provided in subsections 95385(a)(5) or 95385(a)(6) is used to monitor the refrigeration system.

(d) *Requirements That Apply When Additional Refrigerant is Added to All Refrigeration Systems Regulated by this Subarticle*. After January 1, 2011, the owner or operator of any refrigeration system with a full charge greater than 50 pounds of a high-GWP refrigerant must conduct a leak inspection each time an additional refrigerant charge equal to or greater than 5 pounds, or one percent of the refrigeration system full charge, whichever amount is greater, is added to a refrigeration system. The leak inspection must be conducted using a calibrated refrigerant leak detection device, a bubble test, or observation of oil residue. If oil residue is observed, a leak inspection must be conducted using a calibrated refrigerant leak detection device or bubble test to confirm a refrigerant leak.

(e) Alternative Test Methods. The leak inspections required by this section may be conducted using alternative test methods that are demonstrated to the written satisfaction of the Executive Officer to be equally or more accurate than using a calibrated refrigerant leak detection device or bubble test.

NOTE: Authority cited: Health and Safety Code Sections 38501, 38510, 38560, 38562, 38563, 38580, 38597, 39600, 39601, and 41511. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 38562, 38563, 38597, 38580, 39600, 39601, and 41511.

95386. Leak Repair Requirements for Facilities with Stationary Refrigeration Systems

(a) *Leak Repair Requirements.* After January 1, 2011, the owner or operator of a refrigeration system must ensure that all detected refrigerant leaks are repaired as provided in this section, and must maintain records pursuant to section 95389 of all refrigerant leak repairs.

(b) *Refrigerant Leak Repair 14-Day Requirement.* A refrigerant leak must be repaired by a certified technician within 14 days of its detection, except in situations when a longer time period is allowed under subsections (c), (d), or (i) of this section.

(c) *Refrigerant Leak Repair 45-Day Allowance.* The owner or operator of a refrigeration system has 45 days to repair a refrigerant leak or replace a leaking component(s) if one or more of the following conditions apply:

(1) A certified technician is not available to complete the repair or replace the component(s). A written record(s) must be kept pursuant to section 95389 to document that no certified technician was available within 14 days of the initial leak detection.

(2) The parts necessary to repair a refrigerant leak are unavailable, and the owner or operator obtains a written statement from the refrigeration system or component manufacturer or distributor stating that the parts are unavailable. A written record(s) must be kept pursuant to section 95389 to document that the necessary parts were not available within 14 days of the initial leak detection.

(3) The owner or operator has received an exemption from the Executive Officer pursuant to section 95397. A written record(s) must be kept pursuant to section 95389 to document that the owner or the operator has requested and received an exemption. If the owner or operator has submitted a request for an exemption, a refrigerant leak repair is not required until a final exemption determination is made by the Executive Officer.

(4) The refrigerant leak repair requires an industrial process shutdown.

(d) *Refrigerant Leak Repair 120-Day Allowance.* The owner or operator of a refrigeration system has 120 days to repair a refrigerant leak or replace a leaking component(s) if all of the following conditions apply:

(1) The facility owner or operator is an entity subject to Mandatory Greenhouse Gas Emissions Reporting requirements pursuant to section 95101 of the Health and Safety Code; and

(2) The refrigeration system is an industrial process refrigeration appliance; and

(3) The refrigerant leak repair requires an industrial process shutdown; and

(4) Written records are maintained as provided in section 95389 to document that all the conditions required under this subsection are met.

(e) Initial Verification Test. An initial verification test must be conducted upon completion of refrigerant leak repairs.

(f) Follow-up Verification Test. After the initial verification test has been conducted, a follow-up verification test must be conducted on the complete refrigeration system. If the refrigeration system was evacuated during the refrigerant leak repair, the follow-up verification test must be conducted when the system is operating at normal operating characteristics and conditions. If the refrigeration system was not evacuated during the refrigerant leak repair, the follow-up verification test requirement of this subsection is satisfied once required changes are made to return the refrigeration system to normal operating characteristics and conditions.

(g) *Refrigerant Leak Repair Requirements After An Unsuccessful Verification Test.*

(1) If either an initial verification test or follow-up verification test indicate that a refrigerant leak is still occurring within the refrigeration system, the owner or operator must ensure repair of the refrigerant leak through a subsequent repair attempt(s) of the refrigerant leak within the time required for refrigerant leak repair by subsections (b), (c), or (d), or prepare a retrofit or retirement plan pursuant to section 95387.

(2) If a follow-up verification test pursuant to subsection 95386(f) indicates that a refrigerant leak has not been successfully repaired within the 14 days

allowed for a refrigerant leak repair under subsection (b), and the owner or operator does not have an approved exemption pursuant to section 95397, then the owner or operator must either successfully repair the refrigerant leak within 45 days of the initial refrigerant leak detection or must prepare a retrofit or retirement plan pursuant to section 95387 within 60 days of the initial refrigerant leak detection.

(3) If a follow-up verification test pursuant to subsection 95386(f) indicates that a refrigerant leak has not been successfully repaired within the 45 days allowed for a refrigerant leak repair under subsection (c), and the owner or operator does not have an approved exemption pursuant to section 95397, the owner or operator must prepare a retrofit or retirement plan pursuant to section 95387 within 60 days of the initial refrigerant leak detection.

(4) If a follow-up verification test pursuant to subsection 95386(f) indicates that a refrigerant leak has not been successfully repaired within the 120 days allowed for a refrigerant leak repair under subsections (d), and the owner or operator does not have an approved exemption pursuant to section 95397, the owner or operator must prepare a retrofit or retirement plan pursuant to section 95387 within 135 days of the initial refrigerant leak detection.

(h) *Refrigerant Leak Repair Contractors License Requirement.*

(1) Except as provided below in subsection(h)(2), all refrigerant leaks must be repaired by a certified technician holding a current and active California contractors license in the C38 - Refrigeration Contractor licensing classification, or by an employee of a contractor with these qualifications. If the refrigeration system requiring service is also used in an air-conditioning application, it is acceptable for the refrigerant leak to be repaired by a certified technician holding a current and active California contractors license in the C20 - Warm-Air Heating, Ventilating and Air-Conditioning Contractor licensing classification, or by an employee of a contractor with these qualifications.

(2) A current and active California contractors license is not required if:

(A) the refrigeration system service or refrigerant leak repair is performed by the facility owner or operator or its employees with wages as sole compensation, or

(B) the refrigeration system service or refrigerant leak repair is performed by the facility owner or operator through one undertaking or by one or more contracts, and the aggregate contract price for labor, materials, and all other items is less than five hundred dollars ($500), or

(C) the refrigeration system service or refrigerant leak repair is performed pursuant to a contract entered into before January 1, 2011, by any political subdivision of the United States government or the State of California, or by any incorporated town, city, county, irrigation district, reclamation district, or other municipal or political corporation.

(i) *Refrigerant Leak Repair Requirements During System Mothballing.* The leak repair requirements of this section shall not apply during the time that a refrigeration system is undergoing or is in system mothballing. The leak repair requirements of this section shall resume on the day that the refrigeration system resumes operation at a facility.

NOTE: Authority cited: Health and Safety Code Sections 38501, 38510, 38560, 38562, 38563, 38580, 38597, 39600, 39601, and 41511. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 38562, 38563, 38597, 38580, 39600, 39601, and 41511.

95387. Requirements to Prepare Retrofit or Retirement Plans for Facilities with Leaking Stationary Refrigeration Systems

(a) *Retrofit or Retirement Plan Requirements. .*

(1) After January 1, 2011, the owner or operator of a refrigeration system with a refrigerant leak that has not been successfully repaired within the time required for refrigerant leak repair under subsection (b), (c), or (d) of

section 95386 must prepare and implement a dated retrofit or retirement plan as provided in section 95386(g). The plan must establish a schedule to retrofit or retire a leaking refrigeration system no later than six months after the initial detection of the refrigerant leak, and all work must be completed during this six-month period.

(2) The retrofit or retirement plan must be kept at the site of the refrigeration system with a refrigerant leak. If a refrigeration system is to be retired and replaced, the plan must include information required under this subsection specific to the new refrigeration system to be constructed or installed. If a refrigeration system is to be retrofitted, the plan must include information required under this subsection specific to the refrigeration system after the retrofit has been completed. A retrofit or retirement plan must include the following information:

(A) The system identification number of the refrigeration system being retired or retrofitted.

(B) Equipment type.

(C) Equipment manufacturer.

(D) Equipment model or description.

(E) Intended physical location of the refrigeration system through schematic or floor plan with locations clearly noted.

(F) Temperature classification – The refrigeration system must be identified as a low temperature system, a medium temperature system, or other.

(G) Full charge of the refrigeration system.

(H) Type of high-GWP refrigerant(s) used.

(I) If a refrigeration system is to be retired and replaced, a plan to dispose of the retired refrigeration system.

(J) A timetable which includes, at a minimum:

1. the date installation, construction, or retrofit of the refrigeration system is expected to begin, and

2. the expected completion date of the installation, construction, or retrofit of the refrigeration system.

(K) A signature by a representative of the facility, including the date signed.

(b) *Retrofit or Retirement Plan Requirements During System Mothballing.* The retrofit or retirement requirements of this section shall not apply during the time that a refrigeration system is undergoing or is in system mothballing. The retrofit or retirement requirements of this section shall apply on the day that the refrigeration system resumes operation at a facility.

NOTE: Authority cited: Health and Safety Code Sections 38501, 38510, 38560, 38562, 38563, 38580, 38597, 39600, 39601, and 41511. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 38562, 38563, 38597, 38580, 39600, 39601, and 41511.

95388. Reporting Requirements for Facilities with Stationary Refrigeration Systems

(a) Reporting Requirements for *Refrigeration Systems with a Full Charge Greater Than or Equal to 200 Pounds.* After January 1, 2011, the owner or operator of a facility with a refrigeration system in operation with a full charge greater than or equal to 200 pounds of a high-GWP refrigerant must annually submit to the Executive Officer a Facility Stationary Refrigeration Report (Annual Report) that contains the information specified below in subsections 95388(b)(1) and 95388(b)(2). Each Annual Report must provide this information for the previous calendar year and must be submitted by the following dates:

(1) By March 1, 2012, the owner or operator of a facility with a refrigeration system that begins operation before January 1, 2012, with a full charge greater than or equal to 2,000 pounds of a high-GWP refrigerant must submit an Annual Report for the 2011 calendar year. By March 1, 2013,

and each calendar year thereafter, the owner or operator must submit an Annual Report providing information for the previous calendar year.

(2) The owner or operator of a facility with a refrigeration system that begins operation on or after January 1, 2012, with a full charge greater than or equal to 2,000 pounds of a high-GWP refrigerant must submit the first Annual Report for the previous calendar year by March 1 of the calendar year after the refrigeration system begins operating at a facility. Subsequent Annual Reports for the previous calendar year must be submitted by March 1 of each year thereafter.

(3) By March 1, 2014, the owner or operator of a facility with a refrigeration system that begins operation before January 1, 2014, with a full charge greater than or equal to 200 pounds of a high-GWP refrigerant must submit an Annual Report for the 2013 calendar year. By March 1, 2015, and each calendar year thereafter, the owner or operator must submit an Annual Report providing information for the previous calendar year.

(4) The owner or operator of a facility with a refrigeration system that begins operation on or after January 1, 2014, with a full charge greater than or equal to 200 pounds of a high-GWP refrigerant must submit the first Annual Report for the previous calendar year by March 1 of the calendar year after the refrigeration system begins operating at a facility. Subsequent Annual Reports for the previous calendar year must be submitted by March 1 of each year thereafter.

(b) The Annual Report must include the following information.

(1) Refrigeration system information. The following information must be provided for each refrigeration system:

(A) System identification number.

(B) Equipment type.

(C) Equipment manufacturer.

(D) Equipment model or description.

(E) Equipment model year.

(F) Equipment serial number. The serial number(s) of the affected equipment or component must be recorded when present and accessible. When the affected equipment or component is part of an assembly without a serial number or does not have an individual serial number or is not accessible after assembly, the physical location of the affected equipment must be recorded in enough detail to permit positive identification.

(G) Physical location of a refrigeration system through schematic or floor plan with equipment locations clearly noted.

(H) Temperature classification – The refrigeration system must be identified as a low temperature system, a medium temperature system, or other.

(I) Full charge of the refrigeration system.

(J) Type of high-GWP refrigerant(s) used.

(K) Date of initial installation.

(2) Refrigeration system service and leak repair information. The following information for must be provided for each automatic leak detection system audit, leak inspection, and refrigeration system service or refrigerant leak repair that required an additional refrigerant charge of five pounds or more, or an additional refrigerant charge equal to or greater than one percent of the full charge, whichever amount is greater:

(A) Date leak detected, if applicable.

(B) Date of service provided or leak repair completed.

(C) Cause of refrigerant leak, if applicable.

(D) Description of service provided or leak repair completed

(E) Date(s) of initial verification test(s), if applicable.

(F) Date(s) of follow-up verification test(s), if applicable.

(G) Total additional refrigerant charge of each type of high-GWP refrigerant, if applicable.

(H) Purpose for additional refrigerant charge (leak repair, topping off, initial refrigerant charge, or seasonal adjustment), if applicable.

(I) Name of certified technician completing leak repair, if applicable.

(J) The certified technician's identification number issued by an approved technician certification program pursuant to Title 40 of the Code of Federal Regulation, Part 82, §82.161, if applicable.

(K) The certified technician's certification type(s) issued by an approved technician certification program pursuant to Title 40 of the Code of Federal Regulation, Part 82, §82.161, if applicable.

(3) Refrigerant Purchases and Use Information. The following information must be provided on refrigerant purchase and use:

(A) The total weight in pounds of each type of high-GWP refrigerant that was purchased during the calendar year.

(B) The total weight in pounds of each type of high-GWP refrigerant that was charged into a refrigeration system during the calendar year.

(C) The total weight in pounds of each type of high-GWP refrigerant that was recovered from a refrigeration system during the calendar year.

(D) The total weight in pounds of each type of high-GWP refrigerant that was stored in inventory at the facility, or stored at a different location for use by the facility, on the last day of the calendar year.

(E) The total weight in pounds of high-GWP refrigerant that was shipped by the owner or operator for reclamation and destruction during the calendar year.

(d) Reporting Requirements for *Refrigeration Systems with a Full Charge Greater Than 50 Pounds, but Less Than 200 Pounds.* The owner or operator of a facility with a refrigeration system in operation with a full charge greater than 50 pounds, but less than 200 pounds, of a high-GWP refrigerant is not required to submit annual reports. However, owners and operators of these facilities must report to the Executive Officer the information specified in this section within 60 days of receipt of a request from the Executive Officer.

NOTE: Authority cited: Health and Safety Code Sections 38501, 38510, 38560, 38562, 38563, 38580, 38597, 39600, 39601, and 41511. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 38562, 38563, 38597, 38580, 39600, 39601, and 41511.

95389. Recordkeeping Requirements for Facilities with Stationary Refrigeration Systems

(a) After January 1, 2011, the owner or operator of a facility with a refrigeration system in operation with a full charge greater than 50 pounds of a high-GWP refrigerant must maintain the following records for a minimum of 5 years. The records must be kept at the facility where the refrigeration system(s) is in operation and must be made available to an authorized representative of the Executive Officer, including a local Air Pollution Control Officer, upon request:

(1) All registration information required by section 95383.

(2) Documentation of all leak detection systems, leak inspections, and automatic leak detection system annual audit and calibrations required by section 95385.

(3) Records of all refrigeration system service and refrigerant leak repairs, and documentation of any conditions allowing repair of a refrigerant leak to be conducted more than 14 days after leak detection, as required pursuant to section 95386. Refrigeration system and refrigeration system service and refrigerant leak repair records must include documentation of all items reported pursuant to section 95388.

(4) Any retrofit or retirement plans required by section 95387.

(5) All reports required by section 95388.

(6) Invoices of all refrigerant purchases.

(7) Records of all shipments of refrigerants for reclamation or destruction, which must include the following information:

(A) Name and address of the person the high-GWP refrigerant was shipped to.

(B) Weight in pounds of high-GWP refrigerant shipped.

(C) Type of high-GWP refrigerant shipped.

(D) Date of shipment.

(E) Purpose of shipment (e.g. reclamation, destruction, etc.).

(8) Records of all refrigeration systems component data, measurements, calculations and assumptions used to determine the full charge.

NOTE: Authority cited: Health and Safety Code Sections 38501, 38510, 38560, 38562, 38563, 38580, 38597, 39600, 39601, and 41511. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 38562, 38563, 38597, 38580, 39600, 39601, and 41511.

95390. Required Service Practices for High-GWP Appliances

(a) *Required Service Practices.* A person performing any installation, maintenance, service, repair, or disposal of an appliance that could reasonably be expected to release refrigerant from the appliance into the environment must satisfy all of the following requirements:

(1) In preparing an appliance for recycling or disposal, the person must not intentionally disrupt the refrigerant circuit of the appliance resulting in a discharge of refrigerant into the atmosphere, unless an attempt to recover the refrigerant is made using certified refrigerant recovery or recycling equipment; and

(2) The person must make a recovery attempt using certified refrigerant recovery or recycling equipment for that type of appliance before opening

the appliance to atmospheric conditions. Attempts to recover refrigerant must be made even if the person believes that all refrigerant has been removed or has previously leaked from the appliance. Refrigerant may be returned to the appliance from which it is recovered or to another appliance owned by the same person without being recycled or reclaimed; and

(3) The person must not add any additional refrigerant to a refrigeration or air-conditioning appliance during manufacture or service, unless such refrigerant: (A) consists wholly of a class I or class II substance, as identified by section 602 of the federal Clean Air Act; or (B) is an alternative that has been found acceptable, under the Significant New Alternatives Policy (SNAP) program pursuant to section 612 of the federal Clean Air Act, for the specific refrigeration or air-conditioning end-use in which it is being employed; or (C) has been approved by the Executive Officer for the specific refrigeration or air-conditioning end-use in which it is being employed; and

(4) The person must not add an additional refrigerant charge to any appliance known to have a refrigerant leak, except that it is permissible to add an additional refrigerant charge for seasonal adjustment or an additional refrigerant charge required to maintain operations while preparing or conducting a leak repair pursuant to and in compliance with section 95386; and

(5) The person must hold a current, valid, and applicable certificate issued in accordance with Title 40 of the Code of Federal Regulations, Part 82, §82.161; and

(6) The person must employ procedures for which the certified refrigerant recovery or recycling equipment was approved by the U.S. EPA or Executive Officer; and

(7) The person must use certified refrigerant recovery or recycling equipment as specified by the certified refrigerant recovery or recycling equipment manufacturer, unless the manufacturer's specifications conflict

with the procedures approved by the U.S. EPA or the Executive Officer for the certified refrigerant recovery or recycling equipment; and

(8) The person must evacuate refrigerant from a non-refillable cylinder to a vacuum of 15 inches of mercury, relative to standard atmospheric pressure of 29.9 inches of mercury, before to recycling or disposal; and

(9) The person must satisfy job site evacuation of refrigerants during recycling, recovering, reclaiming, or disposing in accordance with Title 40 of the Code of Federal Regulations, Part 82, §82.156.

NOTE: Authority cited: Health and Safety Code Sections 38501, 38510, 38560, 38562, 38563, 38580, 38597, 39600, 39601, and 41511. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 38562, 38563, 38597, 38580, 39600, 39601, and 41511.

95391. Prohibitions

(a) *Prohibitions.* On or after January 1, 2011, no person shall sell, supply, offer for sale, or distribute any high-GWP refrigerant for use as a refrigerant, unless for reclamation or destruction, in a container with a refrigerant capacity of two pounds or greater unless:

(1) The buyer is a certified technician pursuant to Title 40 of the Code of Federal Regulations, Part 82, §82.40 or §82.161; or

(2) The buyer is an authorized representative of a person employing at least one certified technician who is certified pursuant to Title 40 of the Code of Federal Regulations, Part 82, §82.40 or §82.161 and is in full compliance with Title 40 of the Code of Federal Regulations, Part 82, §82.166, and the buyer has provided evidence that at least one technician is properly certified; or

(3) The refrigerant is sold only for eventual resale to a certified technician, an employer of a certified technician, or a refrigeration or air-conditioning appliance manufacturer, or the refrigerant is being sent for reclamation; or

(4) The refrigerant is contained in a refrigeration or air-conditioning appliance.

(b) No person shall sell, supply, offer for sale, or distribute used refrigerant to any person for use as a refrigerant unless the used refrigerant has first been reclaimed by a certified reclaimer.

(c) No person shall sell, supply, offer for sale, or distribute any refrigerant unless such refrigerant: (1) consists wholly of a class I or class II substance, as identified by Section 602 of the U.S. Clean Air Act; or (2) is an alternative that has been found acceptable, under the Significant New Alternatives Policy (SNAP) program pursuant to Section 612 of the U.S. Clean Air Act, for the specific refrigeration or air-conditioning end-use in which it is being employed; or (3) has been approved by the Executive Officer for the specific refrigeration or air-conditioning end-use in which it is being employed.

(d) No person shall recycle or dispose of a non-refillable cylinder before the non-refillable cylinder has been evacuated to a vacuum of 15 inches of mercury, relative to standard atmospheric pressure of 29.9 inches of mercury.

(e) No person shall distribute or sell certified refrigerant recovery or recycling equipment unless such equipment meets the levels of evacuation to be achieved by recovery or recycling equipment as specified in Title 40 of the Code of Federal Regulations, Part 82, §82.158.

(f) No person shall refill a non-refillable cylinder or use it as a temporary receiver during service.

(g) No person shall repair or modify a non-refillable cylinder in any way that allows the non-refillable cylinder to be refilled.

NOTE: Authority cited: Health and Safety Code Sections 38501, 38510, 38560, 38562, 38563, 38580, 38597, 39600, 39601, and 41511. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 38562, 38563, 38597, 38580, 39600, 39601, and 41511.

95392. Reporting Requirements for Refrigerant Distributors, Wholesalers, and Reclaimers

(a) *Reporting Requirements for Refrigerant Distributors and Wholesalers.* A refrigerant distributor or wholesaler that sells, supplies, or distributes any amount of a high-GWP refrigerant for any purpose other than sales to a refrigerant distributor or wholesaler for eventual resale, or to any person for reclamation or destruction must submit an annual report to the Executive Officer by March 1, 2012, for the 2011 calendar year. By March 1, 2013, and each calendar year thereafter, the refrigerant distributor or wholesaler must submit an annual report providing information for the previous calendar year. The annual report must cover all California facilities under the operational control of the refrigerant distributor or wholesaler, must provide statewide annual aggregated data for the previous calendar year, and must include the following information:

(1) Name of refrigerant distributor or wholesaler.

(2) Refrigerant distributor or wholesaler mailing address including an address, city, state, and zip code.

(3) Refrigerant distributor or wholesaler contact person.

(4) The phone number of the refrigerant distributor or wholesaler contact person.

(5) The e-mail address of the refrigerant distributor or wholesaler contact person.

(6) The total statewide annual aggregated weight in pounds of each type of high-GWP refrigerant that was purchased or received for the purpose of subsequent resale or delivery for any purpose other than reclamation or destruction.

(7) The total statewide annual aggregated weight in pounds of each type of high-GWP refrigerant that was sold or distributed, excluding all sales to a facility outside of California or to a refrigerant distributor or wholesaler for eventual resale.

(8) The total statewide annual aggregated weight in pounds of high-GWP refrigerant that was shipped to a certified reclaimer.

(9) Name of all refrigerant distributor or wholesaler facilities under the operational control of the refrigerant distributor or wholesaler.

(10) Address of each refrigerant distributor or wholesaler facility under the operational control of the refrigerant distributor or wholesaler.

(11) Contact person name, phone number, and e-mail address for each refrigerant distributor or wholesaler facility under the operational control of the refrigerant distributor or wholesaler.

(b) *Reporting Requirements for Certified Reclaimers.* A certified reclaimer reclaiming any high-GWP refrigerant in California must submit an annual report to the Executive Officer by March 1, 2012, for the 2011 calendar year. By March 1, 2013, and each calendar year thereafter, the certified reclaimer must submit an annual report providing information for the previous calendar year. The annual report must cover all California facilities under the operational control of the certified reclaimer, must provide statewide annual aggregated data for the previous calendar year, and must include the following information:

(1) Name of the certified reclaimer.

(2) Mailing address of the certified reclaimer including a street address, city, state, and zip code.

(3) Certified reclaimer contact person.

(4) The phone number of the certified reclaimer contact person.

(5) The e-mail address of the certified reclaimer contact person.

(6) The total statewide annual aggregated weight in pounds of high-GWP refrigerant that was received by the certified reclaimer for reclamation or destruction.

(7) The total statewide annual aggregated weight in pounds of each type of high-GWP refrigerant that was reclaimed in California.

(8) The total statewide annual aggregated weight in pounds of high-GWP refrigerant that was shipped out of California for reclamation.

(9) The total statewide annual aggregated weight in pounds of high-GWP refrigerant that was destroyed or shipped out of California for destruction.

(10) Name of all certified reclaimer facilities under the operational control of the certified reclaimer.

(11) Address of each certified reclaimer facility under the operational control of the certified reclaimer.

(12) Contact person name, phone number, and e-mail address for each certified reclaimer facility under the operational control of the certified reclaimer.

NOTE: Authority cited: Health and Safety Code Sections 38501, 38510, 38560, 38562, 38563, 38580, 38597, 39600, 39601, and 41511. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 38562, 38563, 38597, 38580, 39600, 39601, and 41511.

95393. Recordkeeping Requirements for Refrigerant Distributors, Wholesalers, and Reclaimers

(a) The following records must be kept by each refrigerant distributor or wholesaler and certified reclaimer for a minimum of five years. These records must be kept at the facility of each distributor or wholesaler, or certified reclaimer and must be made available to an authorized representative of the Executive Officer upon request:

(1) Annual reports submitted pursuant to section 95392.

(2) Invoices of all high-GWP refrigerant received through sale or transfer and all high-GWP refrigerant distributed through sale or transfer. These invoices must indicate the name of the purchaser, the date of sale, and the quantity and the type of High-GWP refrigerant purchased, sold, or transferred.

(b) A refrigerant distributor or wholesaler selling a high-GWP refrigerant to a purchaser that is an employer of a certified technician must obtain written documentation from the purchaser showing that the purchaser currently employs at least one certified technician. This documentation must be kept at the facility of the refrigerant distributor or wholesaler for a minimum of five years, and must be made available to an authorized representative of the Executive Officer upon request.

NOTE: Authority cited: Health and Safety Code Sections 38501, 38510, 38560, 38562, 38563, 38580, 38597, 39600, 39601, and 41511. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 38562, 38563, 38597, 38580, 39600, 39601, and 41511.

95394. Confidentiality

(a) All of the information identified in section 95388(b)(3) is a public record and may not be claimed as confidential.

(b) Except for the information identified in subsection (a) above, any person submitting information to the Executive Officer pursuant to this subarticle may claim such information as “confidential” by clearly identifying such information as “confidential”. Any claim of confidentiality by a person submitting information must be based on the person’s belief that the information marked as confidential is either trade secret or otherwise exempt from public disclosure under the California Public Records Act (Government Code, section 6250 et seq.). All such requests for confidentiality shall be handled in accordance with the procedures specified in California Code of Regulations, title 17, sections 91000 to 91022.

NOTE: Authority cited: Health and Safety Code Sections 38501, 38510, 38560, 38562, 38563, 38580, 38597, 39600, 39601, and 41511. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 38562, 38563, 38597, 38580, 39600, 39601, and 41511.

§ 95395. Enforcement

(a) *Injunctions.* Any violation of this subarticle may be enjoined pursuant to the Health and Safety Code section 41513.

(b) Each day or portion thereof that any leak inspection or leak repair is not completed after the date the leak inspection or leak repair is required to be completed, or each day or portion thereof that any registration, report, or plan required by this subarticle remains unsubmitted, is submitted late, or contains incomplete or inaccurate information, shall constitute a single, separate violation of this subarticle.

(c) Failure to pay the full amount of any fee required by this subarticle shall constitute a single, separate violation of this subarticle for each day or portion thereof that the fee has not been paid after the date the fee is due.

(d) Enforcement of this article may be carried out by authorized representatives of the Executive Officer including a local Air Pollution Control Officer.

NOTE: Authority cited: Health and Safety Code Sections 38501, 38510, 38560, 38562, 38563, 38580, 38597, 39600, 39601, and 41511. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 38562, 38563, 38597, 38580, 39600, 39601, and 41511.

95396. Equivalent Local Rules

(a) The requirements specified in sections 95383, 95384, 95385, 95386, 95387, 95388, and 95389 of this subarticle shall not be enforced within the geographical boundaries of any air district that adopts and enforces requirements that will achieve emission reductions from stationary refrigeration systems that are equivalent to or greater than those achieved pursuant to sections 95383, 95384, 95385, 95386, 95387, 95388, and 95389.

(b) Subsection (a) shall not become effective unless the Executive officer issues an Executive Order containing written findings that the criteria of subsection (a) have been met. The Executive Order shall include such terms and conditions as are necessary to insure that these criteria continue to be met.

NOTE: Authority cited: Health and Safety Code Sections 38501, 38510, 38560, 38562, 38563, 38580, 38597, 39600, 39601, and 41511. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 38562, 38563, 38597, 38580, 39600, 39601, and 41511.

95397. Approval of Exemptions

(a) *Exemption Criteria.* The owner or operator of facility with a refrigeration system may request the Executive Officer for an exemption from the requirements of section 95386 and section 95387. To request an exemption, the applicant must follow the application procedure specified in subsection 95397(b), and must demonstrate that the criteria for one or more of the three exemptions allowed by this section have been satisfied. Information submitted pursuant to this section shall be handled in accordance with the provision of section 95394. The Executive Officer may approve the following exemptions:

(1) Emissions Lifecycle Exemption. The Executive Officer may allow the continuation of a refrigerant leak for a specified time period of no longer than three years if the Executive Officer determines that the applicant has provided clear and convincing documentation that the refrigerant leak cannot be repaired and that allowing the refrigerant leak to continue will result in less combined direct and indirect emissions than replacing the leaking refrigeration system. The documentation must include information quantifying the lifecycle direct emissions and indirect emissions, including energy use, and must include a calculation of these emissions based on the average lifetime of the refrigeration system or facility. The applicant must also provide a mitigation plan that includes a list of proposed actions to minimize emissions. The plan must include an analysis of options to minimize usage, reduce leaks or venting, and recycle or destroy high-GWP refrigerant. Any exemption granted pursuant to this paragraph may be extended for one or more additional periods of up to three years if the Executive Officer determines that the demonstration made pursuant to this paragraph remains valid.

(2) Economic Hardship Exemption. The Executive Officer may allow the continuation of a refrigerant leak for a specified time period of no longer than three years if the Executive Officer determines that the applicant has

provided clear and convincing documentation that all of the following criteria are met:

(A) Compliance would result in extraordinary economic hardship, such as closure of the entire facility or a large portion of the facility, or loss of a large portion of the revenue from the facility; and

(B) The extraordinary hardship to the applicant would be without a corresponding benefit in reducing combined direct and indirect emissions; and

(C) The applicant has prepared a compliance report that can be implemented and will achieve compliance as expeditiously as possible. The compliance report must reasonably detail when compliance will be achieved and the method by which compliance will be achieved.

(D) Any exemption granted pursuant to this paragraph may be extended for one or more additional periods of up to three years if the Executive Officer determines that the demonstration made pursuant to this paragraph remains valid.

(3) Natural Disaster Exemption. The Executive Officer may allow the continuation of a refrigerant leak for a specified time period of no longer than three years if the Executive Officer determines that the applicant has provided clear and convincing documentation that failure to satisfy the conditions set forth in this subarticle was due to a natural disaster such as an earthquake or flood, an act of war or an act by a public enemy, or a civil disorder or riot.

(b) Application for Exemptions.

(1) To apply for an exemption the applicant must submit a written application demonstrating that the criteria have been met for one or more of the three exemptions specified in subsection (a).

(2) Within 30 days of receipt of the exemption application the Executive Officer shall determine whether the application is complete, and shall notify the applicant of this determination.

(3) If the exemption application is determined to be incomplete, the Executive Officer shall notify the applicant and specify the specific information needed to make the application complete.

(4) Within 90 days after an application is determined to be complete, the Executive Officer shall determine whether and under what conditions an exemption will be permitted. The applicant and the Executive Officer may mutually agree to a longer time period for reaching a decision. During the review period, the Executive Officer may request, and the applicant shall provide, such additional information that is reasonably necessary to the decision. The applicant may also on his or her own initiative submit additional supporting documentation before a decision has been reached. The Executive Officer shall notify the applicant of the decision in writing and shall specify such terms and conditions as are necessary to insure that emissions will be minimized, and that the criteria specified in subsection (a) will continue to be met. Such conditions may include, but are not limited to, a requirement that best management practices be followed or that the applicant must implement the mitigation plan submitted by the applicant or mitigation measures identified by the Executive Officer.

(c) The exemption shall cease to be effective upon the failure of the person to whom the exemption was granted to comply with any term or condition of the exemption.

(d) *Revocation or Modification of An Exemption*. If the Executive Officer determines that an exemption no longer meets the criteria specified in subsection (a) of this section, the Executive Officer may revoke or modify the exemption as necessary to insure that the exemption continues to meet the criteria.

(e) *Effect of Denial or Revocation of an Exemption*. If an applicant for an exemption is denied, or an existing exemption is revoked, within 14 days of a

notice of such revocation the refrigerant leak must be repaired in accordance with section 95386, or the owner or operator of the facility must prepare a retrofit or retirement plan in accordance with section 95387.

NOTE: Authority cited: Health and Safety Code Sections 38501, 38510, 38560, 38562, 38563, 38580, 38597, 39600, 39601, and 41511. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 38562, 38563, 38597, 38580, 39600, 39601, and 41511.

95398. Severability

(a) Each part of this subarticle is deemed severable, and in the event that any part of this article is held to be invalid, the remainder of this subarticle shall continue in full force and effect.

NOTE: Authority cited: Health and Safety Code Sections 38501, 38510, 38560, 38562, 38563, 38580, 38597, 39600, 39601, and 41511. Reference: Health and Safety Code Sections 38501, 38505, 38510, 38560, 38562, 38563, 38597, 38580, 39600, 39601, and 41511.

Appendix B

California Facilities and Greenhouse Gas Emissions Inventory – High-Global Warming Potential Stationary Source Refrigerant Management Program

Research Division

Release Date

October 23, 2009

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1. Background

The proposed Refrigerant Management Program regulation for the management of refrigerants used in stationary refrigeration equipment was developed by the California Air Resources Board (ARB) staff to reduce the emissions of high global warming potential (GWP) greenhouse gases (GHG) used in commercial and industrial refrigeration equipment. This regulation was developed as an early action measure as part of implementing Assembly Bill 32, the Global Warming Solutions Act of 2006 (AB 32). This program aims to minimize emissions of high-GWP refrigerants from stationary refrigeration equipment through facility registration, leak detection and monitoring, leak repair, system retrofit and retirement, required service practices, and record-keeping and reporting.

This appendix outlines analysis conducted to determine statewide emissions estimates of high-GWP GHG from stationary refrigeration and air-conditioning (R/AC) equipment. This analysis was used in the development of the proposed Refrigerant Management Program regulation.

High-GWP refrigerants include chlorofluorocarbons (CFC), hydrochlorofluorocarbons (HCFC), and hydrofluorocarbons (HFC). CFC and HCFC are also classes of ozone depleting substances (ODS). HFC are non-ozone depleting substitutes. Both ODS and HFC have very high global warming potentials, ranging between 500 and 10,000 times more potent than carbon dioxide (CO_2).

ODS production is controlled under the Montreal Protocol as a result of concerns about stratospheric ozone depletion, but emissions are not strictly controlled. The underlying assumption of the Montreal Protocol is that all the gases produced will eventually be emitted. However, for some end uses there can be a considerable time lag between gas production and emission.

High-GWP GHG can generally be categorized as Kyoto gases or Non-Kyoto gases. Kyoto gases are those that pertain to the Kyoto Protocol including CO_2, HFC, methane, nitrous oxide, perfluorocarbons, and sulfur hexafluoride. Non-Kyoto gases include the ODS Montreal Protocol gases, and several miscellaneous gases not covered under either treaty.

<u>Existing Regulations:</u> ODS emissions from R/AC equipment are regulated at the federal level through regulations promulgated under the Clean Air Act and Amendments (CAAA) Section 608, (Stratospheric Ozone Protection, Stationary Sources), which establish maximum allowable leak rates and mandatory leak repair requirements for R/AC equipment that contains 50 lbs or more ODS refrigerant. The same regulations establish requirements prohibiting venting of ODS and HFC refrigerants.

In California, the South Coast Air Quality Management District (SCAQMD) regulates R/AC equipment under Rule 1415 (Reduction of Refrigerant Emissions from Stationary Refrigeration and Air Conditioning Systems).

Rule 1415 is consistent with regulations related to Section 608 of the CAAA as it applies to the minimum refrigerant charge size of 50 lbs per system, and applies to ODS. Rule 1415 is more stringent in allowable leak rates than Section 608, because Rule 1415 requires that leaks be repaired within 14 days after they are discovered (or should have been discovered), while Section 608 regulations allow annual leak rates up to 35% for refrigeration systems, and up to 15% for air-conditioning (AC) systems before repair is required.

Refrigeration and AC Equipment Identified as Potentially Significant Contributors to GHG Emissions: Stationary R/AC equipment was selected as a source of GHG emissions that could potentially be reduced, because R/AC equipment contains high-GWP greenhouse gases, a known contributor to overall GHG emissions.

Based on the 2002-2004 average emissions in the California GHG inventory, high-GWP sector emissions represented about 3 percent all California GHG emissions (source: ARB Climate Change Scoping Plan, Dec 2008, page 13). However, high-GWP sector emissions are one of the fastest growing sources of GHG emissions, and future Kyoto gas emissions from stationary R/AC equipment are expected to at least double by 2020 (sources: Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004, California Energy Commission, December 2006; and Inventory of U.S Greenhouse Gas Emissions and Sinks: 1990 – 2006, U.S. EPA, April 15, 2008).

To get an initial rough estimate of GHG emissions from stationary R/AC equipment in California, ARB staff used the United States Environmental Protection Agency (U.S. EPA) Vintaging Model national estimates for years 2010 – 2030 provided to ARB in October 2008. The U.S. EPA Vintaging Model was developed to estimate nationwide patterns of GHG emissions of HFCs, perfluorocarbons (PFCs), CFCs, and HCFCs from all major emission sources, including refrigerant usage.

National estimates were scaled down to California's 12.5% proportion of the U.S. population. Year 2010 was used as a baseline year; with year 2020 used as the initial target goal date for AB 32 measures. When estimating emissions through 2020, it was assumed that California's proportion of the U.S population remains at a constant 12.5 percent.

The following Table 1 shows initial emissions estimates from stationary R/AC equipment in California for baseline year 2010, as scaled down from national estimates using the U.S. EPA Vintaging Model.

Table 1. Stationary R/AC Equipment Annual Emissions Baseline Year 2010					
Stationary Source	**Number of Facilities [1]**	**Annual Emissions ($MMTCO_2E$)**	**Annual Emissions (Million lbs)**	**Percent of Stationary Refrigerant Emissions**	**Emissions Rate in lbs/facility/ year**
Large Commercial Refrigeration ≥ 50 lbs	26,000	9.4	10.8	37%	415
Small Commercial Refrigeration < 50 lbs	70,000	1.1	1.4	4%	20
Large Commercial AC ≥ 50 lbs	23,000	2.3	1.8	9%	80
Small Commercial AC < 50 lbs	500,000	5.2	5.7	21%	11
Residential AC and Refrigeration	10 million	7.3	7.3	29%	< 1
Total	10.6 million	25.3	27.0	100%	3

Source: U.S. EPA Vintaging Model estimates and technical data sheets, provided to ARB October 2008, and adapted through additional ARB analysis to determine facility numbers and R/AC source categories, as described in this appendix.

The following is a description of the five basic R/AC sectors shown in Table 1:

- Large commercial refrigeration (equipment contains 50 lbs or more refrigerant charge) includes refrigerated equipment found in supermarkets, large grocery stores, and other retail food establishments. The refrigeration equipment generally consists of refrigerant condensing units that commonly contain 50 to 200 lbs of refrigerant, and large centralized refrigeration systems that commonly contain more than 200 lbs of refrigerant, with a central compressor rack and condensing unit system linked to multiple display cases through extensive piping. Large commercial refrigeration also includes industrial process refrigeration, which consists of complex, often custom-designed refrigeration equipment used in manufacturing and industrial applications including the chemical, petrochemical, pharmaceutical, oil and gas, and metallurgical industries. Industrial process refrigeration systems are generally quite large, with an average refrigerant charge size of greater than 2,000 lbs.
- Small commercial refrigeration (equipment contains less than 50 lbs refrigerant charge) includes stand-alone display cases, small walk-in cold rooms, and other small refrigeration equipment used primarily in convenience stores, small grocery stores, pharmacies, and restaurants.

[1] Initial facility number estimates for commercial refrigeration and large commercial AC ranged from 10,000 to 100,000 for each sector. Facility numbers shown in this table reflect best estimates after additional analysis as described in this appendix.

- Large commercial AC (equipment contains 50 lbs or more refrigerant charge) includes centrifugal chillers and positive displacement (packaged) chillers used for comfort cooling in non-residential commercial buildings. Centrifugal chillers have a large refrigerant charge size, usually greater than 1,000 lbs of refrigerant, and packaged chillers generally have a refrigerant charge size between 500 and 600 lbs, on average.
- Small commercial AC (equipment contains less than 50 lbs refrigerant charge) includes unitary AC systems used for commercial building comfort cooling. The AC systems generally contain 20 lbs or less refrigerant charge.
- Residential AC and refrigeration include packaged AC units and refrigerator-freezers used in households. Packaged AC units generally contain 10 lbs or less of refrigerant charge, and refrigerator-freezers generally contain less than 1 lb. of refrigerant charge.

The 2010 estimated GHG emissions are predominantly from ODS (75% of total emissions), with the remaining 25% from HFC. By 2020, total GHG emissions only increase slightly, from 25 to 28 $MMTCO_2E$, but the HFC portion of emissions increases three-fold, from 25% to 75% of the total.

<u>Minimum refrigerant charge size threshold for emissions analysis:</u>
To focus emission estimates on R/AC equipment that create the most emissions, a decision was made at the beginning of the process to set a minimum refrigerant charge size threshold for further detailed analysis. As shown in Table 1, all stationary R/AC equipment emissions were initially estimated, regardless of refrigerant charge size.

Generally, it is understood that the more refrigerant a R/AC system contains, the greater the potential refrigerant loss. However, a cursory look at the data also show that R/AC systems with small refrigerant charges account for significant emissions, as can be seen in Table 1, which shows that residential AC and refrigeration account for 29% of total stationary R/AC equipment emissions, despite almost all residential systems containing less than 10 lbs of refrigerant. Additionally, small AC systems used commercially on average contain less than 20 lbs of refrigerant, but contribute 21% of all stationary R/AC emissions.

Cumulative emissions from R/AC equipment with less than 50 lbs of refrigerant are significant, but their emissions on a per facility basis tend to be low (compared to facilities with R/AC equipment that contains more than 50 lbs of refrigerant). For example, the significant emissions from residential AC and refrigeration are due to millions of households each potentially emitting small amounts of refrigerant. Similarly, the significant emissions from small AC systems are due primarily to the large number of facilities (approximately 500,000) with small AC systems.

In analysis, ARB staff chose to ensure consistency with the existing regulatory framework used in the CAAA Section 608 regulations and SCAQMD Rule 1415 to directly address emissions from R/AC systems with a minimum threshold of 50 lbs refrigerant charge and to indirectly address emissions from other appliances through technician required services practices. Because SCAQMD and federal regulations are based on R/AC equipment with a refrigerant charge of 50 lbs or greater of ODS as the regulatory threshold, a different threshold set by ARB statewide would create confusion.

California-Specific Data: The U.S. EPA Vintaging Model data was used as a starting point to identify the largest sources of GHG emissions from stationary R/AC equipment. Although the U.S. EPA Vintaging Model is an excellent data source, ARB staff also sought additional data from sources that would enable California-specific emission estimates. The emission estimates shown in this appendix are based upon California-specific data sources, which are described in detail in section 3.B., "Data Sources".

Outcome of Emissions Analysis: As part of its assessment of the feasibility of potential regulations, the ARB must consider cost-effectiveness. Development of such an estimate requires a characterization of the baseline emissions as well as the potential emission reductions from the proposal. It also requires identification of compliance costs, and estimates of the number and types of businesses using applicable R/AC systems. This appendix describes the methodology used to determine:

- Types and numbers of businesses with R/AC equipment;
- Types and numbers of R/AC equipment;
- Baseline refrigerant GHG emissions from a current business-as-usual (BAU) scenario; and
- Emission reductions as a result of rule implementation.

The results of the analysis summarized in this appendix are used as the basis to calculate costs of the proposed rule, which are presented in Appendix C.

2. Summary of Results

The numbers of facilities with R/AC equipment were estimated, along with potential GHG emission reductions from these facilities.

Number of Facilities with Refrigeration or AC Equipment
Numbers of facilities with stationary R/AC equipment containing 50 lbs or more high-global warming potential refrigerant were estimated.

R/AC equipment sizes were broken into the following six groups to allow for more precise analysis of the number of facilities using applicable R/AC systems, emissions, and potential emission reductions:

Refrigeration Equipment Refrigerant Charge Size Categories:

- Small Commercial Refrigeration Systems: 50 lbs or greater, but less than 200 lbs (50-<200 lbs);
- Medium Commercial Refrigeration Systems: 200 lbs or greater, but less than 2,000 lbs (200-<2,000 lbs); and
- Large Commercial Refrigeration Systems: 2,000 lbs or greater (≥2,000 lbs).

AC Equipment Refrigerant Charge Size Categories:

- Small Commercial AC Systems: 50 lbs or greater, but less than 200 lbs (50-<200 lbs);
- Medium Commercial AC Systems: 200 lbs or greater, but less than 2,000 lbs (200-<2,000 lbs); and
- Large Commercial AC Systems: 2,000 lbs or greater (≥2,000 lbs).

The following Table 2 shows the number of facilities with R/AC equipment in each refrigerant charge size category described above.

Table 2. Number of Facilities with R/AC Equipment ≥ 50 lbs; Baseline Year 2010

Facility Category (number of facilities containing the following equipment types) [2]	Lower Range	Best Estimate	Upper Range
Small Commercial Refrigeration Systems	10,000	15,500	22,000
Medium Commercial Refrigeration Systems	1,000	8,500	19,000
Large Commercial Refrigeration Systems	2,000	2,000	13,000
Sub-total Facilities with Commercial Refrigeration Equip ≥ 50 lbs	13,000	26,000	54,000
Small Commercial AC Systems	14,000	14,300	52,000
Medium Commercial AC Systems	700	6,100	11,100
Large Commercial AC Systems	800	2,700	4,900
Sub-total Facilities with AC Equip ≥ 50 lbs	15,500	23,100	68,000
Totals	**28,500**	**49,100**	**122,000**

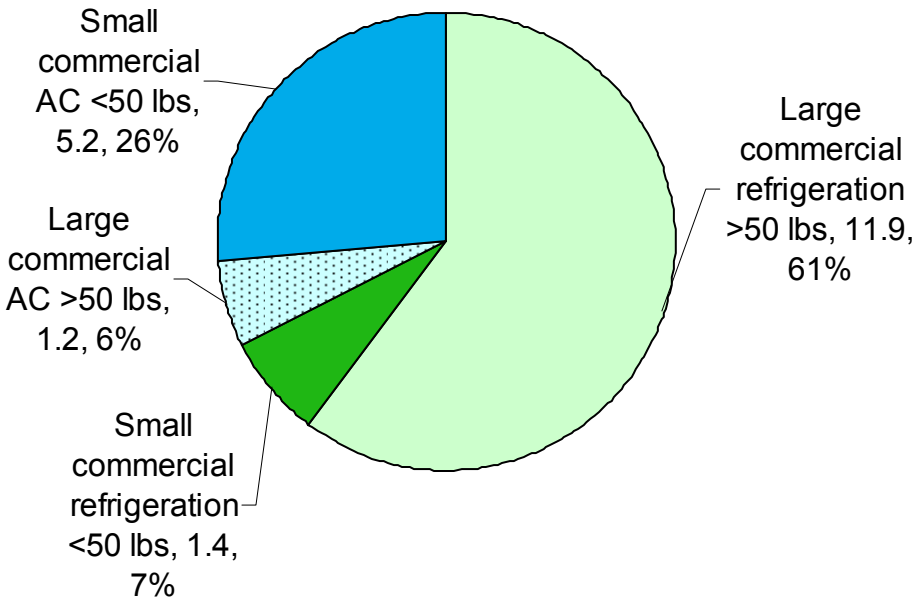
[2] The number of facilities shown in this table represents facilities containing one or more pieces of R/AC equipment within a given refrigerant charge size category. The best estimate is the most likely number of facilities ≥ 50 lbs. Note that the best estimate is not the average or mid-point between the lower range and upper range, but instead was determined using the most reliable data sources.

Emissions and Emission Reductions

The following Figure 1 shows finalized emissions estimates for baseline year 2010 to allow a quick visual comparison of the relative emissions from each commercial R/AC sector. (Refrigerant emissions from residential sources are not analyzed further in this emissions analysis.) These refined emissions estimates do not match exactly with the U.S. EPA Vintaging Model results shown in Table 1 due to the use of California-specific data which yielded slightly different state-wide emission factors, and therefore, slightly different results.

Because the California-specific data was based upon empirical data and a comprehensive bottom-up approach, it is believed to be more accurate than national estimates scaled down to California's population. The two primary changes resulting in using California-specific data was that the large commercial refrigeration sector initial emissions estimates increased from 9.4 to 11.9 $MMTCO_2E$, while the large commercial AC sector initial emissions estimates decreased from 2.3 to 1.2 $MMTCO_2E$. (Table 3 shows the emissions breakdown for each R/AC equipment refrigerant charge size category.)

Figure 1. GHG Emissions Estimates for Commercial Stationary R/AC Equipment (ARB-Refined Estimate) Year 2010 (20 MMTCO2E total) (Sector, Emissions in MMTCO2E and % total shown)



Data source: U.S. EPA Vintaging Model Estimates refined by ARB using California-specific data and emission factors, as described in this emissions methodology appendix.

Refrigeration Equipment:
Baseline 2010 emissions from stationary refrigeration equipment with refrigerant charges of 50 lbs or greater are about 7.4 $MMTCO_2E$ from HFC and 4.5 $MMTCO_2E$ from ODS (11.9 $MMTCO_2E$ total).

By 2020, BAU emissions from stationary refrigeration equipment with refrigerant charges of 50 lbs or greater are anticipated to increase 33% to 15.8 $MMTCO_2E$. HFC emissions are anticipated to almost double by 2020 to 14.3 $MMTCO_2E$ while ODS emissions are anticipated to decrease to 1.5 $MMTCO_2E$. (Montreal Protocol agreements limiting production of ODS including CFC and HCFC are responsible for a transition towards non-ODS replacements such as HFC.)

AC Equipment:
Baseline 2010 emissions from stationary AC equipment with refrigerant charges of 50 lbs or greater are about 0.2 $MMTCO_2E$ from HFC and 1.0 $MMTCO_2E$ from ODS (1.2 $MMTCO_2E$ total).

By 2020, BAU emissions from stationary AC equipment with refrigerant charges of 50 lbs or greater are anticipated to increase 17% to 1.4 $MMTCO_2E$. HFC emissions are anticipated to increase by 2020 to 1.0 $MMTCO_2E$ while ODS emissions will decrease to 0.4 $MMTCO_2E$.

Total Reductions:
Potential emission reductions from facilities with applicable R/AC equipment include HFC emission reductions of approximately 7.2 $MMTCO_2E$ by 2020, with another 0.9 $MMTCO_2E$ additional emission reductions from ODS (above the expected transitional decreases), for a total of 8.1 $MMTCO_2E$ GHG emission reductions. Additional potential emission reductions from AC equipment are 0.5 $MMTCO_2E$ (0.4 from HFC and 0.1 from ODS); for total projected emissions reductions of 8.6 $MMTCO_2E$.

The potential emission reductions are equal to the difference in the statewide emissions estimated using the average BAU leak rates (Table 3, 2020 BAU), and the statewide emissions estimated using the lower achievable leak rates obtainable using best management practices (Table 2, 2020 Post-Rule).

In aggregate, the proposed rule is expected to result in GHG emission reductions of approximately 50 percent, compared to BAU.

The following Table 3 shows emissions and potential reductions from commercial stationary R/AC equipment containing 50 lbs or more refrigerant charge. Emissions are broken out by basic type of equipment (refrigeration or AC), and refrigerant charge size (small, medium, or large).

Table 3. Potential emissions and emission reductions associated with the proposed regulation in 2010 and 2020. All emissions expressed in $MMTCO_2E$.				
	Emissions			**Emission Reductions**
R/AC Equipment Charge Size Category	**2010 BAU**	**2020 BAU**	**2020 Post-Rule**	**2020 Total GHG Reduction**
Small Commercial Refrigeration Systems	1.2	1.4	0.5	0.9 (0.8 HFC + 0.1 ODS)
Medium Commercial Refrigeration Systems	5.7	7.9	4.6	3.3 (3.0 HFC + 0.3 ODS)
Large Commercial Refrigeration Systems	5.0	6.5	2.6	3.9 (3.3 HFC + 0.6 ODS)
Refrigeration Subtotals	11.9	15.8	7.7	8.1 (7.2 HFC + 0.9 ODS)
Small Commercial AC Systems	0.6	0.7	0.3	0.4 (0.3 HFC + 0.1 ODS)
Medium Commercial AC Systems	0.3	0.3	0.2	0.1 (0.1 HFC + 0.0 ODS)
Large Commercial AC Systems	0.3	0.4	0.4	0 see footnote 3
AC Subtotals	**1.2**	**1.4**	**0.9**	**0.5 (0.4 HFC + 0.1 ODS)**
Total Emissions and Reductions	**13.1**	**17.2**	**8.6**	**8.6 [7.5 HFC + 1.1 ODS]**

Note: Sub-totals and totals may not sum exactly due to rounding.

The emissions and potential reductions estimates provide a single data mid-point within a range of plus or minus 22% that reflects the standard error of all refrigerant system leak rates, as determined through refrigerant usage and leak data reported by facilities to the South Coast AQMD under Rule 1415.

Reasonable ranges are as follows:

- 2010 BAU Emissions: 11.6 - 14.6 $MMTCO_2E$
- 2020 BAU Emissions: 15.2 - 19.4 $MMTCO_2E$
- 2020 Post-Rule Emissions: 8.5 - 8.7 $MMTCO_2E$
- Total Potential Emission Reductions: 6.7 - 10.5 $MMTCO_2E$

[3] Emission reductions for large commercial air-conditioning equipment (centrifugal chillers) are probable, but not well-defined using the methodology of comparing current business-as-usual leak rates to lower achievable leak rates, because the empirical data showed that for large centrifugal chillers, the lower achievable leak rate was already being met. Therefore, in this analysis, estimated reductions for large air-conditioning equipment are indicated as zero not because reductions cannot be achieved, but because they are not quantifiable given the constraints of current methodologies to identify further reductions from large chillers that, as reported, already achieve a low annual leak rate of 1%, which is less than the expected lower achievable leak rate of 2-4% per year.

3. Methods

This section describes the methodology used to estimate the number of facilities with R/AC equipment containing ≥ 50 lbs of refrigerant charge, current baseline emissions from those facilities, future emissions under a business-as-usual scenario, and potential emission reductions.

The Methods section is divided into the following sub-sections:

3.A. Emissions Calculation Formula and Emission Factors
3.B. Data Sources Used
3.C. Steps Taken to Determine Number of Facilities, Emissions, and Reductions
3.D. Detailed Description of Steps Used in Emissions Analysis
3.E. Potential Biases and Uncertainties in Data

3.A. Emissions Calculation Formula and Emission Factors

The calculation formula used to estimate GHG emissions is:

Emissions ($MMTCO_2E$) =
*Number of facilities * number of R/AC equipment units (systems) per facility * average refrigerant charge (lbs)/system * average percent of systems leaking during a given year * average percent of refrigerant charge lost from leaking systems * 4.54 x 10^{-10} MMT per lb * GWP of refrigerant*

Where:

- Number of facilities includes all facilities estimated to have R/AC equipment. In addition to the number of facilities, the types of businesses using applicable R/AC systems were also analyzed.
- The number of R/AC equipment units per facility factor is an average of the number of R/AC equipment units within a facility. The factor was developed by dividing the total number R/AC equipment units by the total number of facilities containing those systems.
- The average refrigerant charge per system is the average number of pounds of refrigerant for a given R/AC equipment category.
- The average percent of R/AC equipment units leaking during a given year is the total number of leaking R/AC equipment units divided by the number of all R/AC equipment units. This factor was calculated for each distinct combination of R/AC equipment type and refrigerant charge size (large centralized systems, medium centralized systems, large cold storage, medium cold storage, large process cooling, small refrigerant condensing

units, large centrifugal chiller, medium centrifugal chiller, medium packaged chiller, and small unitary AC).

- The average percent of refrigerant charge lost from leaking systems is the amount of refrigerant lost from leaking systems divided by the total refrigerant charge capacity of those systems that leak. (When the average percent of systems leaking during a given year is multiplied by the average percent of refrigerant charge lost from those leaking systems, the result is the annual average leak rate across all systems within the category. When this annual average leak rate is multiplied by the total quantity of refrigerant charge, the product is the annual amount of refrigerant lost in pounds, resulting from leaks.)
- Pounds of refrigerant loss (emissions) are converted to million metric tons (MMT) as a precursor to expressing emissions in the accepted "common denominator" of $MMTCO_2E$.

  4.54×10^{-10} MMT per lb is the conversion factor to convert pounds of refrigerant to million metric tons of refrigerant, which is derived from the following formula:

  *x lbs (input) * 0.454 kg/lb *.001 metric ton (MT)/kg * 0.000001 MMT/MT = MMT*

- The global warming potential of the refrigerant compared to CO_2 over a 100-year time horizon (GWP) is used to convert emissions in MMT to $MMTCO_2E$.

  For consistency with the method used to calculate California's GHG baseline emissions for AB 32, the Intergovernmental Panel on Climate Change (IPCC) Second Annual Report (IPCC SAR) was used as the source of GWP values. Where GWP values had not been published for specific refrigerants in the IPCC SAR, the values from the IPCC Third Annual Report (IPCC TAR) were used. Multiplying the quantity of refrigerant in MMT by the GWP yields emissions in terms of $MMTCO_2E$.

  In order to use the proper GWP for projected BAU emissions in 2010 and 2020, it was necessary to also use the U.S. EPA Vintaging Model's estimated ratio of R/AC equipment units that use HFC refrigerants compared to the systems that use ODS refrigerants (and the comparative share of all HFC and ODS refrigerant use by both pounds and $MMTCO_2E$). After individual GWPs were assigned to specific equipment, a weighted-average GWP was used for each category of R/AC equipment (centralized systems, cold storage systems, process cooling, chillers, refrigerant condensing units, and unitary AC units.)

The following example calculation shows how baseline 2010 GHG emissions were calculated from facilities within the small refrigeration equipment category, containing refrigerant condensing units that use 50 to 200 lbs of refrigerant. The

source of data and rationale for the methodology used is further explained in subsequent sections after the example calculation.

Example Emissions Calculation:

Given:
15,500 facilities with refrigerant condensing units in 2010.
Each facility contains on average 5 condensing units.
15,500 facilities * 5 condensing units/facility = 77,500 units (systems).

Each system contains on average 122 lbs of refrigerant.

During an average given year, 22% of the systems leak.
Those systems that leak lose 65% of their refrigerant charge.
Therefore, the average annual leak rate across all systems is:
22% leaking systems * 65% of refrigerant charge leaked (from those leaking systems) = 14.5% of all refrigerant leaked each year, on average, from all systems.

The total refrigerant contained in the condensing units is:
122 lbs/system * 77,500 systems = 9,455,000 lbs.

At an annual leak rate of 14.5%, total pounds emitted are:
14.5% loss * 9,455,000 lbs = 1,370,975 lbs leaked per year.

To convert pounds to MMT, multiply by conversion factor 4.54×10^{-10} MMT per lb = 1,370,975 lbs * 4.54×10^{-10} MMT = 0.00062 MMT.

Converting MMT to $MMTCO_2E$, multiply by the GWP of the refrigerant in the equipment (average GWP of refrigerant in condensing units is 2,043):

0.00062 MMT * 2,043 = 1.27 $MMTCO_2E$ emissions per year.

The above calculation process was repeated for each of the distinct categories of R/AC equipment, which are described in methodology section 3.D., “Detailed Description of Steps Used in Emissions Analysis”.

3.B. Data Sources Used

Multiple data sources were used in this analysis to determine facility numbers, emissions, and potential emission reduction estimates. The data sources are briefly described below. Additional details on how the data sources were used to develop emission factors are included in subsequent sections of this appendix.

For each data source, the emission factors it provided or helped to develop are included at the beginning of each data source section, followed by a description of the data source. Several data sources were used only to guide the analysis in the proper direction by informing staff on typical R/AC equipment uses, while

other data sources were used as a secondary cross-check of more complete or precise data sources.

California Commercial End-Use Survey (CEUS): Emission factors derived from this data source include: number of facilities; number of R/AC equipment units (systems per facility); and average refrigerant charge per system (as a cross-reference).

Administered by the California Energy Commission, the CEUS survey collects a wide variety of data on the energy use of commercial buildings in California. The CEUS data included many data fields pertaining to commercial refrigeration and cooling systems. The following is a partial list of fields used to estimate statewide refrigerant emissions:

- Numbers of facilities in California by broad business-type categories.
- Number of facilities with specific types of R/AC equipment (single-zone direct expansion [DX] units, multiple-zone DX units, remote refrigerant condensing units, chillers, and HVAC systems [single-zone and multiple-zone]) and for specific retail food equipment (walk-in coolers/freezers, and multiple types of display cases).
- The total number of R/AC equipment units and the average number of units per type of business.
- Tons of cooling capacity by type of R/AC equipment (converted to pounds refrigerant charge for the emissions analysis).

CEUS data for year 2007 was a sampling of commercial buildings in California from 85 percent of the state's population and regions. The survey data was presented to ARB after it had been extrapolated to represent the entire survey region and population. ARB staff further extrapolated these estimates to 100 percent coverage of the state by multiplying all data results (building numbers, R/AC equipment units) by 1.18, (or 100%/85%) to scale up to a 100 percent representation of state data.

Note that the CEUS survey did not contain any information on the specific type of refrigerant used or annual refrigerant usage (losses). As a result, it was not used to establish specific emission factors such as average leak rates of systems. Instead the South Coast Air Quality Management District Rule 1415 data was used to establish most emission factors specific to refrigerant use.

South Coast Air Quality Management District (SCAQMD) Rule 1415 dataset: Emission factors derived from this data source include: number of facilities, number of R/AC equipment units (systems) per facility, average refrigerant charge per system, average percent of systems leaking during a given year, and average percent of refrigerant charge lost from leaking systems. Rule 1415 data was also used identify the types of businesses using the specific types of R/AC

equipment, and to identify the refrigerants used in specific R/AC equipment groups.

As part of the SCAQMD Rule 1415 (Reduction of Refrigerant Emissions from Stationary Refrigeration and Air Conditioning Systems), all facilities using R/AC equipment with an ODS refrigerant charge 50 lbs or greater are required to submit a biennial report on the refrigerant charge of each piece of equipment and the amount of refrigerant used each year. The amount of refrigerant used each year is the amount added to existing systems, and is assumed to represent leaked refrigerant emissions. Only facilities with R/AC equipment utilizing ODS refrigerants are required to report under Rule 1415, although some systems using HFC refrigerant are included in reports.

In addition to refrigerant use patterns the biennial reports also include facility descriptions, standard industrial classification (SIC) codes, and types of R/AC equipment used.

The Rule 1415 biennial reports were selected as the primary source of data for emission factors because they were the most comprehensive collection of data available specific to actual refrigerant usage and losses, which gave it the distinction of being the best source of empirical data for refrigerant emissions in California. The Rule 1415 data were available for six years (reporting years 2000 through 2005) and consisted of approximately 16,000 records.

ARMINES - Inventory of Direct and Indirect GHG Emissions from Stationary Air conditioning and Refrigeration Sources, with Special Emphasis on Retail Food Refrigeration and Unitary Air Conditioning. Final Report, March 2009 (ARMINES 2009 report): ARMINES survey data was used as the primary source of information for numbers of facilities within the following business type categories: retail food, pharmacies, and hotels/motels. The ARMINES report was also used as a cross-reference for average refrigerant charge per system, average annual leak rates from R/AC equipment, and types of refrigerants used in food-related refrigeration.

The final report provided by ARMINES (principal investigator, Denis Clodic) as a part of a contract with ARB provides comprehensive inventories that are California-specific on the numbers and types of retail food facilities (supermarkets, grocery stores, convenience stores, mini-markets, restaurants, etc.), as well as the numbers and types of refrigeration equipment used by these facilities.

Data was obtained using surveys and facility visits in California. Additional reported data included inventories on numbers and types of commercial refrigeration systems used in cold storage, industrial process cooling, and air cooling in businesses. The ARMINES report was also used to establish or confirm various emission factors, including cooling capacities of refrigeration

systems, types of refrigerants used in centralized systems, and typical refrigerant charge sizes.

The ARMINES report also made extensive use of the Building Services Research and Information Association (BSRIA) 2005 marketing study, which was used as a primary source of information to estimate the installed base of chillers in California.

U.S. EPA Vintaging Model. The U.S. EPA Vintaging Model emission estimates were used at the beginning of the analysis to determine current and future emissions from stationary R/AC equipment in California. Refrigerant distribution data was used to build a profile of typical refrigerants used for specific R/AC equipment groups. Technical summary sheets of R/AC equipment were used to cross-check several emission factors from other sources, including: number of R/AC systems per facility, average refrigerant charge per system, and annual refrigerant leak rates for distinct R/AC equipment groups.

The U.S. EPA Vintaging Model was developed to estimate nationwide patterns of GHG emissions of HFCs, perfluorocarbons (PFCs), CFCs, and HCFCs from all major emission sources, including refrigerant usage. Three U.S. EPA Vintaging Model data sources were used:

1) National GHG emission estimates projected for years 2010 through 2030 from the U.S. EPA's Vintaging Model for R/AC equipment were provided to ARB in October 2008. National estimates were scaled down to California based on population size.

2) Refrigerant distribution by R/AC equipment type, for baseline year 2010, and for year 2020. As part of the input variables added to the U.S. EPA Vintaging Model, refrigerant usage trends are estimated for each major R/AC equipment group. For each R/AC group, the specific refrigerants used and their share of the distribution are listed. For example, in 2010, it is estimated that for large and medium centralized systems, 42% of the systems will use R-22; 40% will use R-404A; and 18% will use R-507. Refrigerant distribution is shown in Table 5.

3) U.S. EPA Vintaging Model, EPA ODS Tracking System, and Alternative Fluorocarbons Environmental Acceptability Study (AFEAS) Comparison for Common Refrigerants (U.S. EPA 2007). Consists of U.S. EPA Vintaging Model technical summaries of R/AC system numbers, average annual leak rates of R/AC equipment, refrigerant emissions, average refrigerant charge size, types of refrigerant used, and trends in R/AC equipment and refrigerant uses. Used to supplement, refine, and act as a cross-check for Rule 1415 data. Summaries are provided for the following R/AC categories:

- ODS and ODS Substitutes in U.S. Commercial Refrigeration End Uses (includes centralized systems).
- ODS and ODS Substitutes in the U.S. Cold Storage End Uses.
- ODS and ODS Substitutes in the U.S. Industrial Process Refrigeration (IPR) End Uses.
- ODS and ODS Substitutes in the Centrifugal Chiller End Uses.
- ODS and ODS Substitutes in the Positive Displacement Chiller End Uses.
- ODS and ODS Substitutes in the Commercial Unitary AC End Uses.

US Census Bureau NAICS code website: Used as a secondary source to cross-check facility types and numbers.

The US Census Bureau published an online guide to mapping SIC codes to 2002 North America Industry Classification System (NAICS) codes on their website: http://www.census.gov/epcd/www/naics.html. This resource was used to help translate, or map the SIC codes provided in the Rule 1415 data to the currently used NAICS codes. NAICS codes are the "common denominator" used to describe facilities, and these had to be determined to extrapolate the number of facilities within the Rule 1415 dataset to a statewide number of facilities.

US Census Bureau censtats database: This resource was used to estimate the statewide number of facilities for individual NAICS codes. The US Census Bureau publishes statewide facility number estimates for individual NAICS codes in California on their website: http://censtats.census.gov/cbpnaic/cbpnaic.shtml.

Energy Information Administration 2003 Commercial Buildings Energy Consumption Survey (CBECS): The CBECS report provided characterizations of commercial heating, ventilation, and air-conditioning (HVAC) equipment use for broad facility categories, including office buildings and office complexes. CBECS data provided a cross-check for numbers and types of facilities with R/AC equipment ≥ 50 lbs.

The national Commercial Buildings Energy Consumption Survey was conducted to collect information on the number of commercial buildings nationwide and to characterize energy related building characteristics. As a part of this survey a data table is available that outlines the estimated number of buildings within several broad building activity types (e.g., office buildings and office complexes) that utilize comfort cooling equipment including packaged air-conditioning units, central chillers, and district chilled water. A "NAICS code crosswalk" including a list of three digit NAICS codes which are representative of the types of facilities characterized by each of the principal building activities is also provided. The NAICS codes provided a breakdown of office building categories by the types of HVAC equipment used, which allowed estimates of the proportion of office

buildings within the refrigerant charge size categories of small, medium, and large.

Intergovernmental Panel on Climate Change Second Assessment Report (IPCC SAR), and Third Assessment Report (IPCC TAR): Used as the source for refrigerant global warming potential (GWP) used in emission estimates. Initially developed to address potential strategies to reduce or avoid climate change worldwide, the IPCC second and third assessment reports include estimates of the global warming potentials for common refrigerants.

2006 Intergovernmental Panel on Climate Change Guidelines for National Greenhouse Gas Inventories (IPCC GHG Guidelines): IPCC developed guidelines in 2006 for estimating national GHG inventories. Volume 3 (Industrial Processes and Product Use), Chapter 7 (Emissions of Fluorinated Substitutes for Ozone-Depleting Substances) includes a range of estimates of refrigerant charge (kilograms of refrigerant), lifetime of equipment (years), annualized refrigerant emissions, and recovery efficiency for several types of R/AC equipment.

Relevant types of R/AC equipment reported include: stand-alone commercial refrigeration, medium and large commercial refrigeration, industrial refrigeration (including food processing and cold storage), chillers, and commercial air conditioning. The IPCC guidelines contain information on the proper methodology to follow when estimating refrigerant GHG emissions. These methodologies helped inform and direct the ARB methodology used to estimate GHG emissions in California from stationary R/AC equipment.

IPCC/TEAP (Intergovernmental Panel on Climate Change [IPCC] and Technology and Economic Assessment Panel [TEAP]) Special Report on Safeguarding the Ozone Layer and the Global Climate Systems, 2005 (IPCC Special Report). Used as the primary source of information for estimated minimum achievable leak rates using best management practices for R/AC equipment.

The minimum feasible and achievable leak rates are used to estimate potential emission reductions. The Special Report provides the scientific context required for consideration of alternatives to ODS, potential methodologies for assessing options, and technical issues related to GHG emission reduction opportunities for several ODS emission sectors, including refrigeration and air conditioning.

The Special Report was used as a basic source of technical information on commercial refrigeration and air conditioning; providing an overview of relevant technologies, emission patterns and trends, ranges of annual leak rates for R/AC equipment, and consideration of improving containment, recovery, and recycling of refrigerants.

United Nations Environment Programme 1998 Report of the Refrigeration, Air Conditioning and Heat Pumps Technical Options Committee, October 1998; Annex III-Refrigerant Data (UNEP 1998): The information contained within this report was used to compare international estimates of average refrigerant leak rates for R/AC equipment (as a "reasonable" baseline) with the average refrigerant leak rates reported under Rule 1415. A comprehensive report with detailed summaries on all major types of R/AC equipment used commercially, it describes GHG emissions from R/AC equipment, trends in refrigerant usage (transition of ODS to HFC and other refrigerants), and numbers and types of R/AC equipment.

United Nations Environment Programme 2006 Report of the Refrigeration, Air Conditioning and Heat Pumps Technical Options Committee, January 2007 (UNEP 2007): This update to the 1998 report includes additional information on refrigerant leak rates under BAU scenarios and minimum achievable leak rates using best management practices for R/AC equipment. Used in conjunction with the IPCC Special Report to assign reasonable lower feasible and achievable leak rates for existing R/AC equipment.

3.C. Steps Taken to Determine Number of Facilities; Emissions and Potential Emission Reductions

The following steps were used determine the statewide number of facilities, emissions, and potential emission reductions from R/AC equipment with ≥ 50 lbs of high-GWP refrigerant (the steps will be described in further detail in the next section of this appendix):

1. R/AC equipment divided into basic three refrigerant charge size categories (small, medium, large)
2. Emission profiles made more specific by adding distinct R/AC equipment types to the existing refrigerant charge size categories of small, medium, and large. Identified distinct equipment groups, based on equipment type or function (including centralized system, cold storage, process cooling, refrigerant condensing units, chiller, and unitary AC).
3. Emission factors developed for each size and type of R/AC equipment
4. Number of facilities with R/AC equipment
5. Annual emissions estimated for baseline year 2010
6. Potential emissions estimated for year 2020 under business-as-usual scenario (no rule implementation)
7. Feasible lower average leak rates achievable after rule implementation is estimated
8. Emission reductions estimated for year 2020 (BAU emissions less post-rule emissions)

3.D. Detailed Description of Steps Used in Emissions Analysis

The following sub-section describes the methodology used in the steps taken to ultimately estimate number of facilities with R/AC equipment, emissions, and potential emission reductions.

Step 1. R/AC equipment divided into basic three refrigerant charge size categories (small, medium, large)

After the minimum refrigerant charge size threshold of 50 lbs per system was established, staff determined that a "one size fits all" approach to the rule would not result in the highest emission reductions for the lowest cost. The emission profiles of the R/AC equipment differ based on refrigerant charge size, and based on reported data, the different categories of R/AC equipment tend to be within defined refrigerant charge sizes. ARB staff analyzed more than 16,000 refrigerant leak data records reported under SCAQMD Rule 1415. Refrigerant loss (both in total pounds and by leak rate) was compared to refrigerant charge size. Natural break points recognized in the data showed three distinct groups of equipment, as determined by charge size, each with its own emissions profile. Based on the analysis, staff developed the following three basic refrigerant charge size groupings:

<u>Small Equipment ≥ 50 lbs, < 200 lbs</u>
As previously described, 50 lbs was the minimum refrigerant charge size threshold established. Small R/AC equipment using less than 200 lbs of refrigerant are characterized by relatively lower leak rates with less potential for large overall emissions compared to larger systems. An upper limit of 200 lbs was set based on its inclusion of all refrigerant condensing units and all unitary AC (with moderate leak rates), while excluding all centralized refrigeration systems, which tend to have higher leak rates. Small R/AC equipment comprises 60 percent of the number of facilities using applicable R/AC systems, and accounts for 15 percent of emissions from stationary commercial R/AC equipment.

<u>Medium Equipment (≥ 200 lbs, < 2,000 lbs)</u>
The 200-lb. threshold was primarily set to focus on emissions profiles representing moderate to extensive leak rates from a large number of systems. This category includes 90 percent of the centralized refrigeration equipment, 50 percent of cold storage equipment, 25 percent of centrifugal chillers, and all the packaged chillers. Medium R/AC equipment comprises 30 percent of the number of facilities using applicable R/AC systems, and accounts for 45 percent of emissions from stationary commercial R/AC equipment.

<u>Large Equipment (≥ 2,000 lbs)</u>
The 2,000-lb. lbs threshold was based upon emissions data from the Rule 1415

dataset, which shows that very large R/AC equipment using 2,000 lbs or more of refrigerant have relatively high leak rates. The combination of large refrigerant charge size and high leak rates combine to form the potential for the greatest emissions. The large category includes all process cooling equipment, 50 percent of cold storage equipment, 10 percent of the largest centralized refrigeration systems, and 75 percent of centrifugal chillers. Although large R/AC equipment only comprises 10 percent of the number of facilities using applicable R/AC systems, it accounts for 40 percent of emissions from stationary commercial R/AC equipment.

Step 2. Emission profiles made more specific by adding distinct R/AC equipment types to the existing refrigerant charge size categories

Initial emission estimates were made for three groups of R/AC equipment: small, medium, and large. The data generally indicated that as R/AC equipment become larger, they have higher leak rates. However, stakeholder comments led to additional analysis of all Rule 1415 data that clearly showed AC systems under the medium and large categories are chillers which leak significantly less than refrigeration equipment of the same refrigerant charge size.

To produce a meaningful analysis of equipment leak data to address stakeholder comments staff re-analyzed all equipment emissions by categorizing equipment into the following R/AC equipment types.

Refrigeration Systems

- Process Cooling (also called industrial cooling, industrial process cooling, and industrial refrigeration)
- Cold Storage
- Centralized Systems (also called DX [Direct Expansion] systems or parallel rack systems)
- Condensing Units (also called refrigerant condensing units or remote condensing units)

Air-conditioning (AC) Systems

- Centrifugal Chillers
- Packaged Chillers (also called positive displacement chillers, which include sub-types of chillers: reciprocating, screw, and scroll)
- Unitary AC (includes Split AC Systems [ducted and non-ducted]; Roof-top Units; and Packaged AC Systems)

The following summarizes typical uses of R/AC Systems:

- Process cooling, while technically a function and not a system, is the term commonly used to describe customized, built systems used in food and drink processing (brewing, distilling, dairy, and soft drink industries), and for industrial refrigeration in the chemical, petrochemical, and

pharmaceutical industries. Process cooling systems fall into the large refrigerant charge size category based on very large refrigerant charges (3,500 lbs on average).

- Cold storage is also more technically a function, and not a system, but is the generally accepted term for custom built refrigeration systems used to cool large storage areas at temperatures between –20º and +50º F, primarily for food storage. Cold storage systems generally fall into the large and medium-size refrigerant charge size categories.
- Centralized systems are commonly used in supermarkets and grocery stores to cool food in display cases and walk-in-coolers. Centralized systems may contain multiple compressor racks in a central location, where the refrigerant circulates from the central location to the retail floor space. Centralized systems tend to be leaky because of the many feet of refrigerant piping and number of connections necessary for these systems. Centralized systems fall into the large and medium-size refrigerant charge size categories.
- Condensing units are similar to centralized refrigeration systems, but are smaller, consisting of only one compressor rack that may cool a single walk-in-cooler or one or two display cases. Generally used in retail food businesses such as convenience stores, and medium-sized to smaller-sized grocery stores. Condensing units are in the small refrigerant charge size category.
- Chillers, also known as water chillers, cool water or heat transfer fluids for air conditioning in retail and commercial buildings. The two primary types of chillers are centrifugal chillers and packaged chillers, which differ primarily by the mechanical system used. Packaged chillers tend to be smaller and more leak-tight than centrifugal chillers. Centrifugal chillers are in the large or medium-size refrigerant charge size categories. Packaged chillers are in the medium-size refrigerant charge size category only.
- Unitary AC systems are self-contained cooling units used for air conditioning in buildings. The typical unitary AC system contains less than 100 lbs of refrigerant. Unitary AC systems are in the small refrigerant charge size category.

Emission estimates were refined by categorizing systems by both refrigerant charge size and R/AC equipment type based on ten distinct combinations, or categories of R/AC equipment type and refrigerant charge size categories.

With three basic refrigerant charge size categories, and seven R/AC equipment types identified, theoretically, there could be 21 distinct combinations of refrigerant charge size and equipment type, but several combinations do not exist in reported data (such as large unitary AC systems, or small process cooling systems).

The ten R/AC equipment categories defined by the R/AC equipment types and refrigerant charge size combinations existing in the Rule 1415 dataset are:

- Centralized refrigeration system - large
- Centralized refrigeration system - medium
- Cold storage - large
- Cold storage - medium
- Process cooling - large
- Refrigerant condensing units - small
- Centrifugal chiller - large
- Centrifugal chiller - medium
- Chiller - packaged - medium
- Unitary AC - small

Each combination pairing of refrigerant charge size category and equipment type creates a distinct R/AC equipment category that defines the basis for all analysis. By estimating emissions from each distinct R/AC equipment type and refrigerant charge size combination, it allowed for a more precise analysis of emissions risks by R/AC equipment categories and total BAU emissions and potential reductions.

Step 3. Emission factors developed for each size and type of R/AC equipment

Emission factors were developed for each R/AC equipment category primarily from empirical data as reported under SCAQMD Rule 1415. As previously stated, GHG emissions in $MMTCO_2E$ were calculated using the following equation:

Emissions in $MMTCO_2E$ =

*Number of facilities * number of R/AC equipment units (systems) per facility * average refrigerant charge (lbs)/system * average percent of systems leaking during a given year * average percent of refrigerant charge lost from leaking systems * 4.54×10^{-10} MMT per lb * GWP of refrigerant*

The following Table 4 shows the emission factors for each distinct R/AC equipment category. The emission factors are also described in greater detail in this appendix sub-section.

(Table 4 shown on following page to preserve table continuity.)

Table 4. Emission Factors by R/AC Equipment Category						
R/AC Equipment Type and Charge Size Category	**Facility Number (2010)**	**Facility Number (2020)**	**Charge (lbs) / System[4]**	**% of Systems Leaking**	**% of Charge Leaked - leaking systems only**	**Avg. Annual Leak Rate - all systems[5]**
Small Refrigeration Systems (≥ 50 lbs, < 200 lbs)						
refrigerant condensing units	15,500	17,123	122	22%	65%	14%
Medium Refrigeration Systems (≥ 200 lbs, < 2,000 lbs)						
centralized refrigeration system	7,500	8,285	704	36%	43%	15%
cold storage	900	994	565	45%	80%	36%
Large Refrigeration Systems (≥ 2,000 lbs)						
centralized refrigeration system	900	994	2,486	77%	28%	21%
cold storage	800	884	7,546	77%	36%	27%
process cooling	340	376	3,640	22%	31%	7%
Small AC Systems (≥ 50 lbs, < 200 lbs)						
unitary AC systems	14,300	15,800	100	19%	60%	11%
Medium AC Systems (≥ 200 lbs, < 2,000 lbs)						
centrifugal chiller	800	900	1,007	6%	23%	1%
packaged chiller	5,300	5,900	526	18%	37%	7%
Large AC Systems (≥ 2,000 lbs)						
centrifugal chiller	2,700	3,000	3,978	15%	16%	2%

A. Number of Facilities:

Estimating the number of facilities with R/AC equipment ≥ 50 lbs of refrigerant charge required a detailed analysis that is covered in the next sub-section (Step 4) of this appendix.

[4] On average, there are approximately 2 refrigeration systems per facility with a large system, and 5 refrigeration systems per facility with medium or small systems. For AC equipment, there are approximately 1.8 chillers per facility with large or medium centrifugal or packaged chillers, and 5.5 unitary AC systems per facility with small AC systems.

[5] The average annual leak rate (all systems) is used to represent an average amount of refrigerant charge leaked per year across all systems, and is calculated by multiplying the percent of leaking systems by the percent of refrigerant charge leaked from those leaking systems. For example, if an equipment type had 40 percent of all systems leaking in a given year, and those systems on average leaked about 30 percent of their refrigerant charge, the resulting annual leak rate averaged across all systems would be 12 percent (40% * 30% = 12%).

B. Number and types of refrigeration or air conditioning equipment units (systems) per facility:

SCAQMD Rule 1415 empirical data was used as the basis to extrapolate numbers and types of R/AC equipment units per facility to statewide averages. For each reporting facility, the numbers and types of R/AC equipment (by equipment type and by refrigerant charge size) were summed for each category; and divided by the number of facilities containing the equipment category.

The following equation was used for each of the ten distinct R/AC equipment categories:

Average number of pieces of R/AC equipment per facility =
Number of R/AC systems/number of facilities containing that type of R/AC system

R/AC equipment units per facility were also independently calculated using CEUS survey data using the same method. CEUS data showed about 20 percent fewer systems per facility than the Rule 1415 data. Results between CEUS data and Rule 1415 were averaged to arrive at a mean number of R/AC equipment units per facility.

C. Average refrigerant charge size (pounds of refrigerant) per system:

Using methodology similar to that used to determine the average number of R/AC equipment units (systems) per facility, the Rule 1415 data reported refrigerant charge sizes for each piece of equipment were summed and divided by the total pieces of that equipment type:

Average refrigerant charge size per system =
Total pounds refrigerant charge (by R/AC equipment category)/total number of R/AC systems (by R/AC equipment category)

CEUS data was used to independently estimate average refrigerant charge size per system. The CEUS data level of precision for this factor is lower than the Rule 1415 average, because an additional conversion was necessary for CEUS data. Specifically, the CEUS data did not report the actual refrigerant charge size of systems in pounds, but was reported in terms of tons of cooling capacity for the system, which had to be converted to an equivalent refrigerant charge size in pounds. Conversion factors of 3.5 lbs refrigerant per ton of cooling capacity for AC systems and 5 lbs refrigerant per ton of cooling capacity for refrigeration systems were used.

Estimates of average refrigerant charge size from CEUS data were within ten percent of Rule 1415 estimates, but only Rule 1415 data was used because it was more precise. As an additional cross-check, average refrigerant charge

sizes were compared to U.S. EPA Vintaging Model technical assessments, which indicated a wide range of average refrigerant charge sizes. Rule 1415 data fell well within U.S. EPA Vintaging Model refrigerant charge size parameters.

D. Types of refrigerants (and their global warming potentials) used:

Rule 1415 data was initially used to determine the types of refrigerants used for baseline emissions year 2010. However, an inherent bias was recognized within Rule 1415 data – only ODS-containing systems were required to report; therefore, HFC-containing systems would be virtually absent. Because Rule 1415 only requires ODS refrigerant reporting, use of this data set without adjustment would have under-estimated statewide emissions of HFCs.

The likely under-estimation of HFC emissions was corrected by using U.S. EPA Vintaging Model estimates of the current distribution of the number and types of R/AC equipment, including the type of refrigerant (ODS or HFC) used in the equipment. These current estimates formed the basis of the baseline 2010 refrigerant distribution assumptions.

For a given R/AC equipment category, the Vintaging Model refrigerant distribution was assigned to normalize Rule 1415 refrigerant data to actual refrigerant usage. For example, if 100% of the process cooling systems reported in Rule 1415 that an ODS refrigerant was used, but Vintaging Model data indicated that nationally, 40% of process cooling use HFC refrigerants, then 40% of the process cooling systems in Rule 1415 were randomly chosen and assigned HFC refrigerant to reflect the national distribution. Random assignment was used to prevent any systematic bias against associating high or low leakage systems with any particular type of refrigerant.

Note that in about five percent of the Rule 1415 reports, the refrigerant reported was indecipherable or inconclusive, such as “refrigerant R”, or “Freon”. Where the refrigerant used could not be ascertained, it was automatically selected for random assignment of normal refrigerant distribution for that type of system.

U.S. EPA Vintaging Model data was used to estimate refrigerant distribution according to R/AC equipment type in 2020. The U.S. EPA Vintaging Model projects that the proportion of R/AC equipment using ODS refrigerants will decline from 2010 to 2020 and use of HFC refrigerants will increase as ODS refrigerants are phased out. Projections are based on the number of R/AC equipment units currently in place, the average lifetime of equipment, ODS phase-out schedules, and the most probable non-ODS refrigerant replacements.

Aggregated industry data is used to estimate current R/AC equipment and their lifetimes. Projecting the likely non-ODS refrigerant substitutes is based upon current usage trends, assuming that refrigerant transitions occur linearly from the start date until the date of full usage. The U.S. EPA’s Vintaging Model often uses

several sets of assumptions to better approximate non-linear transitions, such as the transition of AC equipment from HCFC-22 to HFC blends.

The following Table 5 shows projected refrigerant distribution in 2010 and 2020, based on U.S. EPA Vintaging Model analysis.

Table 5. Refrigerant Distribution by R/AC Equipment Type, 2010 and 2020

R/AC Equipment type	Refrigerant	GWP	% Equipment 2010	% Equipment 2020	HFC or ODS
Centralized Systems	HCFC-22	1500	42.2%	3.0%	ODS
	R-404A	3260	39.7%	65.2%	HFC
	R-507	3300	18.1%	31.8%	HFC
Cold Storage	CFC-12	8100	2.0%	0.0%	ODS
	HCFC-22	1500	56.6%	28.1%	ODS
	R-404A	3260	26.2%	54.2%	HFC
	R-502	4500	6.6%	0.0%	ODS
	R-507	3300	8.6%	17.7%	HFC
Process Cooling	CFC-11	3800	1.0%	0.0%	ODS
	CFC-12	8100	15.6%	0.0%	ODS
	HCFC-22	1500	22.0%	11.0%	ODS
	HCFC-123	90	23.3%	29.4%	ODS
	HFC-134a	1300	33.3%	44.5%	HFC
	R-401A	970	0.4%	0.3%	HFC
	R-404A	3260	2.7%	8.8%	HFC
	R-410A	1725	0.9%	3.4%	HFC
	R-507	3300	0.8%	2.6%	HFC
Refrigerant Condensing Units	CFC-12	8100	2.2%	0.0%	ODS
	HCFC-22	1500	30.4%	7.3%	ODS
	HFC-134a	1300	40.4%	44.5%	HFC
	R-404A	3260	19.0%	33.3%	HFC
	R-507	3300	8.0%	14.9%	HFC
Chillers	CFC-11	3800	2.6%	0.0%	ODS
	CFC-12	8100	0.9%	0.0%	ODS
	HCFC-22	1500	73.8%	32.3%	ODS
	HCFC-123	90	6.8%	8.2%	ODS
	CFC-114	9300	0.1%	0.0%	ODS
	HFC-134a	1300	14.1%	32.3%	HFC
	HFC-236fa	6300	0.4%	0.1%	HFC
	R-407C	1526	1.0%	18.2%	HFC
	R-410A	1725	0.1%	8.9%	HFC
	R-500	6010	0.2%	0.0%	ODS
Unitary AC	HCFC-22	1500	78.4%	15.0%	ODS
	HFC-134a	1300	0.1%	0.7%	HFC
	R-407C	1526	0.3%	1.5%	HFC
	R-410A	1725	21.2%	82.8%	HFC

No break-out by equipment refrigerant charge size was available for HFC-ODS distribution ratios, but assessment of the U.S. EPA Vintaging Model data indicates that the distribution of refrigerants used by R/AC equipment is generally consistent across all refrigerant charge sizes for a given equipment type.

Global warming potentials (GWPs) were assigned according to the values for the 100-year time horizon as reported in the IPCC Second Annual Report (IPCC SAR). For some refrigerant GWP values not shown in the SAR, the IPCC Third Annual Report (IPCC TAR) values were used.

E. Average percent of systems leaking (during a given year):

Rule 1415 data was the best source of data for this factor, as other data tended to report annualized leak rates assuming that all equipment leaked a certain amount each year.

The factor is calculated from:

*Number of systems reporting a leak/total number of systems * 100%*

F. Average percent of refrigerant charge lost from leaking systems:

Rule 1415 data was used to calculate the average percent of refrigerant charge lost from leaking systems using the following equation:

Average percent of refrigerant charge lost from leaking systems =
*Pounds refrigerant lost (added) to equipment annually/total refrigerant charge (lbs) of leaking equipment * 100%*

The average percent of refrigerant charge lost from leaking systems can also be described as the annual leak rate for leaking systems. For example, if a system charge holds 100 lbs of refrigerant, and it leaked 20 lbs in a year, the annual leak rate for that system is 20%.

All refrigerant losses were summed for each specific R/AC equipment category and divided by the summed total of all refrigerant charge within the equipment category. Leak rates were also computed for individual systems, summed, and averaged to give a result for all systems. The results were consistent with the overall weighted average loss for all leaking systems.

Given the percent of systems leaking in a given year, and the average leak rate of refrigerant leaked from leaking systems, the average annual leak rate for all systems can be calculated:

Average annual leak rate (all systems) =

*Average percent systems leaking (during a given year) * average percent of refrigerant charge lost from leaking systems.*

Emissions projections under a BAU scenario for 2020 assume that current leak rates remain constant through 2020; although more leak-tight systems may be developed in the future. A discussion of improvements in equipment leak-tightness and how they would affect projected emissions and reductions is presented in more detail in section 3.E, "Potential Biases and Uncertainties in Data".

G. Final Result: Amount of refrigerant leaked from leaking systems (in pounds and in $MMTCO_2E$):

The emission factors are used to estimate the desired result of emissions from R/AC equipment containing 50 lbs or more refrigerant charge. Emissions are first calculated in pounds, and then converted to $MMTCO_2E$:

*Amount of refrigerant leaked (in pounds) from all leaking systems = Average percent of leaking systems * the average leak rate of those leaking systems * total pounds of refrigerant charge of all systems within the R/AC equipment category.*

To convert emissions from pounds to $MMTCO_2E$:

Leak amount in $MMTCO_2E$ =
*Pounds refrigerant leaked * conversion factor of 4.54×10^{-10} MMT per lb * GWP of refrigerant.*

Step 4. Number of Facilities with R/AC Equipment

ARB staff used several different sources of data to determine the number of facilities with R/AC equipment. Initially, SCAQMD Rule 1415 reported data was used to determine the types and numbers of facilities containing R/AC equipment with 50 lbs or more refrigerant.

For each R/AC equipment unit with 50 lbs or more ozone-depleting refrigerant, Rule 1415 reports require a description of the R/AC equipment, type of refrigerant used, and refrigerant charge size in pounds. Rule 1415 reports also include a business description and the SIC code for each reporting facility.

Reported SIC codes were mapped to NAICS codes and used, in conjunction with data provided by the US Census Bureau censtats database, to extrapolate the regional Rule 1415 data into a statewide estimate of the number of facilities in California in 2006. The data collected from Rule 1415 reports were treated as a valid sample of facilities statewide.

After initial facility estimates were made, ARB staff obtained additional data sources which resulted in a more precise estimate of the number of facilities with R/AC equipment. Specifically, staff realized that based on available data, better facility estimates could be made by looking at the number of facilities containing specific types of R/AC equipment rather than using the more general data available from Rule 1415 reports. Staff determined that no single data source was the best source of information for determining the number of facilities containing a given type of R/AC equipment. Therefore, each distinct type of R/AC equipment required a different data source or combination of sources.

To determine the total facilities inventory, it was necessary to break out the number of facilities containing one or more of the following types of R/AC equipment (with 50 lbs or more refrigerant):

- Centralized refrigeration systems
- Refrigerant condensing units
- Cold storage
- Process cooling
- Chillers (centrifugal and packaged)
- Unitary AC

The number of facilities was estimated for each distinct R/AC equipment category; as no single methodology was sufficient for all the different types of facilities and their R/AC equipment. To prevent double-counting, a facility was counted only once for its largest R/AC system. For example, if a facility contained a large centralized system and a small refrigerant condensing unit, it was counted once as a facility with a large refrigeration system.

<u>Refrigerant condensing units</u>

By definition in this emissions analysis, a refrigerant condensing unit contains less than 200 lbs of refrigerant, and is essentially a smaller version of a centralized system. Conversely, centralized systems are defined as direct expansion systems with 200 lbs or more refrigerant.

SCAQMD Rule 1415 data was used to determine the number of facilities with refrigerant condensing units. The SIC code for each reporting facility was mapped to a NAICS code. Based on an assessment of the facility type represented for each NAICS code (US Census Bureau website) it was determined whether systems used by facilities with each NAICS code represented refrigeration or AC systems. For example, the NAICS code 52210 represents facilities in the commercial banking sector. Based on this business description it was assumed that all R/AC equipment reported under this code were used for comfort cooling (AC systems) and not refrigeration. Similarly, the NAICS code 424420 represents facilities that are “packaged frozen food merchant wholesalers”. Based on this business description it was assumed that

R/AC equipment reported under this code were used for refrigeration and were included in the inventory of facilities using refrigerant condensing units.

Reports from 2000 – 2005 served as the primary contributor to the Rule 1415 dataset (total 16,000 systems). However, after many of the analyses were conducted, more recent reports from 2006 – 2007 became available and were used to cross check and verify the analyses conducted with the older dataset. One important difference between the older reports and the newer reports is the inclusion of more precise descriptions of each R/AC system reported which classify the systems function as refrigeration, freezing, or air conditioning.

Reports from the 1415 dataset were not sufficiently specific to enable accurate mapping to a NAICS code for retail food facilities. Additionally, it was unclear whether pharmacies reporting to the SCAQMD used refrigeration or AC systems with more than 50 lbs refrigerant. The inventory of commercial refrigeration equipment in California provided in the ARMINES report was used to cross check the number of retail food and pharmacy facilities. The ARMINES report inventory indicated that, on average, the only retail food facilities with refrigerant condensing units with more than 50 lbs refrigerant were minimarkets, convenience stores, grocery stores, and supermarkets. Because supermarkets also used centralized systems with more than 200 lbs refrigerant they were counted in the inventory of facilities which use medium and large centralized systems.

Centralized refrigeration systems

The number of facilities with centralized refrigeration systems was derived from analyses of the SCAQMD Rule 1415 dataset and the ARMINES report in the same way that the number of facilities with refrigerant condensing units was derived. All facility types which reported using systems with between 200 - 2,000 lbs of refrigerant in the Rule 1415 dataset were considered.

As before, the SIC code for each reporting facility in the Rule 1415 dataset was mapped to a NAICS code. Of all the facility types which reported using R/AC equipment with 200 – 2,000 lbs of refrigerant, the facility types most likely to represent refrigeration systems (and not AC systems), were isolated in the same way as is described for refrigerant condensing units.

For those facilities representing medium and large refrigeration systems there were two possible system types that could be assigned, centralized systems or cold storage. All facility types that did not match the criteria for cold storage were assumed to represent centralized systems.

As with the refrigerant condensing units, these analyses of Rule 1415 data and equipment assignments were cross checked and verified by looking at the most recent Rule 1415 reports which include improved equipment descriptions and

specific designations of the purpose of the systems reports (refrigeration, freezing, or AC).

Cold storage and Process cooling

SCAQMD Rule 1415 data was used to determine the number of facilities with cold storage or process cooling systems. As described previously for refrigerant condensing units and centralized systems the SIC code for each reporting facility was mapped to a NAICS code. Facility descriptions for individual NAICS codes are generally too specific to be useful for broad characterizations of affected business types in California. As a result, similar NAICS codes were grouped into aggregated business type categories.

The following Table 6 shows some of the NAICS codes associated with aggregated business types likely to use cold storage or process cooling refrigeration equipment.

Table 6. Facilities with Cold Storage or Process Cooling Equipment - List of mapped NAICS codes and Aggregated Facility Category

Aggregated Facility Category	Cold Storage	Process Cooling	Mapped NAICS codes		
Agricultural service	✓		115000		
Beer and ale	✓		312120	424810	
Dairy	✓		311510	311511	311513
Food processing			311000	311111	311812
Fresh fruit and vegetable wholesale	✓		424410	424480	424490
			493110		
Frozen food wholesale	✓		424420		
Fruit and vegetable processing			311400	311421	
Ice manufacturing	✓	✓	312113		
Manufacturing (non-food)		✓	325000	325120	325412
			325414	336400	325320
Meat processing	✓		311600	311611	311612
			311710		
Petroleum		✓	221110	324000	324110
Refrigerated warehousing/storage	✓		493120		

After NAICS codes were aggregated into similar facility categories, the number of facilities within each aggregated category was estimated using the U.S. Census Bureau censtats website.

The censtats website includes all facilities within a NAICS code. This inventory yields an artificially high estimate because facilities with systems containing less than 50 lbs of high GWP refrigerant are included. In order to include only those facilities with R/AC equipment using 50 lbs or greater of refrigerant it was necessary to use additional data sources.

Facility numbers were adjusted accordingly to remove those with very small R/AC equipment units (< 50 lbs) by using data in the CEUS dataset, U.S. EPA Vintaging Model technical data sheets, and the ARMINES report.

Additionally, ARB staff contacted stakeholders including equipment manufacturers, produce and vegetable growers, and other industry stakeholders to verify ARMINES research indicating that at least 80% of cold storage and food processing facilities in California use ammonia or CO_2 as their refrigerant, and thus would not be subject to the proposed rule. Stakeholders were able to verify this assumption, and based on this information, facility number estimates were reduced by 80% at all refrigerant charge sizes for cold storage and food processing categories (including agricultural service, beer and ale, dairy, food processing, fresh fruit and vegetable wholesale, fruit and vegetable processing, meat processing, and refrigerated warehousing/storage).

Chillers (centrifugal and packaged)

The number of facilities that have chillers in California was estimated primarily from CEUS inventory data, with ARMINES report data also used extensively as a cross-check. Because the refrigerant charge size of chillers was not always precise using CEUS data, the ARMINES report data was used to determine the number of chillers that fell into the medium and large categories, the distribution of refrigerant charge sizes, and technology type (centrifugal or packaged chiller).

Chiller data was compared to the inventory provided in the ARMINES Stationary Air Conditioning and Refrigeration Inventory Final Report, March 2009 (Table 1.11, U.S. Installed Base of Chillers from 1990 to 2004). The Building Services Research and Information Association (BSRIA) 2005 marketing study was used as the primary source of information, with national chiller sales and the installed base scaled to California's population

Additionally, chiller inventories from the CEUS and ARMINES reports were compared to estimates from the U.S. EPA Vintaging model technical datasheets scaled down to California based on population size.

Unitary AC

The number of facilities with unitary AC systems (between 50 and 200 lbs refrigerant) was estimated from CEUS data, and these estimates were cross-checked with data from the CBECS report, the U.S. EPA Vintaging Model technical data sheets, and the ARMINES report. Initial attempts to use Rule 1415 data to estimate facilities with unitary AC systems resulted in extremely high facility estimates that could not be confirmed using more precise data provided through CEUS, CBECS, and ARMINES.

The number of facilities with single and multi-zone HVAC systems was reported in CEUS, along with the tons of cooling capacity. Cooling capacity was

converted to pounds refrigerant to exclude facilities using AC systems with less than 50 lbs of refrigerant.

Because CEUS data is specific to California commercial facilities, it is considered more accurate than scaled-down results from national estimates obtained from the CBECS, ARMINES, and U.S. EPA Vintaging Model technical data sheets.

The following conversion factors and assumptions were obtained from SCAQMD Rule 1415 data and the CEUS report:

- Rooftop AC systems in California contain, on average, 11 lbs of refrigerant, with very few (10%) containing more than 50 lbs refrigerant.
- Half of the rooftop AC systems in California are in commercial facilities, and the other half are residential.
- Each facility with unitary AC systems (50 lbs or greater) contain on average, 5.5 systems per facility.

The ARMINES data also included estimates for all AC systems in California. Analysis of data contained within the ARMINES report was in close agreement with CEUS estimates. Estimates obtained from analyses of the CBECS report resulted in facility numbers 30 percent higher than estimates based on CEUS. Although CBECS and ARMINES estimates varied, the CEUS data was used as the best facility number estimate; because the uncertainty level was much lower.

Using the methodology above, staff also estimated that approximately 500,000 facilities in California contain unitary AC equipment with less than 50 lbs of refrigerant.

Emissions and Reductions Summary for Steps 5 - 8:
The following Table 7 shows R/AC equipment emission estimates for baseline year 2010, projected emissions for 2020 under a business-as-usual scenario, and projected reduced emissions for 2020 after implementation of the proposed regulation.

Total GHG emission reductions in 2020 are the difference between 2020 emissions under business-as-usual, and after rule implementation. Methodology and results are further described in following sub-sections steps 5 through 8.

Table 7. Summary of Emissions by R/AC Equipment Charge Size. All emissions shown in MMTCO2E.				
	Emissions			Potential Emission Reductions
R/AC Equipment Type and Charge Category	**2010 BAU**	**2020 BAU**	**2020 Post-Rule**	**2020 Total GHG Reduction[6]**
Small Refrigeration Systems (≥ 50 lbs, < 200 lbs)				
refrigerant condensing units (one type of small refrigeration system, same as subtotal)	1.3	1.4	0.5	0.9 (0.8 HFC + 0.1 ODS)
Medium Refrigeration Systems (≥ 200 lbs, < 2,000 lbs)				
centralized refrigeration system	4.6	6.6	4.3	2.3 (2.2 HFC + 0.1 ODS)
cold storage	1.0	1.3	0.3	1.0 (0.8 HFC + 0.2 ODS)
Subtotal: Medium Refrigeration Systems	5.7	7.9	4.6	3.3 (3.0 HFC + 0.3 ODS)
Large Refrigeration Systems (≥ 2,000 lbs)				
centralized refrigeration system	1.1	1.5	0.7	0.8 (0.8 HFC + 0 ODS)
cold storage	3.7	4.8	1.7	3.1 (2.5 HFC + 0.6 ODS)
process cooling	0.2	0.2	0.2	0 see footnote 6
Subtotal: Large Refrigeration Systems	5.0	6.5	2.6	3.9 (3.3 HFC + 0.6 ODS)
Refrigeration System Subtotals	**11.9**	**15.8**	**7.7**	**8.1 (7.2 HFC + 0.9 ODS)**

[6] Note on Process Cooling and Centrifugal Chiller Emission Reductions: Data from the U.S. EPA Vintaging Model, IPCC Third Annual Report, and ARMINES indicate that large process cooling units tend to leak about 10% of their refrigerant each year. It is not known why the process cooling systems under Rule 1415 have a lower leak rate (7% annually) than other estimates. Similarly, centrifugal chiller leak rate data from Rule 1415 reports show very low leak rates (1% annually for medium centrifugal chillers, and 2% annually for large centrifugal chillers) that are lower than the commonly cited 2-4% annual leak rate.

Emission reductions for process cooling and centrifugal chillers are probable, but not well-defined using the methodology of comparing current business-as-usual leak rates to lower achievable leak rates, because the empirical data showed that for these R/AC equipment types, the lower achievable leak rate was already being met. Therefore, in this analysis, estimated reductions for process cooling and centrifugal chillers are indicated as zero not because reductions cannot be achieved, but because they are not quantifiable given the constraints of current methodologies to identify further reductions from equipment that, as reported, already achieve leak levels that are lower than expected achievable leak rates. CARB staff chose to under-estimate emission reductions by not assigning an arbitrarily lower achievable leak rate.

Table 7. Summary of Emissions by R/AC Equipment Charge Size. All emissions shown in MMTCO2E.				
	Emissions			Potential Emission Reductions
R/AC Equipment Type and Charge Category	**2010 BAU**	**2020 BAU**	**2020 Post-Rule**	**2020 Total GHG Reduction[6]**
Small AC Systems (≥ 50 lbs, < 200 lbs)				
unitary AC systems (one type of small AC system, same as subtotal)	0.6	0.7	0.3	0.4 (0.3 HFC + 0.1 ODS)
Medium AC Systems (≥ 200 lbs, < 2,000 lbs)				
centrifugal chiller	0.02	0.02	0.02	0 see footnote 6 (previous page)
packaged chiller	0.28	0.28	0.18	0.1 (0.1 HFC + 0.0 ODS)
Subtotal: Medium AC Systems	0.3	0.3	0.2	0.1 (0.1 HFC + 0.0 ODS)
Large AC Systems (≥ 2,000 lbs)				
centrifugal chiller (one type of large AC system, same as subtotal)	0.3	0.4	0.4	0 see footnote 6 (previous page)
AC System Subtotals	**1.2**	**1.4**	**0.9**	**0.5 (0.4 HFC + 0.1 ODS)**
Totals All R/AC Systems	**13.1**	**17.2**	**8.6**	**8.6 (7.5 HFC + 1.1 ODS)**

Step 5. Annual emissions estimated for baseline year 2010

Using the emission factors previously described, the baseline emissions in year 2010 were estimated for each size and type of system, as shown in Table 7.

Step 6. Potential emissions estimated for year 2020 under business-as-usual scenario (without rule implementation)

Year 2020 potential emissions were estimated under a business-as-usual scenario and are shown in Table 7. The following assumptions were included in the 2020 BAU emissions estimate:

- Number of facilities will grow by one percent per year.

- Refrigerant usage will gradually transition away from CFCs and HCFCs towards HFCs, as previously shown in Table 5 (Refrigerant Distribution by Equipment Type, 2010 and 2020).
- No other changes in emission factors will occur, i.e., the following remain unchanged:
    - Number of systems/facility
    - Average refrigerant charge (pounds) per system
    - Average percent of systems leaking during a given year
    - Average percent of refrigerant charge lost from leaking systems

Step 7. Feasible lower average leak rates achievable after rule implementation

It is not possible to prevent all refrigerant leaks in refrigeration and AC systems. Normal aging of equipment, such as weakened fittings and gaskets lead to leaks and are a part of R/AC equipment usage in the real world. However, it is possible to find and repair leaks more quickly when best practices in refrigerant management and system maintenance are utilized.

A primary assumption used to estimate emission reductions is that the proposed rule would not necessarily reduce the actual number, or percent of leaking R/AC systems during a given year. Rather, the rule defines inspection and maintenance best management practices and use of these practices would cause leaks to be detected and repaired more quickly and completely, thus reducing overall refrigerant emissions.

In order to calculate emission reductions from BAU to post-rule implementation, it was necessary to first estimate how much the annual leak rate could be reduced, then to quantify those emissions.

Two key sources were used as the basis of lower achievable leak rates:
1) the United Nations Environment Programme (UNEP) *2006 Report of the Refrigeration, Air Conditioning and Heat Pumps Technical Options Committee*; and 2) the Intergovernmental Panel on Climate Change [IPCC] and Technology and Economic Assessment Panel [TEAP] *Special Report on Safeguarding the Ozone Layer and the Global Climate Systems, 2005*. U.S. EPA Vintaging Model technical sheets on specific R/AC equipment types normal leak rates were also used as supplementary references.

The two key references indicate that using best management practices on old or new refrigeration equipment can reduce the average annual leak rates to 10 percent or less for large equipment, and 5 percent or less for small equipment.

Available references were often ambiguous on what was meant by “large” or “small” equipment. Initially, staff assumed large to be equipment with 2,000 lbs

or more refrigerant, and small equipment contained less than 200 lbs refrigerant. However, additional analysis showed that the term "large" was frequently used to include any equipment with about 100 kilograms (220 lbs) or more refrigerant, and "small" equipment generally included all systems with less than less than 100 kilograms.

Therefore, the achievable lower annual leak rates for the purpose of estimating emission reductions was set to 10 percent for systems with 200 lbs or more refrigerant (medium and large equipment category), and 5 percent for systems with less than 200 lbs refrigerant (small equipment category).

Achievable lower leak rates for AC systems were also researched. AC systems are generally more leak tight than refrigeration systems of the same refrigerant charge size, especially chillers, which often operate under negative pressure, so that if a leak occurs, the system will take in air, instead of refrigerant leaking out.

The IPCC Special Report and U.S. EPA Vintaging Model estimate that centrifugal chillers should be able to leak as little as 2 to 4% annually, and medium-sized packaged chillers can achieve leak rates of 3.5% or less per year. Small unitary AC systems can achieve leak rates as low as 5% or less annually.

The following Table 8 shows average annual leak rates calculated from Rule 1415 data on actual usage (refrigerant losses) over six consecutive years (2000 through 2005) for the identified R/AC equipment categories. Table 8 also shows the lower achievable annual leak rates using best management practices, based on industry studies reported in the IPCC/TEAP Special Report and the UNEP Report as previously described.

Table 8. Refrigeration Equipment Leak Rates, BAU Compared to Post-rule

R/AC Equipment Type and Charge Category	Rule 1415 Data - Avg. Annual Leak Rate	Lower Achievable Avg. Annual Leak Rate w/ Best Mgmt. Practices	Reduction of Leak Emissions (relative %)
Refrigeration Systems			
centralized system (large)	21%	10%	53%
centralized system (medium)	15%	10%	33%
cold storage (large)	27%	10%	64%
cold storage (medium)	36%	10%	72%
process cooling (large)	7%	7%	0% see footnote 7

[7] Note on Process Cooling and Centrifugal Chiller Emission Reductions: Data from the U.S. EPA Vintaging Model, IPCC Third Annual Report, and ARMINES indicate that large process cooling units tend to leak about 10% of their refrigerant each year. It is not known why the process cooling systems under Rule 1415 have a lower leak rate (7% annually) than other estimates. Similarly, centrifugal chiller leak rate data from Rule 1415 reports show very low leak rates (1% annually for medium centrifugal chillers, and 2% annually for large centrifugal chillers) that are lower than the commonly cited 2-4% annual leak rate.

Table 8. Refrigeration Equipment Leak Rates, BAU Compared to Post-rule			
R/AC Equipment Type and Charge Category	**Rule 1415 Data - Avg. Annual Leak Rate**	**Lower Achievable Avg. Annual Leak Rate w/ Best Mgmt. Practices**	**Reduction of Leak Emissions (relative %)**
refrigerant condensing units (small)	14%	5%	65%
Sub-total refrigeration systems, (weighted average)	**19%**	**9%**	**51%**
AC Systems			
centrifugal chiller (large)	2%	2%	0% see footnote 7
centrifugal chiller (medium)	1%	1%	0% see footnote 7
packaged chiller (medium)	7%	3.5%	50%
unitary AC (small)	11%	5%	56%
Sub-total AC systems, (weighted average)	**5%**	**3%**	**40%**
Totals (weighted average)	**16%**	**8%**	**50%**

Step 8. Emission reductions estimated for year 2020 (BAU emissions less post-rule emissions):

Emission reductions for year 2020 are estimated by taking the difference between BAU emissions and achievable lower emissions as a result of rule implementation. Results are shown in Table 7.

3.E. Potential Biases and Uncertainties in Data

Potential biases inherent in the Rule 1415 baseline dataset and resulting emission factors include the assumptions made for current and future leak rates, which would decrease or increase estimates of emissions and potential reductions as a result of rule implementation.

1). Current Leak Rates:
The Rule 1415 reports were the most complete data set for leak rates of actual R/AC equipment used in California. However, SCAQMD estimated that less than twenty percent of regulated facilities submit required reports, which results in an under-reporting of data that could potentially bias data from a representative sample of all regulated facilities.

Footnote 7 (cont.) Emission reductions for process cooling and centrifugal chillers are probable, but not well-defined using the methodology of comparing current business-as-usual leak rates to lower achievable leak rates, because the empirical data showed that for these R/AC equipment types, the lower achievable leak rate was already being met. Therefore, in this analysis, estimated reductions for process cooling and centrifugal chillers are indicated as zero not because reductions cannot be achieved, but because they are not quantifiable given the constraints of current methodologies to identify further reductions from equipment that, as reported, already achieve leak levels that are lower than expected achievable leak rates. CARB staff chose to under-estimate emission reductions by not assigning an arbitrarily lower achievable leak rate.

Bias could be introduced in two ways: 1) lower leak rates than representative of the general R/AC equipment population because the facilities that report tend to be the ones that already have best management practices (and therefore low leak rates); or 2) higher leak rates than representative, because facilities that report do so because they have been identified by local environmental enforcement agencies for serious or minor violations of environmental regulations, and have been told to report for Rule 1415 and other environmental regulations. ARB staff believes it is likely that both scenarios exist, nullifying the positive and negative biases and rendering them neutral, leaving a valid non-biased sample from under-reporting of facilities.

2). Future Leak Rates:

Estimates of future fugitive emissions are difficult to predict or quantify, as they assume changes in R/AC equipment and refrigerant usage patterns that may not have occurred yet. Specifically, two alternate scenarios were considered in leak rate assumptions that change estimated BAU emissions and reductions in 2020 from those used in this analysis:

a) Achievable lower leak rate by 2020 for medium sized refrigeration equipment is decreased from 10% to 7.5% (increases estimated emission reductions). Although achievable lower leak rates for large and small sized refrigeration systems were described and supported by several studies, medium-sized equipment was not addressed directly.

ARB staff chose a 10% achievable lower leak rate for medium sized equipment, which is the same as for large equipment. Smaller equipment is assigned an achievable lower leak rate of 5%. Therefore, ARB staff considered assigning a 7.5% achievable lower leak rate for medium systems because it is the midpoint between achievable lower leak rates of 5% for small equipment and 10% for large equipment. However, such an assumption could not be fully justified because the studies available could be interpreted to show that what ARB considers medium equipment (200 – 2,000 lbs refrigerant), encompasses what the studies included as large equipment (220 lbs or more refrigerant). If we assume that medium-sized equipment could achieve a 7.5% leak rate, the projected emission reductions for 2020 are increased from 8.6 $MMTCO_2E$ to 9.8 $MMTCO_2E$ (15 percent greater emission reductions).

b) Newer equipment becomes increasingly leak-tight (decreases estimated emission reductions). Due to a combination of best management practices and better equipment design, average annual leak rates for R/AC equipment have decreased significantly since the late 1980s (due in part to the adoption of the Montreal Protocol in 1987, and the Section 608 requirements in the Clean Air Act Amendments of 1990).

ARB staff estimated 2020 BAU emissions with the assumption that current leak rates for BAU would be constant through 2020, with no reduced leak rates due to better equipment design. However, ICF International environmental consulting company has conducted research indicating that the past trends of more leak-tight equipment should continue through 2020 and beyond, with leak rates at least 10 percent less for new equipment compared to existing equipment.

The reduced leak rates would be expected to apply more towards factory-manufactured equipment, and less to "built" systems, which are custom-built on site, and have leak characteristics different for each system. ARB staff did not use this projection for estimated future emissions under BAU scenarios, because business-as-usual by definition implies that significant changes will not take place. However, ARB staff acknowledges that continued improvements in R/AC equipment design will most likely take place, thus helping to reduce refrigerant emissions, in conjunction with best management practices.

For comparison to BAU emissions in 2020 as calculated, ARB staff calculated 2020 emissions if new equipment installed between 2010 and 2020 leaked 10 percent less than existing equipment; the expected emissions in 2020 under the new BAU assumptions would decrease from 17.2 to 15.5 $MMTCO_2E$. Similarly, total expected emission reductions from the rule would decrease from 8.6 to 7.0 $MMTCO_2E$ (20 percent fewer reductions).

4. Summary and Conclusions

Summary:
Statewide estimates of the number of facilities using refrigeration or air-conditioning (R/AC) equipment containing 50 lbs or more of refrigerant were calculated and refined using several data sources. Emissions inventory estimates were calculated using R/AC equipment use patterns and annual leak rate data provided in the SCAQMD Rule 1415 dataset. Estimates of the distribution of R/AC equipment using specific HFC and ODS refrigerants were obtained from the U.S. EPA Vintaging Model estimates and applied to the Rule 1415 dataset. Refrigerant use distributions were adjusted to reduce a known bias in the rule 1415 data set generated by a requirement to report refrigerant use patterns for only R/AC equipment utilizing ODS refrigerants.

Finally, the reductions in emissions that could be associated with implementation of the proposed regulation and full compliance were estimated. Approximately 50 percent of CO_2E emissions could be reduced from stationary refrigeration or air-conditioning equipment (subject to the proposed rule) as a result of reduced leak rates from improved inspection and maintenance practices required by the regulation.

Conclusions:
Requiring the use of refrigerant best management practices outlined in the Refrigerant Management Program proposed regulation would result in significant GHG emission reductions. The primary emission reductions are a result of the leak detection and monitoring and leak repair components of the proposed rule. The reporting and record-keeping components ensure that the emission reductions are real, verifiable, and enforceable.

HFC emissions inventory estimates for the total annual CO_2 equivalent emissions from leaks associated with stationary refrigeration equipment (containing 50 lbs or more refrigerant) in California in 2010 are 7.4 $MMTCO_2E$, and are projected to increase to 14.3 $MMTCO_2E$ by 2020 under the BAU scenario. HFC emissions double between 2010 and 2020 as a result of the continued transition away from ozone-depleting refrigerants to HFC refrigerants. As a result of transitioning away from ODS refrigerants, emissions of ODS from refrigeration equipment are anticipated to decrease from 4.5 $MMTCO_2E$ in 2010 to 1.5 $MMTCO_2E$ in 2020. (Total GHG emissions of HFC and ODS combined increase about 33%, from 11.9 $MMTCO_2E$ in 2010 to 15.8 $MMTCO_2E$ in 2020.)

HFC emissions from AC equipment are projected to increase from 0.2 $MMTCO_2E$ in 2010 to 1.0 $MMTCO_2E$ in 2020. ODS emissions are anticipated to decrease from 1.0 $MMTCO_2E$ in 2010 to 0.4 $MMTCO_2E$ in 2020. The net increase in GHG emissions from AC equipment is 0.2 $MMTCO_2E$ (1.2 to 1.4 $MMTCO_2E$).

Analyses conducted by ARB staff estimate that approximately 50% of the CO_2E emissions from stationary R/AC equipment could be eliminated relative to BAU as a result of implementing inspection and maintenance best practices such as the leak detection and monitoring and leak repair practices.

Potential annual emission reductions of 7.2 $MMTCO_2E$ HFCs, with an additional 0.9 $MMTCO_2E$ ODS (8.1 $MMTCO_2E$ total) from refrigeration equipment by the year 2020 are projected as a result of the rule. Additional minor reductions from AC equipment are also anticipated as a result of required service practices, but are not quantified in this analysis.

Addendum A – Additional Methodology Details

Initial facility number estimates made by ARB for the proposed rule relied upon the SCAQMD Rule 1415 reported data for all facilities. As more precise data sources became available, the Rule 1415 data was used as the primary data source only to estimate the number of facilities with small refrigerant condensing units, cold storage systems, or process cooling systems (as previously described in this appendix). Although in most cases, the initial methodology was rejected in favor of better methodologies as more precise data became available, the initial methodology used is included below for completeness, because it was used to help identify types of businesses and refrigeration equipment likely to be subject to the rule. After the types of businesses and equipment were initially identified, further refinements could be made to more precisely estimate number of facilities, types and number of R/AC equipment, and emission factors of the equipment and facilities.

SCAQMD Rule 1415 reports include useful data on the types of businesses, R/AC equipment, refrigerant usage, and other data that were used by ARB to develop initial estimates on the magnitude of GHG emissions from stationary R/AC equipment.

All data obtained from SCAQMD Rule 1415 databases were initially scanned for errors and reasonable attempts to fill the data gaps were made, whenever possible.

Section 1. Initial Identification of Types of Businesses, Using SIC Codes.

Rule 1415 reports included a field for the business SIC code, which was used to map to a current NAICS code. NAICS codes were generally too specific and contained too few facilities for meaningful emissions analysis, so similar NAICS coded facilities were aggregated into similar business types.

Occasionally, the Rule 1415 report left the SIC code field blank. If a report did include a specific business description identical to descriptions provided by other facilities reporting an SIC code, then in these cases the facility with a missing SIC code was assigned the same SIC code as the other facilities with identical business descriptions.

Additionally, if a facility provided a business description that was sufficiently specific, a three digit SIC code was assigned to the respective facility based on NAICS code business descriptions. If a facility did not report an SIC code and the description provided was too vague to allow confident assignment of a three digit SIC code the data was not incorporated in further analyses.

The US Census Bureau NAICS code website was used to obtain a better understanding of the types of facilities included within each NAICS or SIC code throughout this process. In many cases the reported SIC code was mapped to a NAICS code based on the suggested mapping scheme provided by the US Census Bureau. In cases where two-digit SIC codes were reported, direct mapping to a NAICS code was not possible. In these cases the specific business description reported by each facility and the reported SIC code were used as guides to map a three- to four-digit NAICS code.

In general, the business description was relied upon more heavily than the reported SIC code because it was assumed that the employee reporting to the SCAQMD was better able to accurately describe their business than assign an appropriate SIC code from the list provided. Additionally, if SIC codes or business descriptions reported were vague, mapping to fewer NAICS digits was used to avoid over-specifying facility categories.

Assumptions/sources of bias: Several assumptions are implicit in the methods used to map SIC codes/business descriptions to NAICS codes described. It is necessary to assume that the employees completing and submitting the reporting forms to the SCAQMD accurately selected SIC codes to represent their primary business activity and that the business descriptions provided are also accurate. It is possible that the employee reporting included a business description that they felt reflected the goals of the SCAQMD instead of the actual business conducted there (for example: a real estate office building with a chiller, including a business description as “building cooling” instead of “real estate”). It is also necessary to assume that, during the SIC to NAICS code mapping process, accurate assessments of facility types included within each NAICS or SIC code were made based on information obtained from the US Census Bureau NAICS code website.

Finally, it is necessary to assume that data within the SCAQMD Rule 1415 dataset is accurate. Data was initially obtained as hard copies and converted to an electronic format using optical character recognition software. It is possible that errors were made during the process of converting data from hard copies to electronic format. However, any errors made during data transcription would have been compensated for by cross-checking the data for reasonableness and how well it reflected actual R/AC equipment numbers and refrigerant usage patterns, as compared to data from CBECS survey, CEUS survey, ARMINES research, and the U.S. EPA Vintaging Model.

Section 2. Initial Estimates of Facility Numbers and R/AC Equipment Numbers Using Rule 1415 Data

After NAICS code mapping was conducted and all NAICS codes were assigned, the numbers of facilities were determined. Facilities were designated further into

categories by type of R/AC equipment and refrigerant charge size category.

R/AC Equipment Size Ranges: Datasets were first generated by sorting SCAQMD data by equipment refrigerant charge size. All R/AC equipment with at least 50 lbs of refrigerant was placed into one of the three basic refrigerant charge categories (large R/AC equipment 2,000 lbs or greater; medium R/AC equipment 200 lbs to 2,000 lbs; and small R/AC equipment 50 lbs to 200 lbs). R/AC equipment was also identified by its specific equipment type or function (centralized system, cold storage, chiller, etc.)

Initial Statewide Extrapolation: The next step to calculate numbers of facilities impacted by the proposed regulation was to determine the number of facilities statewide in each of the NAICS codes represented in the Rule 1415 dataset. Statewide facility number estimates for each NAICS code represented in each refrigerant charge size range were obtained from the US Census Bureau censtats database. The sum of these statewide facility number estimates provided the preliminary statewide estimates for the number of facilities potentially subject to the proposed rule.

To simplify data presentation, individual NAICS codes were assigned to aggregated categories representing broad facility types in California. After statewide facility number estimates for all represented NAICS codes were determined within each R/AC equipment size category, the estimates were summed to yield a cumulative facility number within each aggregated category.

The following Table 9 shows the NAICS codes that were assigned to aggregated categories of business types. Many aggregated categories consist of multiple NAICS codes because the codes are for very specific types of businesses, where the aggregated categories represent very broad business types, such as office buildings.

Table 9. Aggregated Facility Categories and Corresponding Mapped NAICS Codes

Aggregated category	Mapped NAICS codes				
Agricultural service	115000				
Airport	488110				
Amusement/recreation parks	713990	713950	713110	711211	711110
	711219				
Beer and ale	424810	312120			
Bottled gas dealers	454312				
Cemeteries/crematories	812220				
Dairy	311513	311511	311510		
Department stores	452111				
Education - Junior colleges	611210				
Education - tech and trade schools	611519				
Education - universities	611300				
Elementary and secondary schools	611110				
Food processing	311812	311111	311000		

Table 9. Aggregated Facility Categories and Corresponding Mapped NAICS Codes					
Aggregated category	**Mapped NAICS codes**				
Fresh fruit and vegetable wholesale	493110	424490	424480	424410	
Frozen food wholesale	424420				
Fruit and vegetable processing	311421	311400			
Hotels/motels	721110				
Ice manufacturing	312113				
Libraries	519120				
Manufacturing (non-food)	313000	322120	322200	322210	323110
	334516	334613	335313	335911	334513
	336300	336322	336400	336410	336411
	336414	336419	339000	339110	325000
	325120	325211	325300	325320	325411
	325412	325414	325510	325520	325991
	326113	326140	326160	326192	327213
	327310	331000	331111	331316	331512
	332811	332813	333319	334220	334410
	334413	334414			
	313000	322120	322200	322210	323110
Meat processing	311710	311612	311611	311600	
Medical care	623110	622310	622110	621512	
Misc warehousing/storage	493190				
Museums	712130	712110			
Office buildings	813990	813930	813910	425000	561439
	551112	551100	541860	541511	541330
	541110	541000	531312	531110	524298
	522390	522110	518210	518111	
Petroleum	324110	324000	221110		
Pharmacies	446110				
Publishing	511130	511120	511110	323117	
Refrigerated warehousing/storage	493120				
Religious organizations	813110	813000			
Research and development	541710				
Retail (food)	445299	445200	445110	445000	
Retail (non-food)	454390	453998	452000	448310	442110
	441110				
Service industry	811490	811198	561720		
Telecommunications	517110				
TV/movie production	515120	512191	512110		
Utilities	221320	221310	221210	221119	221000
	211111				
Wholesale - (non-food)	424690	424100	423410	423110	

Section 3. Assumptions Used to Assign R/AC Equipment Type

Rule 1415 reports were used as the primary source of data to identify the types and numbers of R/AC equipment with ≥ 50 lbs of refrigerant charge, and therefore, potentially subject to the proposed rule.

Where equipment type was not conclusive from Rule 1415 data (for example, "cooling unit"), an equipment type was assigned based on comparing the equipment's refrigerant type and refrigerant charge size to other R/AC equipment used in the same type of business, and assigning it to the most likely R/AC equipment category. The following Table 10 shows the likely equipment type assigned to unclear R/AC equipment descriptions.

Table 10. Equipment type designations assigned for unclear reported data

Aggregated Facility Category	Equipment ≥ 50 lbs, < 200 lbs (small)	Equipment ≥ 200 lbs, < 2,000 lbs (medium)	Equipment ≥ 2,000 lbs (large)
agricultural service	unitary AC or refrigerant condensing unit	cold storage	N/A
airport	unitary AC	chiller	N/A
amusement/recreation parks	unitary AC	chiller	centrifugal chiller
beer and ale	unitary AC or refrigerant condensing unit	cold storage	N/A
bottled gas dealers	unitary AC	chiller	N/A
cemeteries/crematories	unitary AC or refrigerant condensing unit	chiller	N/A
dairy	unitary AC or refrigerant condensing unit	cold storage	cold storage
department stores	unitary AC	chiller	centrifugal chiller
education - K - 12	unitary AC	chiller	centrifugal chiller
education - Junior college	unitary AC	chiller	N/A
education - tech and trade schools	unitary AC	N/A	N/A
education - universities	unitary AC or refrigerant condensing unit	chiller	centrifugal chiller
food processing	unitary AC or refrigerant condensing unit	cold storage	cold storage
fresh fruit and vegetable wholesale	unitary AC or refrigerant condensing unit	cold storage	cold storage
frozen food wholesale	unitary AC or refrigerant condensing unit	cold storage	cold storage

Table 10. Equipment type designations assigned for unclear reported data			
Aggregated Facility Category	**Equipment ≥ 50 lbs, < 200 lbs (small)**	**Equipment ≥ 200 lbs, < 2,000 lbs (medium)**	**Equipment ≥ 2,000 lbs (large)**
fruit and vegetable processing	unitary AC or refrigerant condensing unit	cold storage	N/A
hotels/motels	unitary AC or refrigerant condensing unit	chiller	centrifugal chiller
ice manufacturing	unitary AC or refrigerant condensing unit	N/A	N/A
libraries	unitary AC	chiller	N/A
manufacturing (non-food)	unitary AC or refrigerant condensing unit	chiller or cold storage	chiller, cold storage or process cooling
meat processing	unitary AC or refrigerant condensing unit	cold storage	cold storage
medical care	unitary AC or refrigerant condensing unit	chiller	centrifugal chiller
misc warehousing/storage	unitary AC or refrigerant condensing unit	chiller	centrifugal chiller
museums	unitary AC	chiller	N/A
office buildings	unitary AC	chiller	centrifugal chiller
petroleum	unitary AC or refrigerant condensing unit	chiller	centrifugal chiller
pharmacies	unitary AC or refrigerant condensing unit	chiller	N/A
publishing	unitary AC	chiller	centrifugal chiller
refrigerated warehousing/storage	unitary AC or refrigerant condensing unit	cold storage	cold storage
religious organizations	unitary AC	chiller	N/A
research and development	unitary AC or refrigerant condensing unit	chiller	N/A
retail (food)	unitary AC or refrigerant condensing unit	refrig: centralized system	refrig: centralized system
retail (non-food)	unitary AC	chiller	centrifugal chiller
semiconductor	unitary AC	chiller	process cooling
service industry	unitary AC	chiller	centrifugal chiller
telecommunications	unitary AC	chiller	N/A
television/movie production	unitary AC	chiller	centrifugal chiller

Table 10. Equipment type designations assigned for unclear reported data			
Aggregated Facility Category	**Equipment ≥ 50 lbs, < 200 lbs (small)**	**Equipment ≥ 200 lbs, < 2,000 lbs (medium)**	**Equipment ≥ 2,000 lbs (large)**
utilities	unitary AC or refrigerant condensing unit	chiller	centrifugal chiller
wholesale - (non-food)	unitary AC	chiller	centrifugal chiller

Appendix C

Economic Impact Estimates – High-Global Warming Potential Stationary Source Refrigerant Management Program

Research Division

Release Date

October 23, 2009

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1. Summary

The proposed Refrigeration Management Program regulation impacts facilities that utilize stationary refrigeration equipment with greater than or equal to 50 pounds of high global warming potential (GWP) refrigerant. Facilities are categorized into three size categories based on the amount of refrigerant required by individual systems used by a facility; greater than or equal to 50 lbs, but less than 200 lbs (small systems); greater than or equal to 200 lbs, but less than 2,000 lbs (medium systems); and 2,000 lbs and greater (large systems). The small systems are typified by small condensing unit refrigeration systems. The medium systems are mainly centralized refrigeration systems and cold storage systems. The large systems are mainly cold storage systems, process cooling systems, and some centralized refrigeration systems. Facilities are categorized by the largest system at the facility; i.e. a facility with both large and medium systems is categorized as a large facility. The resulting characterization of current refrigerant use patterns by facility types and statewide facility number estimates were used to estimate statewide carbon dioxide equivalent (CO_2E) emissions. For a full description of the affected facilities, see Appendix B (California Facilities and Greenhouse Gas Emissions Inventory).

This appendix presents estimates of the costs and cost savings of the proposed high-GWP stationary source refrigerant management program regulation. The economic benefits presented are limited to the cost savings from avoided refrigerant losses. Some energy savings are expected from more optimized operation due to maintaining the proper refrigerant charge and routine maintenance; however these benefits are not quantified. Energy savings would also likely reduce criteria pollutants in addition to emissions of CO_2 from power generation. The economic benefits from mitigated climate impacts from reduced use of high-GWP refrigerants are also not incorporated into these estimates. In these analyses all costs are estimated in constant 2008 dollars.

Costs of refrigerants are expected to rise as hydrochlorofluorocarbon (HCFC) and chlorofluorocarbon (CFC) refrigerants (also referred to as ozone depleting substances [ODS]) are phased out, and if production and import of hydrofluorocarbons (HFC) are restricted under future legislation. However, the rate of price increases from present to 2020 is unknown. The change in the uses of these refrigerants could only be broadly estimated based on linear interpolation of estimates from the United States Environmental Protection Agency (U.S. EPA) Vintaging Model for 2010 and 2020. As a result, this analysis provides an estimate of refrigerant prices that is likely less than what will occur because of the use of an average of current prices of the refrigerants available in 2008.

An important benefit of the proposed rule is that the mandated repairs, which result in the emissions benefits, often result in cost savings that exceed the compliance costs. However, the costs and benefits for any specific company of industry may vary widely from the overall average. The gross cost to regulated entities for 2020

is estimated to be $49 million per year. These estimated costs are more than offset by annual refrigerant savings estimated at $68 million based on current refrigerant prices for a net annual savings of $19 million. The average cost-effectiveness of the proposal is estimated to be a savings of $2 per metric ton CO_2 equivalent ($MTCO_2E$) in the year 2020 after the proposed regulation is fully implemented and for consistency with AB32 target dates. This estimate may understate the actual net savings since it does not account for rising refrigerant prices, energy savings due to optimized system operation, or benefits from mitigated climate impacts.

These costs and savings are based on averages; some businesses will experience higher costs associated with complying with the rule and some will experience lower costs.

2. Introduction

The proposed Refrigerant Management Program consists of two primary components: 1) facility reporting and refrigeration system maintenance and leak repair; and 2) reporting requirements and prohibitions for proper refrigerant sale, use, and disposal. Economic costs and benefits analyses were conducted separately for the individual components. This economic analysis estimates the total costs of the regulation to the regulated community and the fiscal impacts to the enforcement agencies. The economic benefits presented are limited to the cost savings from avoided refrigerant losses.

Costs to regulated facilities and businesses are estimated for the period of 2011 to 2020. The analyses are organized by facilities with large, medium, and small refrigeration systems and provide estimates of the costs and benefits by the size of the system and the type of refrigerant used: HFC-only, ODS-only, and both HFC and ODS.

The cost and economic benefit analyses rely on input from the Air Resources Board (ARB) emissions inventory and anticipated emission reductions outlined in Appendix B, cost and other data from technical literature, input from equipment manufacturers and other stakeholders, and industry surveys. All uncertainties outlined in Appendix B impact the uncertainty of the total cost estimates and economic benefits in this analysis. To evaluate and understand the impacts and uncertainties, additional data were collected and reviewed from as many sources as possible including stakeholders, manufacturers, and air agencies (U.S. EPA, California air pollution control districts, etc.)

For all labor estimates an hourly labor rate of $75 is used. This is a fully loaded (including overhead, benefits, etc.) average labor rate representing input from ICF International, stakeholders, the air quality control districts, and the ARB.

Businesses impacted by this regulation include facilities with refrigeration systems containing 50 lbs or more of high-GWP refrigerants. These include: supermarkets, meat packers, warehouses used for cold storage, food preparation and processing,

hotels, medical facilities, institutions (universities, laboratories, etc.), process cooling facilities, etc. Additional details about these industries and the refrigeration systems they use are in Appendix B. The proposed regulation also impacts other service and sales businesses including: refrigeration and air-conditioning (R/AC) contractors, and technicians; and refrigerant reclaimers, distributors, and wholesalers.

No net change is expected in California's business competitiveness. It is possible some R/AC servicing businesses may be created or existing businesses expanded as a result of the possible increase in demand for U.S. EPA certified technicians and for manufacturing and installation of leak detection monitoring systems.

Estimated leak repair costs represent the difference between immediate repairs and repairs at the time the loss of refrigerant exceeds 35% of the charge (representing the current practices) at the refrigerant loss rate indicated by staff research for the refrigeration system type and size. This is similar to expanding on the U.S. EPA regulations promulgated under Section 608 of the Clean Air Act (Rule 608) whereby repairs of ODS-containing refrigeration systems are mandated when they have leaked 35% of the full refrigerant charge in the preceding year (12 month rolling average). The interest cost (or lost opportunity cost) at 5% per year of the gross repair cost (parts, labor, and refrigerant recharge) is attributed to the rule.

The post-rule implementation scenario leak repair costs reflect a portion of the total cost of leak repairs since the proposed rule does not create a need for leak repair but only requires that leak repairs be completed within 14 days of detection. Under the current practices scenario 100% of all leak repair costs are incurred at some point to maintain refrigeration system operations and preserve refrigerated product. These costs may be incurred immediately after detection of a leak based on best practices or, as often happens in the current practices, after months or years of deferred maintenance, often with top-offs of refrigerant rather than timely repairs. Based on repairs completed under the typical current practices time line, the total costs are incurred and the current emissions and current average leak rates result.

The annual discount rate of 5% used in this analysis is representative of the cost of money when high-risk technologies and activities are not involved and is consistent with cost assumption of the AB 32 Scoping Plan. The Scoping Plan's analysis of costs and savings used a uniform real discount rate of 5% to estimate the cost of money for all proposed measures and provided the first step towards annualizing the upfront or capital expenditures.

ARB staff conducted a sensitivity analysis to determine how sensitive the average cost-effectiveness is to the real discount rate used (Table 1). Real discount rates of 3% to 20% were used for the sensitivity analysis. Although considerably higher than reasonably expected, a real discount rate of 20% represents an extreme case used for the sole purpose of the sensitivity analysis. The resulting change in the cost-effectiveness of the proposed rule at the extreme case of 20% real discount rate was to increase to an average cost of $2 per $MTCO_2E$ in reduced emissions from an average savings of $2 per $MTCO_2E$ calculated with the 5% real discount

rate. The cost effectiveness of the proposed Regulation at a savings or a cost of $2 per $MTCO_2E$ in reduced emissions is within the range of cost effectiveness for GHG-related items approved by the Board in 2009, which have ranged from over $100 in savings to a cost of $21 per $MTCO_2E$.

Table 1: Sensitivity of cost-effectiveness to real discount rate used (rounded to nearest whole dollar)

	3% Discount Rate	**5% Discount Rate**	**10% Discount Rate**	**20% Discount Rate**
Large facilities	-$5	-$5	-$4	-$3
Medium facilities	-$1	$0*	$2	$6
Small facilities	-$1	$0*	$3	$9
Average of all facilities	-$3	-$2	-$1	$2

* approximate break even – less than $1 cost or savings

The local air districts will be impacted by the need for additional inspection and enforcement resources. The costs to the ARB will include enforcement and inspection costs not assumed by the districts and costs to initiate and maintain a web-based reporting system and database as well as processing and maintaining the annual industry reports. These costs are expected to be recovered through the implementation fees imposed on the impacted facilities.

Positions required for administration of the Refrigerant Management Program may be ARB positions or positions throughout Air Districts that would be funded with ARB funds available through receipt of implementation fees.

3. Economic Cost and Cost Savings Estimates (Facility Reporting and Leak Repair Component)

This section presents the underlying data and calculations that were used to estimate the overall costs of the proposed regulation. It includes a discussion of the emissions input data as well as the costs of each key element of the program including the implementation fee, reporting and recordkeeping costs, automatic leak detection system annual audits, refrigeration system leak inspections, automatic leak detection system capital and operating costs, and leak repair costs.

Costs and savings due to the regulation are calculated using the emissions inventory data and projected emission reduction estimates provided in Appendix B and additional economic input variables discussed below. The resulting estimates are tiered by system size to reflect different workload demands (e.g. monitoring, inspection, etc.). Under the proposed rule the annual implementation fee and reporting requirements are phased in depending on the system size. The refrigerant leak detection and monitoring provisions become effective for all system sizes on January 1, 2011. The leak repair and recordkeeping provisions commence upon the effective date of the regulation for all applicable systems.

The cost related input factors used in the economic model, discussed below and listed in Table 2, are based on literature review, a survey of refrigeration and air-

conditioning service contractors, certified technicians, and discussions with stakeholders.

Table 2: Economic estimates input cost factors

	Facilities with small systems	**Facilities with medium systems**	**Facilities with large systems**
Annual implementation fee (per facility)	0	$170	$370
Annual reporting and recordkeeping costs (per facility)	$115	$422	$488
Automatic leak detection annual audit, quarterly inspection, or annual inspection costs (per system)	$75 per system	$300 per system	$150 per system
Automatic leak detection capital costs (per system)	N/A	N/A	$917/year per system annualized over 12 years ($8,130 capital and installation cost financed at 5% real discount rate)
Automatic leak detection operational costs (per system)	N/A	N/A	$720
Cost of earlier leak repairs (base cost per leaking system) *	$62	$79	$328
Post-repair refrigerant recharge (per leaking system)	6 lbs ($67)	69 lbs ($758)	447 lbs ($4,910)

*Leak repairs costs provided as 5% real discount rate per year.

The refrigerant cost estimate ($11 per pound) is based on discussions with stakeholders and is derived from the average of a suite of refrigerants currently in common use. The cost of the individual refrigerants currently varies from $4.50 to $23.00 per pound. All costs and savings are stated in constant 2008 dollars.

The growth of the number of facilities and systems was estimated at 1% per year.

The cost calculation model used estimates the fiscal impact of the proposed regulation on facilities with average configurations (as outlined in Appendix B): small facilities with approximately 5 systems in the small refrigerant charge size category, medium facilities with approximately 5 systems in the medium refrigerant charge size category, and large facilities with approximately 2 systems in the large refrigerant charge size category. In practice facilities with more than one refrigeration system typically have a mixture of system sizes, i.e. many “large” facilities that have large sized systems will also often have medium and small size systems (and likewise, medium facilities will often have smaller systems). It is recognized that facilities with the average configuration modeled do not necessarily commonly exist in practice. The approach taken here provides a means of calculating the average impacts of the costs of the rule. The costs associated with several case studies of real-world, specific facility configurations were also calculated and are presented later in this document.

Recurring annual costs – Facilities will incur annual costs for implementation fees, reporting and recordkeeping, and leak inspections or annual leak detection monitoring system audits.

Equation 1: statewide recurring annual costs

$C_a = N_f \times (F_a + R + L_c \times N_s)$

C_a = statewide recurring annual costs
N_f = number of affected facilities
F_a = annual implementation fees per facility
R = reporting expenses per facility
L_c = annual and quarterly leak inspection or annual leak detection monitoring system audits and recordkeeping
N_s = number of systems per facility

The implementation fees and reporting costs are single costs per facility based on the largest system at the facility. The leak inspection or leak detection system audits and the costs of keeping their associated records are calculated as a cost per system at the facility (i.e. if a facility has 3 refrigeration systems it will incur a single annual implementation fee that covers the entire facility, based on the largest system at the facility, a single reporting cost also covers the entire facility, and 3 times the system leak inspection or leak detection system audit and recordkeeping costs listed in Table 2 [once for each system]).

Under the proposed rule the annual implementation fee and reporting requirements are phased in depending on the system size: facilities with large refrigeration systems submit their first report (covering calendar year 2011) and payment of the implementation fee in early 2012 (due by March 1, 2012) with subsequent reports and payments annually thereafter. Facilities with medium size refrigeration systems (but no large sized systems) would begin reporting for the year 2013 with the report and implementation fee payment due by March 1, 2014 with subsequent reports and payments annually thereafter. Facilities with only small refrigeration systems (i.e., they do not have medium or large systems) will not be subject to either the reporting or annual implementation fee requirements of the rule although they will be required to register beginning in 2016.

Beginning 2011, all facilities with refrigeration systems covered by this regulation will be required to conduct leak inspections of their refrigeration systems and to maintain records of their repairs and refrigerant transactions and have those records available for enforcement inspectors.

- Initial and Annual implementation fees – Each facility with a large or medium refrigeration system will pay an initial and annual implementation fee to the ARB which will be used by the enforcing agency (either the ARB or its authorized agent, a representative of a local air pollution control district) to recoup their implementation, inspection, and enforcement costs (staff training expenses, reporting system development, and inspection and recordkeeping time, etc.). The initial implementation fee would be collected at the time the

facility registration is submitted and an annual implementation fee would be collected at the time the facility annual reports are submitted. Facilities with small refrigeration systems only (i.e., they do not have medium or large systems) will not be subject to the initial or annual implementation fee requirements of the rule, although they will be required to register by 2016 and maintain records of system inspections, refrigerant leaks, and repairs. The amounts of the initial and annual implementation fees are the same and were estimated to approximately balance the costs of administration and inspections (Table 3).

Table 3: Estimated average annual cost to inspect approximately 25% of large and medium facilities each year (2016) and small facilities on as-needed basis

System Inspection Costs	**Number or Cost**
Approximate number of Facilities	10,700
Inspections per year	2,900
Average hours per inspection	6.5
Average hours per inspection for program administration	1.2
*Estimated total cost per inspection	$760
Total cost of inspections	$2.2 Million
Average annual implementation costs per facility	$208
Total annual revenue from large and medium facilities	$2.2 Million
****Annual Personnel Years (PYs) Needed**	
Administrative PYs (ARB)	2
Inspection and Enforcement PYs (ARB and District)	11***
Total PYs cost (@$175,000 per position)	$2.2 million

*Cost per personnel hour (salary, benefits, office, supplies, travel) = $98
**Work hours per Personnel Year (PY) = 1780 hours
***For discussion purposes 10.7 PYs has been rounded to 11 (total of 13 PYs)

The proposed fee amounts ($170 for facilities with medium systems, $370 for facilities with large systems, $208 overall weighted average for all facilities with medium or large systems) are calculated based on estimates provided by California Air Pollution Control Officers Association (CAPCOA)[1] and the ARB Enforcement Division concerning the staff time and materials needed to conduct inspections.

CAPCOA's initial input on fee structure was received early in the rule development process. A primary difference in fee analyses conducted by the ARB and CAPCOA was CAPCOA's initial fee structure analysis included the estimated hours expected to be spent on the review of annual records and reports for each facility, physical onsite facility inspections, and the travel time. However, the estimate did not include additional hours needed to evaluate and cross reference onsite records with data included in the annual reports. The extensive review and cross references will be necessary to confirm compliance or indentify and verify any violations. The average annual implementation costs provided by CAPCOA are very close to the ARB estimates. Staff developed the final estimates of times and costs to conduct and report inspections after subsequent discussions with CAPCOA and

[1] Memo from CAPCOA to Anthony Andreoni, November 4, 2008

ARB's Enforcement Division. The average number of hours needed per facility inspection as shown in Table 3 include pre-inspection time for facility records review; on-site equipment inspection; review of equipment service records and leak repair records; review of refrigerant purchase, use, and shipping records; travel planning; cross referencing related records with the annual report submitted by the facility, and report writing.

The facility fees will be used to support implementation of the program which focuses on facility inspections. The total annual costs of the program ($2.2 million) as estimated in Table 3 are the product of the number of facilities inspected annually, the hours per inspection, and the hourly rate of the inspector. It is anticipated, that, on average, approximately 25% of the large and medium facilities will be inspected each year based on the relative risk of emissions and potential amount of emissions. This percentage is an expected average and does not imply the actual annual number of inspections.

Facilities with large and medium systems are the focus of inspections because they represent the vast majority of emissions (approximately 90% of annual emissions in terms of $MTCO_2E$ are estimated to occur from large and medium refrigeration systems). On average, facilities with only small refrigeration systems have the lowest emission potential on a per system and per facility basis. As such, facilities with small systems will only be inspected on an as-needed basis (<2% per year) based on specific concerns such as in response to complaints or other information which suggests a potential violation. It was assumed that compliance could be maintained with periodic enforcement inspections prioritized on the facilities' potential or demonstrated leak risk, i.e. those facilities with a larger charge size (greater potential emissions in the case of a leak), equipment type that is more prone to leaks, and with a higher leak rate demonstrated by their annual report. Facilities whose annual report indicates frequent leaks and substantial emissions may have a higher priority and be inspected more frequently.

ARB will need two administrative positions for program administration, reporting, and payment system development and maintenance, training for air district staff and facility owners and operators, and outreach to impacted facilities. These positions will also help to prioritize which facilities are inspected each year. In addition, 11 positions will be needed to conduct enforcement inspections. Since most of the districts have indicated they will either enforce the regulation under an agreement with the ARB or adopt a complementary rule, the enforcement positions are anticipated to be secured by districts and supported through implementation fees provided by ARB under the terms of their agreement with the ARB. All 13 proposed positions will be funded by revenue from the implementation fees. The cost per PY used in the calculations ($175,000) is based on the average ARB fully loaded cost per position (typical positions used for inspections in Enforcement division of ARB are Air Pollution Specialists and/or Air Resources Engineers).

- Reporting and recordkeeping costs – Although reporting and recordkeeping costs are not listed together in Equation 1, they are discussed together in this section since they are closely related.

  The proposed regulation will require each facility to maintain records of their leak inspections, repairs, refrigerant use and purchases, etc. The facilities with large and medium size systems will be required to report their leak inspections, service and maintenance, refrigerant leak repairs, and refrigerant consumption by device or system. Additionally, these facilities will be required to report an annual summary of refrigerant purchased, charged into systems, and recovered from systems. Facilities with only small systems will not be required to submit annual reports; however, they will be required to retain the records and have them available for ARB or local air district inspectors. The calculated costs assume that the ARB will initiate and maintain a web-based reporting system and database. The reporting and recordkeeping costs reflect time costs for the facility to maintain records and submit the annual report.

  Many facilities, especially those with large systems already have a process in place for tracking repairs, refrigerant use, and leak rates. The ARB is developing a system whereby the reports will be efficiently transferred to a centralized database for access by ARB and, where appropriate, the air districts. For large facilities it is estimated, based on discussions with stakeholders, to take 15 minutes per system leak to record leaks, 15 minutes per month per monitored system to maintain records of the automatic leak detection system, and 10 minutes once per year to electronically submit the report. For medium facilities it is estimated to take 15 minutes per system leak to record leaks, 15 minutes 4 times per year to maintain records of the leak inspections, and 10 minutes once per year to submit the report. For small facilities it is estimated to take 15 minutes per system leak to maintain repair records and 15 minutes once per year for each system to maintain the leak inspection records. The $75 labor rate was used in these calculations.

Table 4: Estimated reporting and recordkeeping costs per large facility

Large Systems	**Minutes**	**Occurrences per Year**	**Systems / Units**	**Percent Leaking Systems**	**Hours**
Recordkeeping - Recording Leaks	15	(variable by probability of leak)	2	67.5%	0.3
Recordkeeping - Automatic Leak Detection System Performance Records	15	12	2		6.0
Reporting	10	1			0.2
Total Hours					6.5
Total Costs (@ $75 / hour)					$488

The total reporting and recordkeeping costs per facility are listed in Table 2. Using large systems as an example, Table 4 illustrates how these costs are calculated.

- Facility leak inspections and leak detection system audits – Facilities with large refrigeration systems will be required to use an automated system to detect leaks (usually a continuous monitor, but other automatic leak detection systems or procedures will be allowed). Facilities with medium size systems will be required to conduct leak inspections quarterly. Facilities with small systems only will be required to conduct inspections annually. The automatic leak detection annual monitoring costs included in these analyses reflect the costs for an annual audit of the automatic leak detection monitoring system. It is estimated that an audit of a large system leak detection system will take two hours per system to complete.

  In reviewing the cost of leak inspections, the ARB staff compiled estimates based on two very different perspectives to inform cost estimates. One perspective was provided by ICF International and characterized the cost of inspection by in-house vs. external inspectors. The ICF International cost estimate was based on two to six hours of inspection time required per facility (on average, 2 to 5 systems inspected either annually or quarterly) and ranged from $93 to $561 per inspection. The low ICF International estimate represents a two-hour in-house inspection and the higher estimate represents a six-hour inspection by contracted inspectors and includes profits and fees by the contracting company.

  The other estimate was provided by CAPCOA and represented the cost of an enforcement inspection by the ARB or the air district (the local air quality management district or air pollution control district) inspectors. ARB and CAPCOA estimates were based on three to six hours per facility (on average, 2 to 5 systems inspected either annually or quarterly) and ranged from $195 to $682 per inspection.

  The costs used in these analyses were $75 to $300 per system per year reflecting one to four hours at a $75 per hour labor rate. The primary source of the uncertainty in this estimate is the assumption that salaries for inspection staff represent an in-house, hourly salary or the salary of a contracted certified technician. It was assumed that a leak inspection by facility personnel, a contracted inspection service, or enforcement agency personnel would take the same amount of time.

  An inspection of a medium system is estimated to take one hour per system each quarter, and an inspection of a small system is estimated to take one hour per system once per year. The $75/hour labor rate was used in these calculations. Medium and small facilities may substitute automatic leak detection for the quarterly or annual inspections.

Table 5 outlines how the total automatic leak detection annual audit and leak inspection costs are calculated. The total estimated costs are outlined in Table 2.

Table 5: Automatic leak detection system audit and leak inspection costs per system

Leak Inspection	Hours	Times per Year	Total Hours per System	Total Cost per System
Automatic Leak Detection Audit	2	1	2.0	$150
Medium Sized Leak Inspections	1	4	4.0	$300
Small Sized Leak Inspections	1	1	1.0	$75

Automatic leak detection capital and operational costs – Facilities with large refrigeration systems will be required to have a mechanism for automatic leak detection and monitoring of each large system. This will primarily be a continuous monitoring system measuring the presence of refrigerant in the air surrounding the components of the refrigeration system, but other continuous leak detection mechanisms and procedures will be allowed. In addition, facilities with medium or small systems may substitute automatic leak detection for the quarterly or annual system inspections. If a facility with medium or small systems is required to have a monitoring system to comply with health and safety rules this option may be beneficial. It may also be beneficial for facilities with large systems requiring automatic leak detection systems along with medium and/or small systems to include those systems in the automatic leak detection system.

The automatic leak detection system requirements of the proposed regulation can be met by installing a direct system that detects the presence of refrigerant in ambient air or an indirect system that indicates a refrigerant leak by interpreting parametric measurements of the refrigeration system. This analysis focuses on direct systems as the basis of the likely costs for an automatic leak detection system. In some cases the indirect (parametric monitoring) may be more feasible depending on the refrigeration system design (systems with outdoor components, etc).

Estimated costs related to automatic leak detection are based on a system that will meet all requirements of the rule and were confirmed through discussions with manufacturers. The ARB also contracted with ICF International for input into the analysis of the costs of automatic leak detection systems required by the proposed rule based on their experience in refrigerant management and participation in the development of the U.S. EPA Vintaging Model. The primary sources of uncertainty in the estimated costs of automatic leak detection are the type of equipment purchased and the installation of the monitoring system. To be conservative, this analysis assumes that each large refrigeration system would require a separate monitoring system. There is likely some unknown scalability factor in which multiple refrigeration systems can be monitored by a single monitoring system, this will

depend on the capabilities of the monitoring system purchased and how it is installed.

The installation cost data reflects a best estimate of the capital cost to purchase an automatic leak detection system based on market studies conducted for this analysis[2]. The estimated capital costs of $8,130 for an eight sensor system are annualized over a twelve-year projected life of the monitoring system at a 5% real discount rate ($917/year). This cost represents an estimated average cost which takes into account: 1) the cost of a new monitoring system on each refrigeration system (estimated at between $10,000 to $11,000); 2) the cost of a somewhat larger system that is capable of monitoring more than one refrigeration system at the facility (estimated at $12,000 to $15,000 for up to 16 sensors; i.e. $6,000 to $7,500 per system to monitor two systems); and 3) the cost of enhancing an existing system installed to monitor the machine room for health and safety purposes (adding capacity and sensors to a monitoring system designed to alert the operator of concentrations of refrigerant potentially dangerous to worker health and safety [one or more sensors usually in the lowest area of the machine room where refrigerant gases would collect if present] to a monitoring systems with sensors placed to promptly detect leaks [estimated at $3,000 to upgrade control panel and new/additional sensors]).

Although one automatic leak detection system per refrigeration system was modeled, each facility will likely have a somewhat different configuration. In some applications a single monitoring system may be sufficient to monitor for leaks on several refrigeration systems, depending on refrigeration system and monitoring system configurations, sensor design and placement, and the design of the systems. Facilities may also choose to configure the monitoring systems to monitor zones of the facility; for example: one system may monitor all equipment in the equipment room while another monitoring system may monitor for leaks in the evaporators, etc.[3]

The typical monitoring system requires annual maintenance. The maintenance costs include the replacement of filters and/or calibration of the sensors, depending on the design of the system. These costs are typically approximately $90 per monitoring point per year ($720/year for the average 8 point monitoring system).[4]

Equation 2: annual automatic leak detection and monitoring costs

$C_m = N_f \times (N_s \times (M + I))$

C_m = automatic leak detection and monitoring costs
N_f = number of affected facilities
N_s = number of systems per facility requiring automatic leak detection systems
M = annual cost of maintaining the system
I = capital cost to install a system (annualized)

[2] ICF International memo to ARB, October 21, 2008
[3] Lewis, Kimberly, Guidelines for Refrigerant Leak Monitor Installation, RSES Journal, April 2002.
[4] ICF International memo to ARB October 21, 2008 and discussions with equipment manufacturers

Leak repair costs – Refrigeration system leaks may be categorized as smaller, operating leaks or catastrophic leaks. While the catastrophic leak may result in the sudden loss of much or all of the refrigerant charge, the operating leaks account for most of the leaks that occur and the majority of the refrigerant emissions.[5] Regular leak inspections or automatic leak detection systems are useful in finding operating leaks promptly, facilitating prompt repair and minimizing the amount of refrigerant lost. Under this rule both the operating leaks and catastrophic leaks would be repaired as quickly as possible (within 14 days) upon discovery.

All facilities and systems will be subject to the leak repair requirements of the regulation beginning with the effective date of the regulation. The repair costs are calculated as the base cost of making the repair and the refrigerant to recharge the system to replace the refrigerant lost in the leak. Since the leaking systems eventually need to be repaired to continue to operate without regard to this rule, the repair costs (both base costs and cost of the refrigerant to recharge the system after the repairs) attributable to the rule are based on the time cost of funds at 5% per year real discount rate and the length of time that the leak would be expected to continue under the current practices until the amount of refrigerant leaked would equal 35% as opposed to repair of the leak upon the first indication that the leak has occurred.

Leak repair costs are based on research conducted on behalf of the ARB by ICF International and discussions with stakeholders. The ARB conducted a survey of refrigeration and air-conditioning service contractors and technicians to validate prior research and discussions.

Annual leak repair costs presented in Table 2 are divided into three ranges based on refrigeration system size. It is assumed that repairs on a small system will be relatively simple while medium and large systems will require progressively more extensive repairs when a leak occurs. Leak repair costs include two components: the base cost of making the repair (parts, labor, and recovery of remaining refrigerant in the system) and the refrigerant needed to recharge the system to its nominal operating charge. Table 6 shows that the base annual repair costs (labor, parts, and refrigerant recovery) are $900, $1,550, and $2,450 for repair scenarios projected for the small, medium, and large systems. The base costs include 8, 12, and 16 hours of labor at $75/hour; $100, $300, and $600 in parts; and $200, $350, and $650 for refrigerant recovery for small, medium, and large systems, respectively. [6, 7]

The refrigerant needed to recharge the system following a repair is calculated from the modeled average target leak amount per system of that size and type and a refrigerant cost of $11 per pound. The target leak amount represents a realistic and achievable reduction in leaks projected as a result of the leak detection and

[5] Troy, Eugene, F., Options for Reducing Refrigerant Emissions from Supermarket Systems, Final Report, EPA-600/R-97-039, April 1997
[6] ICF International memo to ARB November 10, 2008
[7] ARB technician survey results

monitoring and best management practices provisions of this rule. Refrigerant savings are the difference between the current leakage and the target leak amount (Table 7). The recharge for large systems is, on average, about 447 pounds per system per year (see Appendix B for more details); down from 1090 pounds based on the current leak rate; a savings of 642 pounds ($7,060).

In the model for this rule the repairs would currently be initiated when the projected refrigerant loss reaches 35%. The time factor of the cost calculation is calculated as the number of years until the refrigerant leak reaches 35%. The interest cost (or lost opportunity cost) at 5% per year of the gross repair cost (parts, labor, and refrigerant recharge) is attributed to the rule. For example: a typical medium system containing 689 pounds of refrigerant which leaks an average of 17% of the charge per year under the current practices would lose 119 pounds per year. After approximately two years (2.1 years) the refrigerant loss would equal 35% of the charge; therefore a repair currently would be made at that time. Under the proposed regulation requirements the repair is made as quickly as possible upon the first indication of a leak (repairs are made within 14 days after discovery) rather than at a later date. This quicker repair time-frame to help reduce the cost of purchasing new replacement refrigerant lost due to leaks. Current repair practices typically top-off refrigerant systems without checking and repairing leaks – which may cost hundreds to thousands of dollars in refrigerant purchased each year to businesses (see refrigerant savings in Table 7). The cost attributable to the regulation would be the cost of borrowing (or lost opportunity cost) for 2.1 years at 5% per year; or approximately 10% of the gross cost of the repair. The cost of repairs attributable to the rule when the refrigerant loss equals or exceeds 35% in less than one year are calculated at 5% of the gross repair cost.

Table 8 illustrates the effective cost of funds of incurring the cost of the repairs immediately and is the portion of the repair costs that are attributed to the rule. Table 7 shows average values, specific values of the cost of funds were used in the calculations whenever possible.

Table 6: Base annual repair costs (figures rounded to the nearest whole value)

	Labor hours / cost (@ $75 per hour)	**Parts**	**Cost to recover the remaining refrigerant prior to repair**	**Total labor, parts, and recovery**
Small systems	8 hrs / $600	$100	$200	$900
Medium systems	12 hrs / $900	$300	$350	$1,550
Large systems	16 hrs / $1,200	$600	$650	$2,450

Table 7: Annual leak repair refrigerant costs and savings

	Current average annual refrigerant leak (lbs)	**Target average annual refrigerant leak ***	**Annual refrigerant savings (lbs)**	**Annual refrigerant cost savings (@ $11 / lb)**
Small systems	18	6	12	$127
Medium systems	119	69	50	$548
Large systems	1090	447	642	$7,060

* Expected amount needed to recharge following repair (lbs)

Table 8: Calculation of effective cost of funds for the average facility leak rate

	Annual average leak rate	**Average charge (lbs)**	**Time frame**	**Effective cost of early repair**
Small systems	14%	122	2.4 years	12%
Medium systems	17%	689	2.0 years	10%
Large systems	23%	4663	1.5 years	8%

Equation 3: annual leak repair costs

$C_r = (N_s \times L_s \times C_{rt}) \times (35\% / L_r) \times 5\%$

C_r = leak repair cost
N_s = number of systems
L_s = percent of systems leaking
C_{rt} = repair cost (parts, labor, and refrigerant to recharge system)
L_r = average annual leak rate

<u>Statewide gross annual cost</u> – The gross cost is the sum of all costs incurred in a given year.

Equation 4: statewide gross annual costs

$C_g = C_a + C_m + C_r$

C_g = statewide gross annual costs
C_a = statewide recurring annual costs
C_m = annual automatic leak detection and monitoring costs
C_r = annual leak repair cost

<u>Refrigerant savings</u> – Because the anticipated result of the proposed rule is the transition from the current average leak rate to the post rule implementation average leak rate, the costs and emissions that reflect each scenario are used to estimate cost effectiveness. The refrigerant savings arise as a result of earlier leak repairs following a transition to the post-rule implementation average leak rates. The change in leak rates results in estimated emission reductions due to the difference between the current emissions and the post rule implementation emissions.

Equation 5: refrigerant savings

$R_s = (L_{CUR} – L_{r1}) \times P_r$

R_s = annual refrigerant savings
L_{CUR} = annual refrigerant loss under the current practices
L_{r1} = reduced refrigerant needed per year
P_r = refrigerant price

Statewide net annual cost – The net annual cost is the gross annual cost minus the savings due to reduced refrigerant use because the leaks are repaired earlier as compared to the business as usual scenario.

Equation 6: statewide net annual costs

$C_n = C_g – R_s$

C_n = statewide net annual costs
C_g = statewide gross annual costs
R_s = annual refrigerant savings

Although some energy savings are expected from more optimized operation due to maintaining the proper charge and routine maintenance; these benefits are not quantified at this time and not included in Equation 6. The economic benefits associated with mitigated climate impacts are also not included.

Cost-effectiveness (C/E) – The cost-effectiveness is the ratio of the net costs to the emission reductions expected due to the enhanced leak detection and repair requirements of the rule, in dollars per metric ton of CO_2E (\$ / $MTCO_2E$).

Equation 7: cost-effectiveness (C/E)

$C_e = C_n / L_{r2}$

C_e = cost-effectiveness (\$ / $MTCO_2E$)
C_n = statewide net annual costs
L_{r2} = reduced leak per year in metric tons of CO_2E

In 2020 when the rule is in full effect the statewide net annual costs are expected to result in a savings of approximately \$19 million (\$20 million savings for large facilities, \$0.3 million cost for medium facilities, and \$0.2 million cost for small facilities) with reduced emissions of 8 MMTCO2E (4, 3, 1 MMTCO2E for large, medium, and small facilities, respectively) and a cost-effectiveness of approximately \$5/$MTCO_2E$ savings for large, approximately break even for medium and small facilities (\$0.08/MTCO2E cost for medium and \$0.26/$MTCO_2E$ cost for small) with an overall average of \$2/$MTCO_2E$ savings.

Total cost summary – The total costs of the rule are calculated for calendar years 2011 through 2020 (estimated costs in the year 2020 are summarized in Table 9). New facilities and systems are assumed to exist for the entire year they enter service and costs are calculated for a given whole year.

Table 9: Statewide average annual cost of Stationary Refrigeration System Registration and Leak Repair for all facilities in the year 2020

	Annual cost (HFC plus ODS systems) ($ millions)	**Annual cost (HFC systems only) ($ millions)**
Recurring Annual Costs		
Implementation	$2.4	$2.0
Reporting and recordkeeping	$7.0	$6.4
Leak inspection	$21.0	$19.7
Automatic leak detection and monitoring		
Capital and installation cost	$4.1	$3.2
Annual maintenance	$3.2	$2.5
Leak Repair* (labor, parts, and refrigerant recharge)	$11.3	$10.2
Gross cost	$49.0	$44.0
Refrigerant savings	$68.1	$56.8
Net cost	$19.1 savings	$12.8 savings
Emissions reductions	8 $MMTCO_2E$	7 $MMTCO_2E$
Cost-effectiveness (annual average)	$2/$MTCO_2E$ savings	$2/$MTCO_2E$ savings

*Leak repairs provided as 5% real discount rate cost of funds per year (see text for details)

The costs and cost-effectiveness for any given facility will be dependent on the size, design, number of refrigeration systems at the facility, and the quality of maintenance and repair. A facility that quickly locates and repairs leaks will reduce the amount of refrigerant leaked when a leak occurs and save more refrigerant and therefore, receive more of the cost benefits than a facility that is not as vigilant. It will also be more cost effective for a facility to construct their refrigeration system and make repairs using high quality parts so that leak occurrences are minimized.

Table 10 presents the costs to 'average' facilities. Implicit in Table 10 is the assumption that evacuation equipment, already required by federal rules for ODS system repairs, is already available and could be employed for recovery of all refrigerants. As a result, the proposed rule is not anticipated to result in additional costs for evacuation equipment. For all labor estimates an hourly labor rate of $75 is used. The average facility with small systems has approximately 5 systems, the average facility with medium systems has approximately 5 systems, and the average facility with large systems has approximately 2 systems (number of systems rounded for clarity, actual average number used in calculations). Repair costs included in the analyses represent 5% of the total cost of making the repair (parts, labor, and refrigerant recovery plus the refrigerant needed to recharge the system based on the modeled leak amount) per year to reflect the real discount rate cost of funds to do the repairs immediately upon the first indication of a leak rather than at a later date. Costs also include the percent of systems that leak in a given year as described in Appendix B (on average, approximately 68% of large systems, 37% of medium systems, and 22% of small systems will leak and require repairs each year). The impact on the average facility with small, medium, or large refrigeration systems is projected to be a net cost of $14, $30, and a savings of $8,720 respectively with an overall average impact of the program of a net savings of $667 per facility.

Table 10: Example average costs to average facilities (figures rounded to the nearest whole number)

	Facilities with small systems	Facilities with medium systems	Facilities with large systems
Annual implementation fee	$0	$170	$370
Annual reporting and recordkeeping costs	$115	$422	$488
Automatic leak detection annual audit, quarterly inspection, or annual inspection costs	$375	$1,500	$300
Automatic leak detection capital costs	N/A	N/A	$1,830/year ($16,260 annualized over 12 years)*
Automatic leak detection operational costs	N/A	N/A	$1,440
Leak repair costs	$161	$677	$984
Total gross cost	$651	$2,770	$5,410
Refrigerant savings	$637	$2,740	$14,130
Total net annual costs	$14	$30	$8,720 savings

*Multiple monitoring systems since the average large facility has multiple large systems

4. Example Case Studies

The analysis of potential emission reductions and costs is based on the average costs and leak rates for an entire population of refrigeration systems and the resulting annual emissions, in contrast to the emissions that would result from a single refrigerant leak incident. As an example, a refrigeration system with a refrigerant charge of 2,000 pounds that has a 10% annual refrigerant leak rate would leak 200 pounds of refrigerant over a one-year period if it were not repaired. If detected promptly and repaired within 14 days of detection the actual emissions from this specific leak would be reduced to less than eight pounds – less than ½ of one percent of the full charge. In this example refrigerant savings would amount to over $2,000.

Several scenarios have been calculated to illustrate how individual facilities may be impacted by the proposed regulation. Although the rule is expected to go into effect in 2011, there will be a phase-in period. The case studies are based on the year 2020 because it allows for comparison with the statewide emission reduction targets specified in AB 32 and because all aspects of the rule will be in effect at all facilities subject to the regulation. These scenarios are described in the bullets that follow and then summarized in Table 11. Since it is assumed that the leaking systems will have to eventually be repaired to continue to operate without regard to this rule, the repair costs in the model are based on the real discount rate cost of funds (estimated at an annual rate of 5% per year of the cost of the repair) to do the repairs immediately upon the first indication of a leak rather than at a later date when the leak gets to the point of affecting the operation of the system. Other key assumptions including the assumed leak rate as well as the leak rate following repair are discussed in Appendix B.

These case studies are based on actual facility configurations encountered during development of the rule and average leak rates, etc. from the emission inventory for

the types and sizes of equipment at these facilities. The case studies were also calculated with the actual reported refrigerant leaks. The results for the actual data are consistent with the average results; however, they are highly variable from year to year based on the facility's annual performance. The average results are presented to be more widely representative of facility types and configurations. If a facility has no leaks in a given year the total gross costs and net annual costs would be reduced since the repair costs and refrigerant savings would be zero ($0). The reporting and recordkeeping costs would also be slightly reduced. The annual implementation fees and monitoring system costs are fixed costs whether a leak occurs or not.

Table 11: Case study example costs for the average the facility of specific types listed (2020)

	Annual reporting and recordkeeping costs and system inspections / audits costs	**Annual implement-ation fees**	**Annual monitoring system capital and operating costs**	**Expected annual repair Costs attributed to early repair ***	**Total gross annual costs**	**Annual refrigerant savings due to early repair of leaks**	**Net annual costs**	**Cost-effective-ness ($/ $MTCO_2E$)**
Supermarket with 1 large system (3,000 lbs total charge)	$400	$370	$1,640	$420	$2830	($3,780)	($948)	($2)
Supermarket with 4 medium systems (4,400 lbs total charge)	$1,540	$170	$0	$800	$2,520	($2,610)	($97)	($0)
Dairy distributor with 2 medium systems (2,000 lbs total charge)	$780	$170	$0	$380	$1,320	($1,190)	$140	$1
Pharmacy with 1 small refrigeration system (72 lbs total charge)	$100	$0	$0	$30	$130	($75)	$50	$8

* 5% per year real discount rate cost of total funds for making repairs immediately after identifying a leak rather than at a later date

- A supermarket with a single large system with a total refrigerant charge of 3,000 pounds that combines all refrigeration and air-conditioning loads of the store. (Although air-conditioning systems are not included in the proposed rule, systems that combine both refrigeration and air-conditioning functions would be included in the rule.)
- A supermarket with four medium systems totaling 4,400 pounds of refrigerant to handle all combined refrigeration and air-conditioning loads of the store.
- A dairy distributor with two medium systems (800 pounds and 1,200 pounds).
- A pharmacy with one small refrigeration system (72 pounds).

5. Economic Cost and Cost Savings Estimates (Refrigerant Sale, Use, and Disposal)

The cost and economic impacts specific to the reporting of the Refrigerant Use, Sale, and Disposal component (Table 12) are based on requirements and prohibitions specific to California refrigeration and motor vehicle air conditioning (MVAC) and stationary heating, ventilation and air-conditioning (HVAC) service providers and refrigerant reclaimers, distributors, and wholesalers.

The cost resulting from the refrigerant use, sale, and disposal component of the Refrigerant Management Program proposed rule are primarily borne by U.S. EPA certified technicians, refrigerant reclaimers, and refrigerant distributors or wholesalers.

Table 12: Statewide annual cost of Refrigerant Use, Sale, and Disposal for all HVAC distributors, wholesalers, and reclaimers for the year 2020

	Annual cost (HFC plus ODS systems) ($ millions)	Annual cost (HFC systems only) ($ millions)
Refrigerant Distributor or Wholesaler Prohibitions, Reporting and Recordkeeping Costs	$0.094	$0.070
Refrigerant Reclaimer Reporting and Recordkeeping Costs	$0.095	$0.071
Total Cost (Refrigerant Sale, Use, and Disposal)	$0.189	$0.141

<u>California Service Contractors & Certified Technicians</u> - As leak repairs are required to be completed by U.S. EPA certified technicians the certification cost to a technician related to a repair will be borne by a facility or the certified technician. Other than cost already identified for affected facilities, the primary requirements are related to evacuation of R/AC systems and recovery of refrigerant from empty cylinders, these costs are assumed to be borne by facilities for payments for refrigerant leak repair services. Equipment evacuation is already required by federal regulation for U.S. EPA certified technicians that provide refrigeration and air-conditioning service using ODS. As the alternative to cylinder evacuation is intentional venting of refrigerant and intentional venting is prohibited by federal law, the proposed rule does not create any additional costs for cylinder evacuation. Evacuation equipment, already required by federal rules for ODS system repairs, is already available and could be employed for recovery of all refrigerants. The proposed rule is not anticipated to result in additional costs for evacuation equipment.

<u>California Refrigerant Distributors and Wholesalers</u> - Based on federal regulations, Title 40 of the Code of Federal Regulation, Part 82, §82.166, refrigerant wholesalers who sell ODS refrigerants must retain invoices that indicate the name of the purchaser, the date of sale, and the quantity of refrigerant purchased. Although

reporting is required under the proposed regulation, while it is not required by federal regulations, the reporting for distributors and wholesalers is a simple annual inventory report of the total refrigerant shipped to certified technicians and to reclaimers. The annual report would consist primarily of a summary of recordkeeping required in significant part by federal regulations. Based on similar reporting requirements, using the U.S. EPA reclaimer reporting estimate of five hours annually and approximately 250 distributors in California additional reporting costs for the proposed annual report requirement are anticipated to be minimal at approximately $94,000 per year, approximately $375 per distributor/wholesaler per year.

California Refrigerant Reclaimers - Pursuant to Title 40 of the Code of Federal Regulation, Part 82, §82.154 refrigerant sales for ODS are limited to 1) sales to certified technicians, or their employer, 2) sales for the purpose of resale to certified technicians or appliance manufacturers, or 3) sales of refrigerant in an appliance. The proposed rule maintains the same requirements and extends the requirement to all high-GWP gases. The U.S. EPA estimated the annual burden of these requirements to total 8,882 hours. Many of the records required for the federal regulations would be required for all high-GWP gases as the refrigerant sales would be to the same certified technicians and appliance manufacturers. But, to be conservative if the ARB assumes the same burden and reduces the amount to reflect only California (~12%), the estimated burden would be 1,066 hours or approximately $80,000 annually at $75 per hour for all refrigerant sales.

Based on federal regulations refrigerant reclaimers reclaiming ODS must maintain records of the names and addresses of persons sending them material for reclamation and the quantity of material sent to them for reclamation. This information must be maintained on a transactional basis. Pursuant to Title 40 of the Code of Federal Regulation, Part 82, §82.166, within 30 days of the end of the calendar year, reclaimers must report to the U.S. EPA the total quantity of material sent to them that year for reclamation, the mass of refrigerant reclaimed that year, and the mass of waste products generated that year. Reporting requirements in the proposed regulation in substantial part are already required by federal regulations for ODS. In the determination of costs for reclaimer reporting, the U.S. EPA estimated that reporting required a total of five hours annually. At five hours and approximately 40 reclaimers in California additional reporting costs as a result of this rule are anticipated to be minimal at approximately $15,000 per year, approximately $375 for reclaimer per year.

6. Conclusion

In summary (Table 13), the refrigerant management rule will significantly reduce the emissions of high-GWP GHG in California, is technologically feasible, and will achieve emissions reductions at an average cost-effectiveness of a savings of about $2/MTCO$_2$E and an average savings of approximately $700 per facility per year.

Table 13: Statewide annual cost of the entire proposed rule for the year 2020

	Annual cost (HFC plus ODS systems) ($ millions)	Annual cost (HFC systems only) ($ millions)
Net Costs: General Requirements for Stationary Refrigeration System Registration and Leak Repair (Table 9)	$19.1 savings	$12.8 savings
Net Costs: General Requirements for Refrigerant Use, Sale, and Disposal (Table 12)	$0.2	$0.1
Entire Rule Net Cost	$18.9 savings	$12.7 savings
Proposed Rule Emissions Reductions	8 $MMTCO_2E$	7 $MMTCO_2E$
Proposed Rule Cost-effectiveness (overall average)	$2/$MTCO_2E$ savings	$2/$MTCO_2E$ savings

Appendix D

Summary of the Public Process for Development and Implementation of the High-Global Warming Potential Stationary Source Refrigerant Management Program (RMP)

Research Division

Release Date

October 23, 2009

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1. Background

The proposed Refrigerant Management Program (RMP) is an AB 32 early action measure designed to reduce the emissions of high global warming potential (GWP) greenhouse gases in California by requiring some best practices in the management of refrigerants by system owners/operators, repair technicians, wholesale distributors, and reclaimers. High-GWP refrigerants, including chlorofluorocarbons (CFC), hydrochlorofluorocarbons (HCFC), and hydrofluorocarbons (HFC), typically have thousands of times greater global warming potency than carbon dioxide (CO2). High-GWP refrigerants are used in a broad array of sectors in California that use refrigeration and air conditioning systems. California Air Resources Board (ARB) staff estimate that approximately 26,000 businesses in California are applicable to the proposed RMP and use commercial refrigeration systems with more than 50 pounds high global warming potential (GWP) refrigerant. Because high-GWP refrigerants are used by many different business types ARB staff conducted extensive outreach efforts during the rule development process.

Throughout the rule development process ARB staff relied upon a diverse set of methods to distribute information about the proposed rule and solicit comments and feedback from potentially impacted industries. Pre-rule adoption outreach efforts included: technical work group meetings, statewide public workshop series, individual meetings with stakeholders, phone calls to trade associations, direct phone calls to individual businesses, e-mail list serves, and development of outreach materials. As an example of the extensive outreach efforts made during the rule development process ARB staff contacted 67 trade associations and 800 individual businesses. ARB staff has developed a comprehensive post-rule adoption outreach plan that utilizes the strength of the previous outreach efforts conducted and builds upon them to communicate with an even more extensive group of stakeholders.

2. Introduction

The RMP is a regulation proposed by the California ARB to reduce the emissions of high-GWP refrigerants used in stationary non-residential refrigeration systems. ARB staff estimate that greenhouse gas emissions in California could be reduced by approximately 8 million metric tons carbon dioxide equivalent annually through the facility registration, reporting, leak inspection, and maintenance requirements included in the RMP (see Appendix B for details). Appendix B provides a description of the methods used to estimate statewide emissions of high-GWP refrigerants from stationary non-residential refrigeration and air-conditioning systems.

As a part of the regulatory development process ARB staff established an inventory of the types and numbers of businesses in California that use

stationary non-residential refrigeration systems with more than 50 pounds of a high-GWP refrigerant. In developing this inventory staff estimated that approximately 26,000 facilities in California use applicable non-residential refrigeration systems in many different industries including supermarkets, convenience stores, food processing and wholesale, refrigerated warehouses, pharmacies, hospitals, petroleum, utilities and some manufacturing (Appendix B). Approximately 64% of these are small businesses with fewer than 100 employees. Because of the large number of facilities potentially impacted by the RMP, extensive outreach efforts were conducted to educate business owners and solicit comments on the proposed regulation during the rule development process.

ARB staff goals in conducting outreach during the rule development process were: 1) inform affected industries about the RMP, 2) solicit feedback from affected industries to develop an effective rule and better understand their concerns, and 3) use industry input to develop an effective outreach plan. To reach the widest possible audience several methods of outreach were used focusing on working in collaboration with six groups of stakeholders. The outreach efforts implemented during the development of the RMP were individually tailored to facilitate effective communication and dissemination of information to each group of contacts. The six targeted stakeholder groups are:

- Technical workgroup composed of equipment and refrigerant manufacturers, environmental groups, government agencies, repair technicians, refrigerant distributors, and business owner/operators with broad knowledge of the commercial refrigeration industry in California.
- Trade associations representing businesses using large non-residential refrigeration and air-conditioning systems with high-GWP refrigerants.
- Individual businesses likely to use non-residential refrigeration systems with high-GWP refrigerants.
- Small businesses groups, chambers of commerce, and local government agencies throughout California.
- Subscribers to ARB climate change and high-GWP sector e-mail list serves.
- Government Agencies including United States Environmental Protection Agency (U.S. EPA), California Air Pollution Control Officers Association (CAPCOA), South Coast Air Quality Management District (SCAQMD), air quality management districts and air pollution control districts (Air Districts), and the California Energy Commission.

Table 1 includes a comprehensive list of all outreach efforts conducted during the development of the Refrigerant Management Program.

Table 1. Refrigerant Management Program Outreach Activities	
Outreach Activities	**Month - Year**
Board Approves Early Action First Report (provided the concept for developing the RMP regulation)	April-07
Board Approves Early Action Final Report (provided the concept for developing the RMP regulation)	October-07
Refrigerant Management Program website and e-mail serves established	January-08
High-GWP Sector Statewide Public Workshop	February-08
Site Visit - UC Davis Lighting & Cooling Technology Center	March-08
Commercial Refrigeration Technical Work Group Meeting	April-08
Refrigerant Tracking/Reporting/Repair Work Group Meeting	May-08
Draft Scoping Plan Released (provided general description of the RMP)	June-08
First Draft Refrigerant Management Program Rule Released	July-08
Meeting with Hussman and Ingersoll Rand	July-08
Refrigerant Tracking/Reporting/Repair Work Group Meeting	July-08
Updated California Air Pollution Control Officers Association (CAPCOA) Climate Protection Committee	July-08 & Monthly After
Conducted Facility Surveys	July & August-08
Site Visit - Refrigeration Supplies Distributor	August-08
Site Visit - Office Building Property Management Maintenance Tour	August-08
Met with California Grocers Association (CGA) and California Retailers Association (CRA)	August-08
Site Visit - Supermarket Systems Tours	August-08
Met with Representatives of Agricultural Sector Trade Associations	September-08
Met with Hudson, Inc.	September-08
Second Draft Refrigerant Management Program Rule Released	September-08
Refrigerant Management Program Public Workshop – Fresno	September-08
Meeting with Heating, Air Conditioning, Refrigerant Distributors International	September-08
Refrigerant Management Program Public Workshop - El Monte	September-08
Refrigerant Management Program Public Workshop - Sacramento	September-08
Final Scoping Plan Released	October-08
Met with Verisae	November-08
Conducted Refrigeration and Air-conditioning Contractor and Technician Surveys	November & December-08
Met with Institute of Heating and Air Conditioning Industries, Inc. (IHACI)	November-08

Table 1. Refrigerant Management Program Outreach Activities	
Outreach Activities	**Month - Year**
Met with Sheet Metal and Air Conditioning Contractor's National Association (SMACNA)	December-08
Refrigerant Management Program Work Group Meeting	January-09
Establish additional trade association contacts and update all previous contacts	January-09
Third Draft Refrigerant Management Program Rule Released	January-09
Refrigerant Management Program Public Workshop - Diamond Bar	February-09
Refrigerant Management Program Public Workshop - Modesto	February-09
Meeting with Heating, Air Conditioning, Refrigerant Distributors International (HARDI)	February-09
Refrigerant Management Program Public Workshop - Sacramento	February-09
Meeting with Western States Petroleum Association (WSPA)	February-09
Meeting with City of Los Angeles HVAC Technicians	February-09
Meeting with AB 32 Implementation Group	February-09
Field visit/inspection w/ U.S. EPA - Oakland Airport	February-09
Field visit/inspection w/ U.S. EPA - Richmond Wholesale Meats cold storage warehouse	February-09
Survey all local Air Districts regarding anticipated participation in the RMP after board adoption	February-09
Site Visit - Grand opening of Raley's in Petaluma	April-09
Site Visit - Tour of UC Davis chillers and refrigeration systems	April-09
Refrigerant Management Program Technical Workgroup Meeting	July-09
Update Trade Associations and Distribute Refrigerant Best Management Practices Brochure & Frequently Asked Questions (FAQ) Document	July -09
Released Refrigerant Management Best Practices Brochure & FAQ Document to Small Business Associations	July-09
Released Refrigerant Management Best Practices Brochure & FAQ Document to Small Business Development Centers	July-09
Teleconference meeting with Small Business Association with the help of the Governor's Office of the Small Business Advocate	July-09
Conducted direct business outreach pilot to contact all possible businesses in City of Industry and City of Merced to inform them of proposed rule and provide information.	July-August-09
Refrigerant Best Management Practices Brochure & FAQ Documents Distributed to Air Districts and Posted on Web Pages	August-09
Fourth Draft Refrigerant Management Program Rule Released	August-09
Public workshop in Sacramento (webcast)	August-09
Site Visit - Saticoy Lemon facility in Ventura, CA	August-09
Meeting with Western States Petroleum Association (WSPA)	August-09

3. Summary of Rule Development Outreach Process

In summary, ARB staff held 9 site visits to individual businesses, 13 meetings with individual stakeholders, 5 technical workgroup meetings, and 3 series of public workshops throughout the state of California. In addition to these meetings and workshops ARB staff conducted extensive outreach efforts via e-mail and phone to approximately 67 trade organizations, 800 individual businesses, 20 state and local government agencies, and 3 ARB e-mail list serves.

4. Components of Rule Development Outreach Plan

Throughout the process of developing the RMP ARB staff have used many different approaches in conducting outreach to industries likely to use large non-residential refrigeration and air-conditioning systems. Staff has used e-mail, direct phone calls, outreach documents, private meetings, public workshops, and technical working groups to distribute information throughout the rule development process and solicit feedback from stakeholders.

4.A Technical workgroup

Beginning in April 2008, a technical workgroup comprised of individual business, non-governmental organizations (NGO), and government representatives with expertise relevant to the stationary non-residential refrigeration and air-conditioning sector in California was assembled. Technical workgroup members included equipment and refrigerant manufacturers, environmental groups, government agencies, technicians, distributors, and individual business owners. The purpose of the technical working group was to provide a forum for ARB staff and experts in the non-residential refrigeration or air-conditioning field to discuss draft versions of the regulation. Comments received in technical work group meetings served to improve the quality of the regulation and its utility for affected businesses. Additionally, the technical workgroup meetings enabled industry groups potentially affected by the RMP to express their comments and concerns in a more detailed and targeted manner than a workshop may afford.

4.B Trade association outreach

Beginning in July 2008, trade associations with member businesses likely to use large non-residential refrigeration or air-conditioning systems with high-GWP refrigerant were contacted by phone. Trade association contacts were given updates by phone on the progress of the proposed rule in January and July 2009. In total 67 trade associations were contacted by phone throughout the process of developing the RMP (Attachment 1, provides a list of all trade associations contacted). To assist trade associations with distributing accurate and effective information to their member businesses they were provided with outreach documents in follow up e-mails after each update. Outreach documents

distributed to trade associations included a press release document, a refrigerant Best Management Practices (BMP) brochure (Attachment 2), and Frequently Asked Questions (FAQ) document (Attachment 3).

4.C Direct business outreach

In addition to the substantial “top down” outreach to trade associations, manufacturers, and distributors ARB staff contacted many individual businesses throughout California directly. ARB staff contacted individual businesses in two ways: 1) e-mail updates of all public workshops were sent to a list of approximately 800 individual businesses in the South Coast Air Quality Management District (SCAQMD) and 2) phone calls to individual businesses in two California cities.

i. E-mail contacts

E-mail addresses for approximately 800 individual businesses in California which use large non-residential refrigeration or air-conditioning systems with high-GWP refrigerant were obtained from reports submitted to the SCAQMD as a part of compliance with their Rule 1415. Regular updates on all public workshops and regulatory documents were sent, via e-mail, to all individual businesses reporting to the SCAQMD with a valid e-mail address. Because the proposed RMP represents an extension of the SCAQMD Rule 1415 these e-mails were specifically targeted to a relevant and active audience of individual business owners and operators.

ii. Phone contacts

ARB staff implemented a novel direct outreach campaign to inform individual businesses during the process of developing the proposed RMP. Two representative cities in California were selected based on their size and the distribution of business in industries relevant to the proposed RMP. The City of Industry and Merced were selected because they are located in geographically distinct regions of the state and contain a representative sample of businesses in the industries most likely to use non-residential refrigeration systems subject to the requirement of the proposed rule.

The primary goals of this outreach project were to 1) demonstrate a form of direct outreach that could be used in combination with other programs after the RMP is adopted, 2) communicate with businesses that would not otherwise be made aware of the RMP during the rule development process, 3) solicit comments from small businesses on the proposed RMP, and 4) identify a few businesses already implementing the best management practices outlined in the RMP who are willing to come forward and be recognized for these positive efforts.

The direct outreach project resulted in 187 total phone calls. The responses of individual businesses to the phone calls varied substantially. Thirty calls successfully identified a business using applicable refrigeration systems and provided them with outreach materials. Another 56 calls identified businesses with refrigeration systems that were not applicable to the rule (or used no applicable refrigeration systems). Seventy-five calls resulted in at least two voice mail messages with no reply. A smaller subset of contacts (26 total) were not viable or ended the call abruptly.

In general, this direct outreach effort was successful in contacting businesses that would otherwise not have heard of the RMP through traditional avenues. Some important lessons learned during the development of this project included: 1) encouraging staff to modify the "phone script" to better match their own conversational style, 2) the need for at least one or two bilingual staff in any future direct outreach efforts (Spanish and Mandarin speakers would be most valuable), and 3) a focused outreach effort in a small geographic area many not be as beneficial in cases where the proposed rule is anticipated to affect only a small proportion of businesses in a given industry statewide. Most of the businesses contacted were not affiliated with a trade association and therefore represented contacts that would otherwise not have been made aware of the proposed RMP using traditional outreach methods. This result provided an important demonstration of the success of this project and highlights the necessity of using direct outreach as a complement to top down outreach through trade associations. Attachment 4 provides more details on the direct outreach efforts to these two representative cities.

4.D Small Business and local government organizations

ARB staff estimate that approximately 64% of the businesses in California that use large non-residential refrigeration systems are small businesses (fewer than 100 employees). As a result, staff made extensive efforts to outreach to the small business communities in California to distribute information regarding the proposed RMP and solicit comments during the rule development process. In addition to contacting many individual businesses directly (see previous section) staff communicated with several small business associations in California, including the California Small Business Association, Small Business California, and the Merced and City of Industry chambers of commerce, as well as small business advocates such as the Governor's Office of the Small Business Advocate. Small business groups were contacted by phone and sent follow up e-mails with the refrigerant BMP brochure (Attachment 2), the FAQ document (Attachment 3), links to the RMP webpage, contact information, and the August 2009 public workshop notice.

In collaboration with the Office of the Small Business Advocate a notice and invitation to a conference call to discuss the proposed RMP was sent to a network of up to 120,000 small businesses statewide. The invitation was sent

from the Office of the Small Business Advocate to an e-mail distribution of approximately 700 small businesses and associations, which sent out the invitation to their e-mail network including 120,000 small business contacts. During the conference call individual businesses were provided a summary of the proposed RMP and encouraged to ask questions and voice concerns about the proposed rule.

ARB staff conducted a survey of city and county governments in collaboration with the California State Association of Counties and the Institute for Local Government to estimate the number of cities and counties using refrigeration or air-conditioning systems with more than 50 pounds of a high-GWP refrigerant. In addition to the survey, updates on the proposed RMP were distributed to all California counties and cities in February 2009 and August 2009. The refrigerant BMP brochure (Attachment 2) and FAQ document (Attachment 3) were distributed to cities and counties and posted on the League of California Cities website in August 2009.

4.E Local Air Districts

Throughout the rule development process ARB staff conducted regular outreach efforts to local Air Districts and solicited comments on the draft regulation and implementation plans. ARB staff provided monthly updates to the California Air Pollution Control Officers Association (CAPCOA) Climate Protection Committee on the status of the RMP throughout the rule development process.

In addition to regular updates to CAPCOA, ARB staff also conducted outreach to individual local Air Districts in California. ARB staff has worked closely with staff at the SCAQMD to obtain insights from the implementation of Rule 1415, obtain facility level data from all reports submitted as a part of Rule 1415, and received comments and suggestions on the proposed rule. ARB staff surveyed all local air districts to asses the feasibility of collaboration on the implementation and enforcement of the RMP and distributed outreach materials to the local air districts (Attachments 2 and 3).

4.F E-mail list serves

ARB staff distributed updates to the proposed RMP and public workshop announcements to a broad audience via three e-mail list serves. All updates were distributed to the Climate Change (“cc”, 6,561 contacts), Commercial Refrigeration Specifications (“commref”, 915 contacts), and High-GWP Refrigerant Tracking, Reporting and Recovery (“ref track”, 853 contacts) e-mail list serves. Combined, these list serves represent approximately 6,700 unique contacts interested in tracking the progress of climate change and refrigerant related regulations in California.

4.G Outreach materials

To complement the substantial phone and e-mail outreach efforts made to trade associations, local government, and individual businesses ARB staff developed several outreach documents providing information about the proposed rule and refrigerant best management practices. During the process of rule development a succinct press release was developed and distributed to individual businesses and trade organizations for broader distribution to their members. Subsequently, a refrigerant BMP brochure (Attachment 2) and Frequently Asked Questions (FAQ) document (Attachment 3) were developed for distribution to local Air Districts, trade associations, and individual businesses.

5. Components of Post Rule Adoption Plan

ARB staff will develop an outreach plan to ensure that facilities subject to the requirements of the RMP are aware of the regulation and have access to information that streamlines their ability to comply (examples include an online refrigerant leak inspection video and online guide to use self-reporting database). Given the number of facilities subject to the proposed regulation, the effort will be a significant focus for several years followed by ongoing maintenance by staff. Throughout the extensive outreach efforts conducted during the development of the RMP ARB staff were able to test and refine several novel outreach projects. As a result of the wide array of outreach methods used staff developed an understanding of how to conduct the most effective outreach to communicate with the diverse set of industries affected by the RMP after rule adoption. Staff will continue to refine and improve upon these aspects of the rule development outreach project, in addition to adding new outreach and training projects after the RMP is adopted.

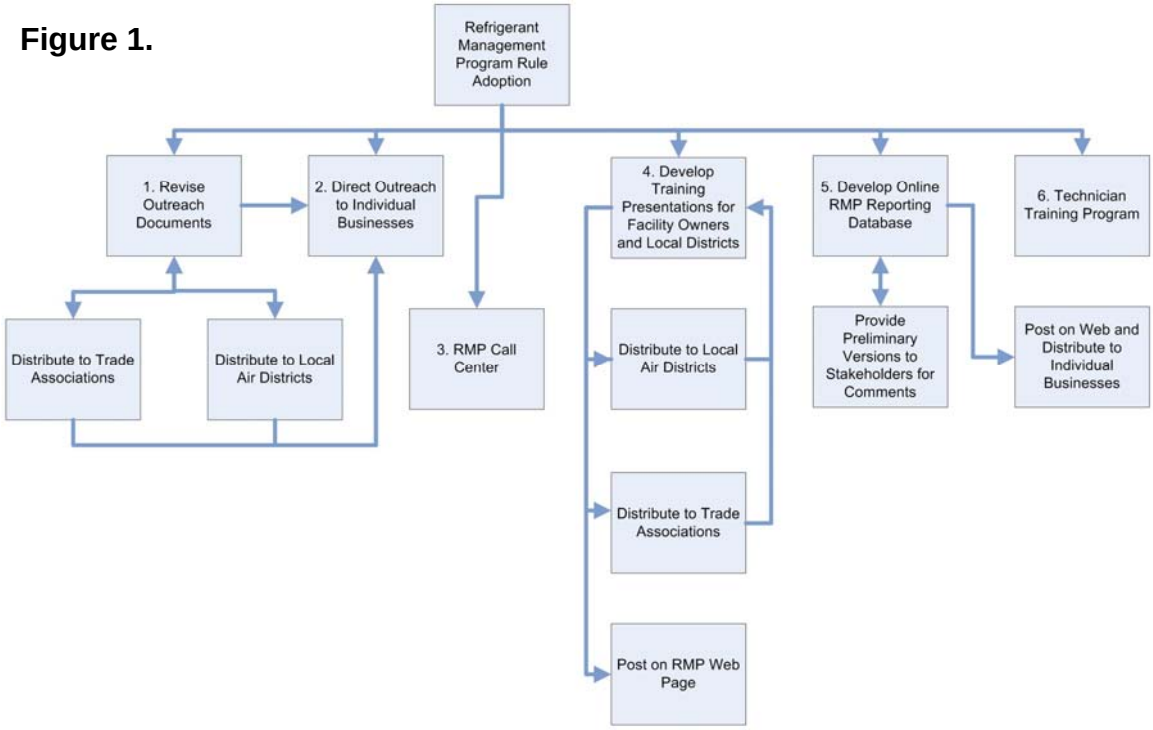
The focus of the outreach plan will be based on the final rule approved, but the goal will be to share clear and concise information on the applicability of the rule and how to comply, as well as how to most effectively reduce refrigerant emissions. The primary outreach topics anticipated include:

- How to determine the refrigeration system full charge
- How to comply with rule provisions applicable to your facility
- How to effectively conduct leak inspections
- How to benefit from use of refrigerant best management practices for all high-GWP appliances

A summary of key elements that are expected to be drawn on for the outreach during the implementation phase of the RMP follow.

Figure 1 depicts the planned outreach efforts to be conducted after the Refrigerant Management Program is adopted.

Figure 1.



5.A Facility Outreach Plan

i. Direct outreach to businesses

During the process of developing the RMP ARB staff conducted a novel direct outreach project which included calling all facilities in two sample cities likely to use large non-residential refrigeration systems. Because this direct outreach was successful in refining available data on the type of industries applicable to the RMP and in contacting businesses not affiliated with any trade associations ARB will obtain statewide address and contact information for businesses based on the Standard Industrial Code (SIC) or North American Industry Classification System (NAICS) code for business categories likely to be impacted by the RMP.

The contact information purchased will be used in two ways, 1) to conduct a limited set of direct calls to businesses likely to use large non-residential refrigerant systems and 2) to distribute direct mailings of outreach documents to all businesses on a statewide contact list. Staff will continue to make some calls to individual businesses likely to be affected by the RMP. Because it is not feasible to call all businesses in the affected industries statewide the remaining contacts will be made via direct mail from ARB or by including outreach documents in utility bills as a part of a collaborative effort with local utilities. In

addition information will be distributed via HVAC technicians and contractors who visit these facilities to service the refrigeration and air-conditioning systems.

ii. Trade associations

During the rule development process ARB staff has established contacts with 67 state and national trade associations with member businesses likely to use large non-residential refrigeration systems. In general trade association contacts were engaged and willing to distribute information regarding the RMP to their member businesses. Staff will to continue to work with these contacts to distribute information about the RMP after it is adopted in two ways: 1) provide them with updated outreach documents for electronic distribution and 2) press releases to be included in monthly publications. Staff will also work with trade associations to give presentations, training sessions, or booths at trade conferences to provide training and assistance to member businesses.

iii. Reporting database

An online database will be developed by ARB staff to facilitate reporting and recordkeeping for businesses using non-residential refrigeration systems with more than 50 pounds of a high-GWP refrigerant. The online database will facilitate outreach to individual businesses by providing a place where they can easily and quickly submit required reports and learn about the requirements of the RMP that apply to their business based on the size of the refrigeration systems they use. The automated annual reporting will allow facilities to keep track of their refrigeration systems and refrigerant usage. This will enable them to make decisions to replace less efficient and leaky systems which will save money and the environment. Additionally, the database will enable rapid data collection and analysis by ARB and facilitate all training and enforcement efforts made by ARB and local Air Districts.

iv. RMP call center

Once the RMP comes into effect approximately one year after adoption ARB staff will establish a call center for facilities with questions about the requirements of the RMP and reporting using the online database. The call center hotline number and a general e-mail address (ex. RMP@arb.ca.gov) will be included on all outreach documents and provide a simple way for businesses to get basic information about the rule from trained staff. The call center will enable ARB to communicate directly with the large number and diversity of facilities expected to be impacted by the RMP, and effectively educate businesses about the regulation and requirements for compliance. Additionally, ARB staff participating in the call center will facilitate processing and entering any hard copy reports submitted by facilities outside the online reporting database provided.

v. Post-implementation outreach documents

Following board adoption of the RMP ARB staff will begin to assemble additional documents to be used in the subsequent outreach process. Staff will revise the refrigerant BMP brochure, develop a RMP fact sheet, and write a brief press release document in collaboration with the ARB Public Information Office (PIO). These documents will provide information about the rule in a simple format suitable for the general public and contact information for ARB staff, similar to the brochure and FAQ documents (Attachments 2 and 3) produced during the rule development process. Additionally, these revised outreach documents will be translated into other languages including Spanish to reach a broader audience. The revised outreach documents will be distributed to all previously established individual business and trade association contacts, local Air Districts, technicians, local chambers of commerce, and technician training centers.

5.B Facility Compliance Training and Assistance

i. Local Air Districts

After receiving the Board approval of the proposed RMP ARB staff will continue to work with representatives from local Air Districts and CAPCOA during the process of revising outreach documents and formulating the post rule adoption plan. Staff will work closely with representatives from local Air Districts when developing facility training presentations to ensure that the material reaches the broadest possible audience of facility owners using non-residential refrigeration systems, and is communicated in a simple and clear format. Because local Air Districts generally have enforcement personnel familiar with some of the facility types impacted by the proposed rule (e.g., supermarkets) their feedback during the process of planning the post rule adoption outreach plan will be helpful.

ii. Training presentations

In collaboration with staff in the enforcement division presentations which provide a clear and concise description of the requirements of the RMP and the types of systems and facilities that are applicable will be developed. ARB staff will collaborate with established contacts from trade associations, refrigeration system manufacturers, small business advocacy groups, and local chambers of commerce to give presentations at organized meetings and conferences. Additionally, staff could present information that streamlines the ability of businesses to comply with the rule including, for example an instructional video describing how to conduct a refrigerant leak inspection for facility owner/operators.

iii. Best Practices Certified Technician Outreach

Training for technicians has been identified as a key component for the effective implementation of the program. The quality of the work by these personnel will

be the ultimate determinant of the quantity of emissions reduced by this program. Training needs have been discussed in detail with trade associations representing heating and air-conditioning equipment distributors and refrigeration and air-conditioning service contractors as well as several technician training institutions.

The general concept of a potential Best Practices Certified Technician Outreach plan specific to the Refrigerant Management Program would be based on developing a mechanism to ensure certified technicians are trained to understand best practices to reduce refrigerant emissions as outlined in ANSI/ASHRAE Guide 147 (Reducing Release of Halogenated Refrigerants from Refrigeration and Air-Conditioning Equipment and Systems), or similar standards or guidelines.

ARB staff will work with industry associations and training institutions to develop a full inventory of training opportunities and provide information during presentations to support the training opportunities currently available. ARB will also consider working with these organizations to develop specific training modules on methods to reduce emissions of refrigerants and comply with the Refrigerant Management Program. This training can be used to help reduce GHG emissions and potentially provide an advantage to those companies that have all employees completed the training.

The Best Practices Certified Technician Outreach Plan would be developed for implementation in harmony with any future plans to work towards regulatory and/or voluntary programs specific to requirements for a Best Practices Certified Technician Program as outlined in the Plans for the Future section of the staff report.

6. Summary

ARB staff conducted a comprehensive and extensive outreach campaign to a vast majority of industries likely to use and service non-residential refrigeration and air-conditioning systems during the process of developing the Refrigerant Management Program. The outreach efforts used by ARB staff involved 1) direct communication in workgroup and individual meetings, 2) top-down information distribution through an extensive network of trade association contacts and advocacy groups, and 3) direct phone call and e-mail outreach to many individual businesses throughout the state. In all cases ARB staff solicited comments on the proposed rule and technical appendices and sought to actively involve stakeholders in the process of rule development.

Immediately following rule adoption ARB staff will implement a comprehensive outreach plan similar to that used in the process of developing the RMP. Staff will use both direct contacts with businesses and top down outreach through trade

associations, trade publications, chambers of commerce, and local Air Districts to distribute information and outreach documents. Additionally, ARB staff will develop training materials and presentations to educate affected business owners and technicians. Ongoing discussions with stakeholders throughout the rule development phase have played a significant role in the formation of the proposed RMP. ARB staff will continue to work closely with affected businesses and trade associations to, whenever necessary, adapt based on their input to ensure effective implementation.

Attachments

This Attachments section contains the following supporting documents:

1) List of trade association contacts
2) Refrigerant Best Management Practices brochure
3) Frequently Asked Questions outreach document
4) Direct Outreach Project Summary

Attachment 1. Trade associations contacted during development of the Refrigerant Management Program.	
Industry type	**Trade Association**
Cold storage/ Food processing	Fresh Produce Association of America
	CA Grape and Tree Fruit League
	CA League of Food Processors
	Western Growers Association (WGA)
	Ventura County Agriculture Association
	California Beer and Beverage
	International Association of Refrigerated Warehouses
	International Dairy Foods Association
	California Cheese and Butter Association
	Western United Dairymen
	California Association of Meat Processors
	US Poultry and Egg Association
	Refrigerated Foods Association
	International Foodservice Distributors Association
	National Frozen and Refrigerated Foods Association
	CA Citrus
	Nisei Farmers League
	California Strawberry Commission
	World Food Logistics Organization
	Dairy Institute
Medical	Cemetery and Mortuary Association of California
	California Children's Hospital Association
	Alliance of Catholic Health Care
	California Association of Health Facilities (long term care)
	California Hospital Association
State and local government	California State Association of Counties
	League of California Cities
	Institute for Local Government
	California Department of General Services
	California Department of Corrections
	California Department of Education

Attachment 1. Trade associations contacted during development of the Refrigerant Management Program.	
Industry type	**Trade Association**
State and local government	Administrative Office of the Courts
	Office of Statewide Health Planning and Development (OSHPD)
Manufacturing	The Association of Electrical and Medical Imaging Equipment Manufacturers
	California Manufacturers and Technology Association
	National Association of Manufacturers
	Pharmaceutical Research and Manufacturers of America
Petroleum	Intermodal Association of North America
	California Independent Oil Marketers Association
	California Independent Petroleum Association
	Western States Petroleum Association
Retail groups	Grocery Manufacturers of America
	CA Independent Grocers
	California Grocers Association
	Dairy-Deli-Bakery Council of Southern California
	National community pharmacists association
	National association of chain drug stores
	National Association of Convenience Stores
	Retail Industry Leaders Association
Property Management/ Lodging	Apartment Association of California Southern Cities
	National Association of Industrial and Office Properties (NAIOP)
	California Business Properties Association
	California Hotel and Lodging Association
	California Lodging Industry Association
Education	Coalition for Adequate School Housing (CASH)
	Collaborative for High Performing Schools
	University of California - Office of the President
	California State Universities
Small business	California Small Business Association
	Small Business California
	Governor's Office of Small Business Advocate
Miscellaneous	National Association of Theater Owners
	Motion Picture Association of America
	Telecommunications Industry Association
	International Association of Amusement Parks and Attractions
	Los Angeles World Airports (LAWA)
	American Association of Airport Executives

What Types of Facilities Should Consider Implementing Refrigerant Best Management Practices?

Facilities with refrigeration and air-conditioning systems using Chlorofluorocarbon (CFC), Hydrofluorocarbon (HFC), or Hydrochlorofluorocarbon (HCFC) refrigerant including:

- Supermarkets
- Convenience stores
- Food processing and wholesale
- Refrigerated warehouses
- Pharmacies
- Hospitals
- Manufacturing
- Office buildings
- Institutions

Additional Information Sources for Commercial Refrigeration and Air-Conditioning Systems

U.S. EPA Regulations:
www.epa.gov/ozone/title6/608/index.html

South Coast Air Quality Management District Rule 1415:
www.arb.ca.gov/drdb/sc/cur.htm

Proposed Regulations

California Air Resources Board's Refrigerant Management Program:

The Refrigerant Management Program is a regulatory proposal to require specific refrigerant best management practices to reduce emissions of refrigerant from non-residential refrigeration systems.

Program Information:
www.arb.ca.gov/cc/reftrack/reftrack.htm

Frequently Asked Questions:
www.arb.ca.gov/cc/facts/facts.htm

7/21/2009

California Environmental Protection Agency AIR RESOURCES BOARD

Refrigerant Best Management Practices

Commercial Refrigeration and Air-Conditioning Equipment

California Air Resources Board
1001 I Street, P.O. Box 2815
Sacramento, CA 95812

Contact: Chuck Seidler
cseidler@arb.ca.gov
(916) 327-8493

FACTS ABOUT Refrigerant Best Management Practices

What are common Refrigerant Best Management Practices currently used?

- Designate one employee as a Refrigerant Manager
- Develop a Refrigerant Management Plan and Mission Statement
- Conduct an inventory of all systems that use refrigerant and their refrigerant charge
- Check for leaks regularly
  - Use automatic leak detection equipment
  - Conduct monthly manual leak inspections
- Repair refrigerant leaks promptly
- Do not "top off" refrigerant
- Use U.S. EPA certified technicians to conduct repairs
- Keep records of all refrigerant leaks, repairs, storage, and disposal

How do Best Management Practices help the environment?

CFC, HFC, and HCFC refrigerants are greenhouse gases typically thousands of times more potent than carbon dioxide (CO_2). Commercial refrigeration systems are the fastest growing source of greenhouse gas emissions in California.

Reducing refrigerant leaks will reduce greenhouse gas emissions.

Is your facility a model of Refrigerant Best Management Practices?

The California Air Resources Board wants to highlight businesses that are already effectively conserving and properly managing refrigerants.

If you would like to have your business considered as an example to highlight refrigerant best management practices please contact ARB staff listed in this brochure.

How do Best Management Practices save money?

Facilities using commercial refrigeration and air-conditioning equipment that implement Refrigerant Best Management Practices reduce consumption of refrigerant.

Examples of savings from reaching a 10% annual leak rate with best management practices include:

1. A store with four refrigeration systems with a total charge of 1,000 pounds of refrigerant that leaked 30% per year could ***save*** $8,800 on refrigerant.

2. A food distribution facility with one refrigeration system with a total charge of 3,000 pounds of refrigerant that leaked 30% per year could ***save*** $6,600 on refrigerant.

What are the benefits of using Best Management Practices?

- Save $ annually on refrigerant
- Save energy
- Help comply with the law
  - Federal Clean Air Act, Section 608
  - South Coast Air Quality Management District Rule 1415
  - Proposed: Air Resources Board Refrigerant Management Program

FREQUENTLY ASKED QUESTIONS

Refrigerant Management Program

What is the Refrigerant Management Program?

The Refrigerant Management Program is a regulatory proposal to require specific best management practices to reduce emissions of refrigerant from non-residential refrigeration systems. The proposal includes provisions similar to current federal and local regulations in effect specific to ozone-depleting substances (ODS) refrigerants and extends requirements to ODS refrigerants substitutes.

Why is the Refrigerant Management Program proposed?

- It is a board approved AB 32 Early Action Measure developed to help meet the goals of reducing CA greenhouse gas emissions to 1990 levels by 2020.
- Addresses stationary source non-residential refrigeration, which is characterized by high leak rates and minimal oversight.
- Reduces emissions of Chlorofluorocarbon (CFC), Hydrofluorocarbon (HFC), and Hydrochlorofluorocarbon (HCFC) refrigerants, which are greenhouse gases typically thousands of times more potent than carbon dioxide (CO_2).

Who must comply with the proposed regulation?

The proposed regulation will affect any person who owns or operates a facility with a stationary, non-residential refrigeration system using more than 50 pounds of a high-global warming potential (GWP) refrigerant, services any appliance using a high-GWP refrigerant, or distributes or reclaims a high-GWP refrigerant.

What is a high-global warming potential refrigerant?

High-global warming potential, or high GWP, refrigerants include CFC, HCFC, and HFC refrigerants. Refrigerants that are not high-GWP include ammonia and carbon dioxide (CO_2).

What is a refrigeration system and what types of facilities use them?

A refrigeration system is any appliance that is, 1) used in the retail food and cold storage warehouse sectors, 2) used in manufacturing industries directly linked to an industrial process, or 3) used for any purpose other than comfort cooling that requires requires more than 50 pounds of a high-GWP refrigerant.

What are the estimated emission reductions of the proposed regulation?

The proposed regulation is estimated to reduce high-GWP refrigerant emissions by 8 million metric tonnes of carbon dioxide equivalent ($MMTCO_2E$). This reduction has an equivalent climate impact of removing 1.4 million cars and light trucks from the road each year.

What are the estimated costs?

On average the proposed regulation results in a cost savings of $2 per metric tonne of carbon dioxide equivalent ($MTCO_2E$) in emissions reduced. The cost savings is a direct result of reduced consumption of refrigerant through the use of best management practices.

What does the proposed regulation require?

The proposed regulation requires facility registration, leak detection and monitoring, leak repair, retrofit and retirement, reporting, and recordkeeping for any person who owns or operates a facility with a stationary, non-residential refrigeration system using more than 50 pounds of a high-GWP refrigerant. Required service practices for refrigerant management are applicable to any person who services an appliance using a high-GWP refrigerant. Reporting and recordkeeping requirements are also applicable to distributors, wholesalers, and reclaimers of high-GWP refrigerants.

When does the regulation take effect?

The proposed regulation has requirements that are phased in over time depending on the largest refrigeration system used at a facility.

Refrigeration systems are categorized as:

- **Large**: Refrigeration systems using 2,000 pounds or more of a high-GWP refrigerant
  - Systems typically used in cold storage warehouses, manufacturing, and some supermarkets
- **Medium**: Refrigeration systems using 200 pounds or more, but less than 2,000 pounds, of a high-GWP refrigerant
  - Systems typically used in smaller warehouses and many supermarkets
- **Small**: Refrigeration systems using more than 50 pounds, but less than 200 pounds, of a high-GWP refrigerant
  - Systems typically used in some pharmacies and small grocery stores

The following requirements for facilities using applicable refrigeration systems, refrigerant distributors and refrigerant reclaimers will apply on the effective date of the rule or January 1st, 2011:

- Required Service Practices applicable to the service of any high-GWP appliance
- Leak detection, monitoring, and recordkeeping
- Retrofit and retirement plans
- Refrigerant distributor, wholesaler, and reclaimer prohibitions

Refrigerant distributor, wholesaler, and reclaimer annual reporting requirements will become effective in 2012.

Requirements for facilities using applicable refrigeration systems that are phased in include:

- Annual Registration for Operation: Large in 2012, Medium in 2014, Small in 2016.
- Annual Implementation Fee: Paid upon initial Registration for Operation and annual renewals - Large ($370) and Medium ($170). There is no fee for Small.
- Annual Facility Reporting: Large in 2012 and Medium in 2014. No required reporting for Small.

How will the Refrigerant Management Program be enforced?

- Air Districts may adopt a rule of equivalent emission reduction benefit under local authority.
- Air Districts may enforce statewide rule under agreements with the ARB with funding provided through fees paid by facilities subject to the rule.

Will there be other regulations to reduce refrigerant emissions?

Yes. ARB is developing additional regulations or other measures to address emissions of refrigerants used for other stationary applications and motor vehicle air conditioning including: new commercial refrigeration specifications; residential refrigeration management; foam recovery and destruction; use of refrigerants with a lower global warming impact in new cars, buses, trucks, and equipment in California; recovery of refrigerant from decommissioned refrigerated shipping containers; enforcement of a federal ban on refrigerant release during servicing and dismantling; and emission reductions during professional servicing.

Where can I find out more information about the proposed regulation?

For the regulation and accompanying documents see: *www.arb.ca.gov/cc/reftrack/reftrack.htm*.
For further information contact: Mr. Chuck Seidler, cseidler@arb.ca.gov, (916) 327-8493

Refrigerant Management Program
Direct Outreach Project Report
July – August 2009

INTRODUCTION

The Refrigerant Management Program (RMP) is a regulation proposed by the California Air Resources Board (ARB) to reduce the emissions of high global warming potential (GWP) refrigerants from large stationary non-residential refrigeration systems and help meet the greenhouse gas reduction goals of California's Global Warming Solutions Act of 2006 (AB32). High GWP refrigerants include chlorofluorocarbons (CFC), hydrochlorofluorocarbons (HCFC), and hydrofluorocarbons (HFC). ARB staff estimate that by 2020 greenhouse gas (GHG) emissions from stationary refrigeration systems in California could be reduced by approximately 8 million metric tons carbon dioxide equivalent (MMTCO2E) annually through the facility registration, reporting, leak inspection, and maintenance requirements included in the RMP.

In the process of developing the RMP, ARB staff developed an inventory of the types and numbers of businesses in California that use stationary commercial and industrial refrigeration systems with 50 pounds or more of a high GWP refrigerant. In developing this inventory staff estimated that approximately 26,000 facilities in California use applicable refrigeration systems. These facilities represent many different industries including supermarkets, convenience stores, food processing and wholesale, refrigerated warehouses, pharmacies, hospitals, petroleum, utilities, and some manufacturing. ARB staff estimate that almost 65% of these are small businesses with fewer than 100 employees. Because of the large number of small businesses potentially impacted by the RMP, an extensive and diverse outreach was conducted to educate business owners about refrigerant best management practices and solicit comments on the proposed regulation during the rule development process.

Throughout the rule development process, staff conducted several different outreach activities including: 1) contacting a total of 60 different trade associations representing businesses likely to use large commercial and industrial refrigeration systems, 2) distributing information to small business development centers, 3) distributing information to all 35 air quality districts, 4) hosting 5 technical workgroup meetings, 5) hosting 3 statewide public workshop series throughout California, and 6) e-mail list serves to ~6,700 contacts. All contacts were provided press releases, brochures, and FAQ documents for further distribution.

In addition to this substantial "top down" outreach ARB staff elected to conduct a novel direct outreach campaign to a comprehensive sample of businesses likely to use commercial and/or industrial refrigeration systems with

high GWP refrigerants in two cites in California. The primary goals of this direct outreach project were:

1) To serve as a pilot study to determine the effectiveness of conducting a direct outreach to affected facilities/businesses.
2) Demonstrate a form of direct outreach that could be used in other programs or regulations that the ARB develops.
3) Communicate with small businesses that would not otherwise be made aware of the RMP during the rule development process.
4) Solicit comments from small businesses on the proposed RMP.
5) Identify businesses willing to be recognized for voluntarily using refrigerant best management practices outlined in the proposed RMP.
6) Gain information that informs the implementation phase of the RMP to ensure that small businesses are fully aware of its requirements as well as tools to assist with compliance.

DIRECT OUTREACH EFFORT - RESULTS

The direct outreach pilot project resulted in 187 total phone calls to individual businesses. The responses of individual businesses to the phone calls varied substantially. Thirty calls successfully identified a business using applicable refrigeration systems and provided them with outreach materials. Another 56 calls identified businesses with refrigeration systems that were not applicable to the rule (or used no commercial refrigeration). Seventy-five calls resulted in at least two voice mail messages with no reply. A smaller subset of contacts (26 total) were not viable or ended the call abruptly. Most of the businesses contacted were not affiliated with a trade association and therefore represented contacts that would otherwise not have been made aware of the proposed RMP using traditional outreach methods.

Table 1. Summary of calls by industry type.

Industry type	Successful contacts	Systems n/a	Voicemail only	Not viable contact	Total
Cold storage/ Food processing	13	13	33	11	**70**
Grocery store/ Supermarket	9	1	12	5	**27**
Convenience store	0	9	4	1	**14**
Pharmacy	3	5	3	1	**12**
Medical	2	12	4	3	**21**
Manufacturing/ Petroleum	3	16	19	5	**43**
	30	**56**	**75**	**26**	**187**

A secondary goal of this direct outreach project was to find individual businesses already following the refrigerant best management practices required in the RMP and interested in receiving public recognition for their efforts. Although several businesses were identified which claimed to employ very stringent refrigerant best management practices none volunteered to be publically recognized.

DIRECT OUTREACH EFFORT - DESCRIPTION OF INDIVIDUAL TASK COMPONENTS

a. Selection of cities to be used for the direct outreach project

The facility inventory developed for the Refrigerant Management Program estimated that approximately 26,000 facilities statewide use refrigeration systems with more than 50lbs of high GWP refrigerant (see Appendix B for more details). Because it would not be feasible to contact such a large number of facilities directly by phone two moderately sized cities in Northern and Southern California were selected to serve as samples of all affected industries statewide. Merced and City of Industry were selected based on several criteria including; geographic location, broad representation of all affected industry types, and less than 250 businesses contacts for both cities combined.

b. Development and distribution of contact list

Before planning a substantial phone based outreach effort to individual businesses in California the types and numbers of businesses likely to use large commercial/industrial refrigeration systems with high GWP refrigerants was estimated. The facility inventory developed for the proposed RMP identified specific industries and NAICS codes that were likely to apply to the proposed rule (see Appendix B for more information on methods and inventory). These NAICS codes were used, in conjunction with a subscription to a marketing firm Directories USA, to obtain contact information for approximately 26,000 individual facilities statewide that could be affected by the proposed RMP. The contact information provided by Directories USA included the following fields:

- Business description
    - Business name
    - NAICS code
    - NAICS code description

- Business data
    - Estimated number of employees
    - Estimated annual sales
    - Estimated square footage
    - Business status (single location or branch)

- Contact information

- Address
- Phone number
- Website URL (when available)

All individual business contacts (187 total) in the selected cities, Merced and the City of Industry, were assigned to participating ARB staff. Contacts were assigned so that each individual staff would be interacting with facilities in the same industry. By assigning contacts from only one or two industry types to each staff it would allow them to focus and specialize on the specific issues unique to each industry (ex. cold storage, food processing, manufacturing, medical facilities). For example calls to cold storage warehouses would initially focus on determining the type of refrigerant used in a facility because many facilities in California use low GWP refrigerants like ammonia. Additionally, calls to small grocery and convenience stores would initially focus on determining the size of the system used because many facilities are likely to have systems with less than 50lbs refrigerant.

c. Development of phone script, follow up form e-mail, and contact database

A standard phone script (Attachment 1) was drafted and used by staff to help ensure consistency in the information conveyed to stakeholders and responses provided to questions asked during phone calls. The script included several questions that were to be asked in all calls and subsequent questions to be asked during successful calls. Although it was assumed, when compiling the facility inventory, that only a small proportion of some industries use commercial refrigeration systems with more than 50lbs high GWP refrigerant (ex. manufacturing and cold storage) contact information for all businesses in each industry were obtained. As a result information regarding the presence and size of refrigeration systems used in a business was requested early in the phone call. Additionally, at the end of the script, ARB staff anticipated possible questions stakeholders could ask and provided sample answers.

After developing a first draft, the script was refined substantially based on comments and observations gleaned from a practice session where staff tested the script in a role playing scenario. After this practice session the script was changed to include more questions at the beginning of the call to engage the stakeholder promptly. As a result most of the description of the proposed rule was moved to the end of the call as a follow up to questions asked. After ARB staff completed several calls they adapted the script to better match their own individual speaking style and make the script sound more conversational.

Participating staff were provided with a contact database containing their assigned list of businesses contacts. The contact database also contained empty cells where staff could track the status of a contact (for example “follow-up required” or “not viable contact”), the name and e-mail of a contact person at each business, and answers to questions included in the call script (see

Attachment 2 for full list of fields included). After completing calls with a facility with applicable refrigeration systems, staff sent a form e-mail and several outreach documents (Frequently Asked Questions sheet and Refrigerant Best Management Practices brochure) to the business to provide additional information about refrigerant best management practices and the proposed RMP.

d. Observations and lessons learned

This project represents one of the first comprehensive effort to contact a substantial number of individual businesses by phone during the process of developing a broad regulation affecting many different facilities and industry types. Participating ARB staff made some valuable observations during this process that could provide useful guidance for any similar outreach projects.

Refrigeration systems not applicable to RMP: ARB staff noted that this type of outreach effort is less effective in industries where only a small proportion of the total facilities statewide are expected to be applicable to the rule. If less than 30% of the facilities in a given industry are likely to be applicable to the proposed rule then it is likely that, in a limited statewide sample, none of the calls made will result in successful contacts with applicable businesses.

Language barrier: In some cases the business owners/operators contacted did not speak English as their primary language. When conducting substantial phone based outreach efforts in the future making a few bilingual staff available could dramatically increase the effectiveness of the outreach to individual businesses.

Incorrect data: The data purchased from DirectoriesUSA, the marketing company used to obtain contact lists, was occasionally mis-categorized. In several cases business contacts listed under a specific NAICS code claimed that their primary business activities were very different from their reported NAICS code. This mis-categorization is possibly due to the fact that most businesses and marketing companies still use SIC codes for classification while the US Census bureau uses NAICS codes. Some accuracy in categorizing business types is lost when mapping from less specific SIC codes to more refined NAICS codes. Future outreach efforts of this kind might consider organizing businesses by SIC codes to reduce the number of calls made to mis-categorized businesses.

Phone call script modifications: Several important changes were made to the phone script by staff as they made more calls. Changes included asking to speak to the appropriate person in the company immediately after stating their name and affiliation (ARB). In many cases the person answering the phone knew nothing about the facility or refrigeration systems used there and staff found this expedited calls. Another change suggested by staff was to clearly state that the purpose for the call was not sales, but instead to solicit feedback on a government regulation being developed that may affect their business.

Importance of direct calls in outreach process: None of the businesses contacted with applicable refrigeration systems had heard of the proposed Refrigerant Management Program or were affiliated with a trade association. This highlights the importance of calling individual businesses in addition to the substantial "top down" outreach efforts used in the development of the RMP in contacting manufacturers, distributors, trade associations, and local chambers of commerce. The fact that all of the small businesses contacted were not aware of the proposed RMP and were not affiliated with trade organizations is an important result of this direct outreach project. This provides a strong indication that the most effective way to outreach to small businesses is by direct calls or mailings. Although some of the businesses contacted had more than 100 employees, most of them were small businesses.

Overall, staff agreed that assigning 30-40 calls per person over a 1 ½ week time span was not overly burdensome and that this form of outreach was effective in distributing information to individual businesses. After implementing this ambitious direct outreach project staff will work to incorporate a similar approach to subsets of the total facilities estimated to be affected by the rule (26,000 statewide). The experience obtained from conducting this outreach project will be vital in forming the development of a successful and comprehensive post-rule adoption outreach plan. Additionally, the information obtained from this direct outreach project will provide a useful comparison to the data used to establish the facility inventory.

ATTACHMENT 1: PHONE SCRIPT

Hi, my name is Jane Doe and I'm calling from the California Air Resources Board to talk to you about the refrigeration systems used in your business. I'm calling all local businesses in the area, including (convenience/grocery/warehouse/food processing/dairy/manufacturing) businesses like yours, that use large commercial refrigeration systems with high global warming potential refrigerants, for example Freon type refrigerants like R-22 or R404a. I'm not selling anything, I'd just like to talk to you about a regulation we developing called the Refrigerant Management Program which focuses on changes that can reduce leaks of refrigerant and save money.

Are you the right person to talk to?

When calling food warehouse or processing facilities may need to ask this question at the beginning: Do you know if your business uses ammonia or CO2 as a refrigerant in your cooling systems?

Have you heard about this program before?

If you don't mind I have a few quick questions and I'd like to give you a little more information about the proposed rule. It shouldn't take more than 5 minutes. The

information that you and other businesses provide will help us make sure that the rule is effective, and has the least possible impact on your business.

1. Can you describe your business and the refrigeration/freezer systems you use?

2. Do you know if you have any refrigeration systems with more than 50 pounds of refrigerant?

    a. Alternate question for convenience stores or pharmacies: Do you plug all your refrigerated cases into a wall outlet or do they have a walk in area in the back where you stock the shelves?

3. Do you contract with a company to do all the maintenance and repairs, or do you use onsite staff?

4. How often do you usually inspect your refrigeration systems?

5. What trade associations are you affiliated with?

Thank you, this is very helpful.

The rule were developing is designed to reduce the emissions of refrigerant from large commercial refrigeration systems by requiring some Best Management Practices. Many businesses are already using these practices because they are also generally seen as good business.

Some examples of Best Management Practices include:

- Keeping records of all repairs made to refrigeration systems and all refrigerant added and lost from refrigeration systems
- Checking for refrigerant leaks regularly and repairing them as soon as they are found
- Using automatic leak detection equipment on very large systems (>2,000 lbs)

Based on many conversations I have had with business owners and technicians I've found that these practices can often help SAVE money on refrigerant each year.

* At this point – if the call is going well and you think they may be interested in working with us see the additional list of questions at the end.

Can I send you some additional information about our proposed rule by e-mail?

What is your e-mail address?

Please feel free to call me with any questions you have about the information I send you, or if you have comments or concerns about this proposed rule.

Thank you for taking time to talk to me today, I know you are very busy and I sincerely appreciate your attention.

If the call goes well:

I'm interested in finding some businesses that already use Best Management Practices and highlighting them as positive examples for other business owners because they not only save money but also help the environment.

Would you be willing to let myself and a few of my coworkers visit your business to learn more about your operation? We are interested in finding ways to highlight local businesses that already use Refrigerant Best Management Practices and would appreciate the chance to talk to you further.

Additional questions for "good" players:

1. Do you use an automatic leak detection system to monitor your refrigeration system?
2. What is the name of your service company?
3. How quickly are you able to fix a leak after it is detected?

Possible questions and suggested answers:

For example:

1. How do I know what the refrigerant charge in my equipment is?
   There are several ways to determine the full refrigerant charge in a system. These include:
   - The full charge may be listed on the equipment name plate which includes the make/model number, refrigerant type, and manufacturer information.
   - The full charge could also be included in documentation about the system provided by the manufacturer after installation.
   - The full charge could be determined by looking back at old service records from when a leak repair was conducted. By looking at the amount of refrigerant removed from the system before the repair and the amount added back after the repair was complete you can estimate the full charge.
   - If you have none of this information available you can contact the refrigeration system manufacturer.

2. Why is the RMP needed? Isn't there already enough regulation for refrigeration systems?

- Many refrigerants are very potent global warming chemicals. What this means is that, on average, a single pound of HFC, CFC, of HCFC refrigerant has the same global warming impact as 4,000lbs of carbon dioxide.
- Because they are so potent releases of even small amount of high global warming potential refrigerant can have contribute substantially to the greenhouse gas emissions in California.
- High global warming potential refrigerants represent the fastest growing source of greenhouse gas emissions in California.
- By using best management practices in dealing with refrigeration systems business owners can save money on refrigerant purchased every year and help reduce greenhouse gas emissions.

3. My business is barely managing to keep a float in these tough times. Why is ARB imposing yet another burdensome and costly regulation?
    - Our goal in developing the proposed refrigerant management program has been to reduce emission of greenhouse gases in a way that can also help businesses SAVE money every year.
    - Our research indicates that this proposed regulation will actually achieve emissions reductions at an average cost SAVINGS.
    - After many discussions with refrigeration system manufacturers and business owners we think that refrigerant best management practices will actually help typical businesses save money every year by spending less money on refrigerant
4. Will I be inspected by my local air district or by the Cal EPA? Is the local air district working with you on this rule?
    - We have been working closely with all local air districts in California including the **South Coast Air Quality Management District/San Joaquin Air Pollution Control District**.
    - After the rule is passed by our board we will work with local air districts to administer the program.
    - You will not have to send reports to multiple locations. We plan to have one statewide online database where you can submit your annual reports.

5. What will this rule cost me?
    - Our research indicates that many facilities which use Refrigerant Best Management Practices will save money every year on refrigerant.
    - The proposed refrigerant management program includes minimal annual fees for facilities that have at least one refrigeration systems with more than 200lbs refrigerant.
        - At least one system with 200-2,000lbs: $170 annual fee
        - At least one system with >2,000lbs: $370 annual fee
    - These fees will be used solely to pay for maintenance of the online reporting database and for enforcement.

- There would be cost for requirements such as regular leak inspections and keeping records of refrigerant leaks and repairs, but the money saved on refrigerant can be used to pay for these types of expenses.

Two examples of annual savings possible using refrigerant best management practices:

- A store with four refrigeration systems containing 1,000 pounds of refrigerant that leaked 30% per year could SAVE $8,800 every year on refrigerant.
- A food distribution warehouse with one refrigeration system containing 3,000lbs refrigerant that leaks 30% per year could SAVE $6,600 per year on refrigerant.

6. What are you doing with the information you asked me about my business and our refrigeration systems?
    - The information you gave me will help us learn more about the types of businesses in California that use large commercial refrigeration systems with high GWP refrigerants.
    - It will also help us get an idea of how commonly refrigerant best management practices are used in businesses and how aware most facilities are about these practices.

ATTACHMENT 2: LIST OF FIELDS INCLUDED IN OUTREACH DATABASE

A contact database was provided to all participating ARB staff and was intended to be filled in after each call made. The information recorded in the database was used to provide a summary of the effectiveness of the direct outreach project.

Fields included:

- Contact outcome (follow up required/successful contact/possible collaboration/not viable contact/refrigeration systems not applicable)
- City
- Business name (from DirectoriesUSA)
- Sales (from DirectoriesUSA)
- NAICS code description (from DirectoriesUSA)
- # employees (from DirectoriesUSA)
- Last name
- First name
- Title of contact person
- Phone number (from DirectoriesUSA)
- E-mail address
- Business type
- Date last contacted

- Contacted by phone? (yes/voicemail)
- Received outreach documents? (yes/follow-up)
- Received workshop notice? (yes/follow-up)
- Affiliated associations
- Notes

(Adopted June 7, 1991)(Amended October 14, 1994)

RULE 1415. REDUCTION OF REFRIGERANT EMISSIONS FROM STATIONARY REFRIGERATION AND AIR CONDITIONING SYSTEMS

(a) Purpose

The purpose of this rule is to reduce emissions of Class I and Class II refrigerants from stationary refrigeration and air conditioning systems by requiring persons subject to this rule to reclaim, recover, or recycle refrigerant and to minimize refrigerant leakage.

(b) Applicability

This rule is applicable to any person who owns or operates a refrigeration system, as defined in this rule. This rule is also applicable to any person who installs, replaces, services, disposes, audits, or relocates a refrigeration system, to any person who services or maintains recycling and recovery equipment, and to any person who recycles, recovers, reclaims, or sells refrigerant. All amendments to this rule adopted as of October 14, 1994 shall take effect as of October 14, 1994.

(c) For purposes of this rule, the following definitions shall apply:

(1) ADDITIONAL REFRIGERANT CHARGE is the quantity of refrigerant (in pounds) charged to a refrigeration system in order to bring the system to a full-capacity charge and replace refrigerant which has leaked.

(2) APPROVED RECOVERY EQUIPMENT is equipment for refrigerant recovery that is certified by the Environmental Protection Agency pursuant to the requirements of Part 82 of Title 40 of the Code of Federal Regulations.

(3) APPROVED RECYCLING EQUIPMENT is any refrigerant recycling equipment that is certified by Underwriters Laboratories, or another independent testing organization as approved by the Executive Officer's designee, and is certified by the Environmental Protection Agency pursuant to the requirements of Part 82 of Title 40 of the Code of Federal Regulations.

(4) AUDIT is an annual inspection of the refrigeration systems containing Class I refrigerants conducted to:

(A) identify leaks pursuant to a District-approved method (Section (2)(A)); and

(B) ensure proper operation pursuant to manufacturer's specification.

(5) CERTIFIED AUDITOR for the purpose of this Rule is a person that:

(A) has the following current, valid, and applicable U.S. Environmental Protection Agency certificate provided in accordance with Part 82 of Title 40 of the Code of Federal Regulations:

(i) a Type II Technician certificate for high or very high pressure refrigeration systems and a Type III Technician certificate for low pressure refrigeration systems; or

(ii) a Universal Technician certificate, or

(B) until June 30, 1995, has successfully completed a District-approved course in conducting inspections and generating records for compliance with this rule, and has a current, valid, written certification from the Executive Officer's designee.

(6) CERTIFIED RECLAIMER is a person who holds a current, valid, and applicable reclaimer certificate in accordance with Part 82 of Title 40 of the Code of Federal Regulations.

(7) CERTIFIED TECHNICIAN is a person who on and after November 14, 1994 has the following current valid, and applicable U.S. Environmental Protection Agency certificate provided in accordance with Part 82 of Title 40 of the Code of Federal Regulations:

(i) a Type II Technician certificate for high or very high pressure refrigeration systems; or

(ii) a Type III Technician certificate for low pressure refrigeration systems; or

(iii) a Universal Technician certificate.

(8) CLASS I REFRIGERANT is any compound or any combination of compounds designated by U.S. Environmental Protection Agency as a CLASS I refrigerant pursuant to 42 U.S.C. 7671(a).

(9) CLASS II REFRIGERANT is any compound or any combination of compounds designated by U.S. Environmental Protection Agency as a CLASS II refrigerant pursuant to 42 U.S.C. 7671(a).

(10) DISPOSE is to discard refrigerant in any manner, except destruction by incineration or by a treatment method specifically approved by the U.S. Environmental Protection Agency for handling such refrigerant without releasing it to the atmosphere.

(11) High pressure refrigeration system is a refrigeration system that uses a refrigerant with a boiling point between -50 and 10 degrees Centigrade at atmospheric pressure (29.9 inches of mercury).

(12) Low pressure refrigeration system is a refrigeration system that uses a refrigerant with a boiling point above 10 degrees Centigrade at atmospheric pressure (29.9 inches of mercury).

(13) MAINTENANCE is an annual service of the refrigeration system containing Class II refrigerants conducted to:

(A) ensure proper operation pursuant to manufacturer's specification; and

(B) assess the overall integrity of the refrigeration system to detect leaks.

(14) PERSON is any firm, business establishment, association, partnership, corporation, or individual, whether acting as principal, agent, employee, or in any other capacity, including any governmental entity or charitable organization.

(15) RECLAIM is to process refrigerant to a level equivalent to new product specifications in accordance with applicable requirements of the U.S. Environmental Protection Agency contained in Part 82 of Title 40 of the Code of Federal Regulations.

(16) RECOVER is to remove refrigerant, in any condition, from a system and to store it in an external container, without necessarily testing or processing it in any way.

(17) RECYCLE is to clean refrigerant for reuse by oil separation and single or multiple passes through moisture-absorption devices, such as replaceable core filter-driers which reduce moisture, acidity, and particulate matter.

(18) REFRIGERANT LEAK is any discharge of refrigerant from a refrigeration system, recovery equipment, or recycling equipment into the atmosphere.

(19) REFRIGERATION SYSTEM is any non-vehicular equipment used for cooling or freezing, which holds more than 50 pounds of, any combination of Class I and/or Class II refrigerant, including, but not limited to, refrigerators, freezers, or air conditioning equipment or systems.

(20) SELF-CONTAINED RECOVERY EQUIPMENT is any refrigerant recovery equipment that is capable of removing the refrigerant from a refrigeration system without the assistance of components contained in the refrigeration system.

(21) Very high pressure refrigeration system is a refrigeration system that uses a refrigerant with a boiling point below -50 degrees Centigrade at atmospheric pressure (29.9 inches of mercury).

(d) Requirements

(1) On and after January 1, 1992, no person shall install, service, modify, or dispose of any refrigeration system, or perform any related repairs or modifications that may cause release of Class I or Class II refrigerants unless that person meets all of the following requirements:

(A) Recovers, recycles, or reclaims the refrigerant, using approved recycling or recovery equipment for that type of refrigeration unit , and employs procedures for which the recycling or recovery equipment was approved by the U.S. Environmental Protection Agency. Recovery and recycling equipment shall be used as specified by the recovery or recycling equipment manufacturer unless manufacturer's specifications are in conflict with the equipment approved procedures. Refrigerant may be returned to the refrigeration system from which it is recovered from or to

another refrigeration system owned by the same person without being recycled or reclaimed.

(B) Satisfies job site evacuation of Class I and Class II refrigerants during recycling, recovering, reclaiming, or disposing in accordance with applicable regulations of the U.S. Environmental Protection Agency as contained in Part 82, Subpart F, Section 82.156, of Title 40 of the Code of Federal Regulations then in effect including, but not limited to, "Required Levels of Evacuation for Air Conditioning and Refrigeration Equipment". De minimis refrigerant releases associated with a good faith attempt to recycle or recover refrigerants are allowed provided that required practices or requirements in accordance with regulations then in effect of the U.S. Environmental Protection Agency contained in Part 82, Subpart F, Section 82.156 and Section 82.158, and Part 82, Subpart B of Title 40 of the Code of Federal Regulation are followed.;

(C) Has at least one piece of approved, self-contained recovery equipment available at their place of business;

(D) On or after October 14, 1994, any person who owns or operates an approved recycling or recovery equipment:

(i) Shall not operate any approved recycling or recovering equipment except for the maintenance or repair of such equipment, unless the equipment has been tested for and been determined to have no leaks within the past six months as determined by a method approved by the Executive Officer's designee. Leaks in recycling, recovering, or charging equipment shall be repaired within 2 working days after the leak is first detected, unless the equipment does not leak if its use is discontinued;

(ii) Shall not alter the design of approved recovery and recycling equipment in a manner that would affect the equipment's ability to meet the certification standards set by the U.S. Environmental Protection Agency without resubmitting the altered design for approval testing. Until

such altered equipment is tested by a U.S. Environmental Protection Agency approved testing facility and is shown to meet the certification standards set forth by the U.S. Environmental Protection Agency, equipment so altered shall not be considered approved; and,

(iii) Shall provide proof of certification for the recovery and recycling equipment from the U.S. Environmental Protection Agency to the Executive Officer's designee upon request.

(E) On and after November 14, 1994 has the following current, valid and applicable U.S. Environmental Protection Agency certificate provided in accordance with Part 82 of Title 40 of the Code of Federal Regulations:

(i) a Type II Technician certificate for high or very high pressure refrigeration systems; or

(ii) a Type III Technician certificate for low pressure refrigeration systems; or

(iii) a Universal Technician certificate.

(2) No person shall operate a refrigeration system unless all of the following applicable requirements are met:

(A) An annual audit has been conducted for refrigeration systems containing Class I refrigerant by a Certified Auditor to determine whether the system is operating pursuant to manufacturer's specifications and does not have refrigerant leaks. This audit shall commence no later than July 1, 1992, and every 12 months thereafter. At minimum, the annual audit shall require the following:

(i) A leak test shall be conducted for refrigeration systems operating above atmospheric pressure using one of the following methods:

(I) Electronic halogen detector used in accordance with manufacturer's specifications;

(II) Fluorescent tracer dyes injected into the system according to manufacturer's specifications, and scanned with an ultraviolet lamp; or

(III) An alternate method approved by the Executive Officer's designee.

(ii) A leak test shall be conducted for refrigeration systems operating below atmospheric pressure by using one of the following methods:

(I) Pressurizing the system by using an inert gas mixture with an indicator or by raising the temperature of the Evaporator; or

(II) An alternate method approved by the Executive Officer's designee.

(iii) Amount of refrigerant leak shall be determined, for each refrigeration system, by recording the total capacity of refrigerant charge in each refrigeration system, the quantity of any additional refrigerant charge to each refrigeration system, as defined in (c)(1), and the date of each charge. The quantity of additional refrigerant charge shall be determined by weighing the refrigerant charging container before and after each charge, using equipment that is accurate to the nearest pound.

(iv) An examination for deficiencies which may cause refrigerant leakage.

(B) An annual maintenance program for refrigeration systems containing Class II refrigerants has been established to ensure that the system is operating pursuant to the manufacturer's specification and that it does not have any refrigerant leaks. This program shall consist of all of the following:

(i) An inspection for leaks by a certified technician which includes an examination for deficiencies which may cause refrigerant leakage.

(ii) A written record of the quantity of any additional refrigerant charge to each refrigeration system. The quantity of additional refrigerant charge shall be determined by weighing the refrigerant charging container before and after each charge, using equipment that is accurate to the nearest pound.

(C) A Registration Plan for the entire facility has been submitted to the District by January 1, 1996 and every two years thereafter. This Registration Plan shall contain:

(i) number of refrigeration systems in operation;

(ii) type of refrigerants in each refrigeration system;

(iii) amount of refrigerant in each refrigeration system;

(iv) date of last annual audit or maintenance performed for each refrigeration system; and

(v) amount of refrigerant charged every year.

(3) On and after January 1, 1992, any person who owns or operates a refrigeration system that has a refrigerant leak as defined in paragraph (c)(18) shall ensure that the leak is repaired no later than 14 calendar days after the leak has been discovered or should have been discovered. The owner or operator shall maintain a log of repair activities beginning at the time the leak is discovered and ending at the time when the leak has been repaired. The refrigeration system shall be verified by a certified technician to be leak free before any refrigerant is added to the system.

(4) On or after November 14, 1994, no person shall sell, distribute, offer for sale or distribution, or purchase any Class I or Class II refrigerant for use as a refrigerant to any person unless:

(A) The buyer is certified pursuant to Part 82 of Title 40 of the Code of Federal Regulations;

(B) The refrigerant is sold only for eventual resale to certified technicians or to refrigeration system manufacturers;

(C) The refrigerant is contained in a refrigeration system; or

(D) The refrigerant is charged into a refrigeration system by a certified technician.

(5) Effective October 18, 1994 until May 15, 1995, no person shall sell or offer for sale any Class I or Class II refrigerant consisting wholly or in part of used refrigerant unless the refrigerant has been reclaimed by a certified reclaimer.

(6) No person reclaiming refrigerants shall release into the atmosphere more than 1.5 percent of the refrigerant received for reclamation.

(e) Recordkeeping

(1) On and after January 1, 1992, any person owning or operating any refrigeration system is required to maintain the following records for each refrigeration system:

(A) A report demonstrating compliance with paragraph (d)(2) and repairs required by paragraph (d)(3), which includes the following information:

(i) Date of annual audit and annual maintenance program;

(ii) All work completed for each refrigeration system to prevent or repair leaks, including results of leak testing and leak determinations;

(iii) Name(s) of the person who completed the inspection and repair, and name, address, and telephone number of the company the person is representing;

(iv) The permit number of the recycling or recovery equipment;

(v) The log of repair activities; and

(vi) Technician certificate type.

(B) A log of the quantity of each additional refrigerant charged to the refrigeration system and the date of each charge.

(C) A log of malfunctions of the refrigeration system, other than that determined in section (d)(2) and (d)(3), including the following:

(i) The cause of the malfunction; and

(ii) The type of repairs required and the date the repairs were completed.

(D) If refrigerant is recycled off-site, a transportation bill-of-lading (or other transportation document as approved by the Executive Officer's designee) indicating the name and location of the facility from which the refrigerant is shipped, the quantity of refrigerant transported, destination (company name, phone number, and location) and date of transportation.

(E) The quantity (in pounds) of Class I or Class II refrigerants purchased or used in the District in a calendar year and the name and address of the refrigerant supplier.

(2) On and after July 1, 1991, any person who receives refrigerant for recycling or reclaiming from off-site locations shall maintain copies of all transportation documents as required in section (e)(1)(D) for each shipment of refrigerant received.

(3) Records and reports required under sections (e)(1)(A), (e)(1)(B), and (e)(1)(C) shall be generated by a Certified Auditor or a certified technician. Annual audits and maintenance records shall be in a format approved in writing by the Executive Officer's designee.

(4) All persons who sell or distribute any Class I or Class II refrigerant shall retain invoices that indicate the name of the purchaser, the date of sale, and the quantity of refrigerant purchased.

(5) Purchasers of any Class I or Class II refrigerant who employ certified technicians shall provide evidence that at least one technician is properly certified to the wholesaler who sells them refrigerant. The wholesaler shall keep this information on file and may sell refrigerant to the purchaser or authorized representative even if such purchaser or authorized representative is not a properly certified technician. The purchaser must notify the wholesaler in the event that the purchaser no longer employs at least one properly certified technician.

(6) Reclaimers shall maintain records of the names and addresses of persons sending them material for reclamation and the quantity of the material (the

combined mass in pounds of refrigerant and contaminants) sent to them for reclamation.

(7) Reclaimers shall maintain records of the quantity of material sent to them for reclamation, the mass in pounds of refrigerant reclaimed, and the mass in pounds of waste product.

(8) On and after October 14, 1994, any person owning and operating an approved recycling or recovery equipment shall maintain the following records as required by paragraph (d)(1)(D), which includes the following information:

(A) Date of semi-annual inspection;

(B) All work completed for each recycling or recovery system to prevent or repair leaks, including results of leak testing and leak determinations;

(C) Name(s) of the person who completed the inspection and repair, and name, address, and telephone number of the company the person is representing; and

(D) The permit number of the recycling or recovery equipment.

(9) Records and reports as required under sections (e)(1), (e)(2), (e)(4), (e)(5), (e)(6), (e)(7), and (e)(8) shall be maintained for not less than 3 years after their creation and shall be made available to the Executive Officer's designee upon request.

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Title 40: Protection of Environment

PART 82—PROTECTION OF STRATOSPHERIC OZONE

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Subpart F—Recycling and Emissions Reduction

Source: 58 FR 28712, May 14, 1993, unless otherwise noted.

§ 82.150 Purpose and scope.

(a) The purpose of this subpart is to reduce emissions of class I and class II refrigerants and their substitutes to the lowest achievable level by maximizing the recapture and recycling of such refrigerants during the service, maintenance, repair, and disposal of appliances and restricting the sale of refrigerants consisting in whole or in part of a class I and class II ODS in accordance with Title VI of the Clean Air Act.

(b) This subpart applies to any person servicing, maintaining, or repairing appliances. This subpart also applies to persons disposing of appliances, including small appliances and motor vehicle air conditioners. In addition, this subpart applies to refrigerant reclaimers, technician certifying programs, appliance owners and operators, manufacturers of appliances, manufacturers of recycling and recovery equipment, approved recycling and recovery equipment testing organizations, persons selling class I or class II refrigerants or offering class I or class II refrigerants for sale, and persons purchasing class I or class II refrigerants.

[69 FR 11978, Mar. 12, 2004]

§ 82.152 Definitions.

Appliance means any device which contains and uses a refrigerant and which is used for household or commercial purposes, including any air conditioner, refrigerator, chiller, or freezer.

Apprentice means any person who is currently registered as an apprentice in service, maintenance, repair, or disposal of appliances with the U.S. Department of Labor's Bureau of Apprenticeship and Training (or a State Apprenticeship Council recognized by the Bureau of Apprenticeship and Training). If more than two years have elapsed since the person first registered as an apprentice with the Bureau of Apprenticeship and Training (or a State Apprenticeship Council recognized by the Bureau of Apprenticeship and Training), the person shall not be considered an apprentice.

Approved equipment testing organization means any organization which has applied for and received approval from the Administrator pursuant to §82.160.

Certified refrigerant recovery or recycling equipment means equipment manufactured before November 15, 1993, that meets the standards in §82.158(c), (e), or (g); equipment certified by an approved equipment testing organization to meet the standards in §82.158(b), (d), or (f); or equipment certified pursuant to §82.36(a).

Commercial refrigeration means, for the purposes of §82.156(i), the refrigeration appliances utilized in the

retail food and cold storage warehouse sectors. Retail food includes the refrigeration equipment found in supermarkets, convenience stores, restaurants and other food service establishments. Cold storage includes the equipment used to store meat, produce, dairy products, and other perishable goods. All of the equipment contains large refrigerant charges, typically over 75 pounds.

Critical component means, for the purposes of §82.156(i), a component without which industrial process refrigeration equipment will not function, will be unsafe in its intended environment, and/or will be subject to failures that would cause the industrial process served by the refrigeration appliance to be unsafe.

Custom-built means, for the purposes of §82.156(i), that the equipment or any of its critical components cannot be purchased and/or installed without being uniquely designed, fabricated and/or assembled to satisfy a specific set of industrial process conditions.

Disposal means the process leading to and including:

(1) The discharge, deposit, dumping or placing of any discarded appliance into or on any land or water;

(2) The disassembly of any appliance for discharge, deposit, dumping or placing of its discarded component parts into or on any land or water; or

(3) The disassembly of any appliance for reuse of its component parts.

Follow-up verification test means, for the purposes of §82.156(i), those tests that involve checking the repairs within 30 days of the appliance's returning to normal operating characteristics and conditions. Follow-up verification tests for appliances from which the refrigerant charge has been evacuated means a test conducted after the appliance or portion of the appliance has resumed operation at normal operating characteristics and conditions of temperature and pressure, except in cases where sound professional judgment dictates that these tests will be more meaningful if performed prior to the return to normal operating characteristics and conditions. A follow-up verification test with respect to repairs conducted without evacuation of the refrigerant charge means a reverification test conducted after the initial verification test and usually within 30 days of normal operating conditions. Where an appliance is not evacuated, it is only necessary to conclude any required changes in pressure, temperature or other conditions to return the appliance to normal operating characteristics and conditions.

Full charge means the amount of refrigerant required for normal operating characteristics and conditions of the appliance as determined by using one or a combination of the following four methods:

(1) Use the equipment manufacturer's determination of the correct full charge for the equipment;

(2) Determine the full charge by making appropriate calculations based on component sizes, density of refrigerant, volume of piping, and other relevant considerations;

(3) Use actual measurements of the amount of refrigerant added or evacuated from the appliance; and/or

(4) Use an established range based on the best available data regarding the normal operating characteristics and conditions for the appliance, where the midpoint of the range will serve as the full charge, and where records are maintained in accordance with §82.166(q).

High-pressure appliance means an appliance that uses a refrigerant with a liquid phase saturation pressure between 170 psia and 355 psia at 104 °F. This definition includes but is not limited to appliances using R–401A, R–409A, R–401B, R–411A, R–22, R–411B, R–502, R–402B, R–408A, and R–402A.

Industrial process refrigeration means, for the purposes of §82.156(i), complex customized appliances used in the chemical, pharmaceutical, petrochemical and manufacturing industries. These appliances are directly linked to the industrial process. This sector also includes industrial ice machines, appliances used directly in the generation of electricity, and ice rinks. Where one appliance is used for both industrial process refrigeration and other applications, it will be considered industrial process refrigeration equipment if 50 percent or more of its operating capacity is used for industrial process refrigeration.

Industrial process shutdown means, for the purposes of §82.156(i), that an industrial process or facility temporarily ceases to operate or manufacture whatever is being produced at that facility.

Initial verification test means, for the purposes of §82.156(i), those leak tests that are conducted as soon as practicable after the repair is completed. An initial verification test, with regard to the leak repairs that require the evacuation of the appliance or portion of the appliance, means a test conducted prior to the replacement of the full refrigerant charge and before the appliance or portion of the appliance has reached operation at normal operating characteristics and conditions of temperature and pressure. An initial verification test with regard to repairs conducted without the evacuation of the refrigerant charge means a test conducted as soon as practicable after the conclusion of the repair work.

Leak rate means the rate at which an appliance is losing refrigerant, measured between refrigerant charges. The leak rate is expressed in terms of the percentage of the appliance's full charge that would be lost over a 12-month period if the current rate of loss were to continue over that period. The rate is calculated using only one of the following methods for all appliances located at an operating facility.

(1) Method 1. (i) Step 1. Take the number of pounds of refrigerant added to the appliance to return it to a full charge and divide it by the number of pounds of refrigerant the appliance normally contains at full charge;

(ii) Step 2. Take the shorter of the number of days that have passed since the last day refrigerant was added or 365 days and divide that number by 365 days;

(iii) Step 3. Take the number calculated in Step 1. and divide it by the number calculated in Step 2.; and

(iv) Step 4. Multiply the number calculated in Step 3. by 100 to calculate a percentage. This method is summarized in the following formula:

$$\text{Leak rate (\% per year)} = \frac{\text{pounds of refrigerant added}}{\text{pounds of refrigerant in full charge}} \times \frac{365\ \textit{days/year}}{\textit{shorter}\text{ of: \# days since refrigerant last added or 365 days}} \times 100\%$$

(2) Method 2. (i) Step 1. Take the sum of the quantity of refrigerant added to the appliance over the previous 365-day period (or over the period that has passed since leaks in the appliance were last repaired, if that period is less than one year),

(ii) Step 2. Divide the result of Step 1. by the quantity (*e.g.,* pounds) of refrigerant the appliance normally contains at full charge, and

(iii) Step 3. Multiply the result of Step 2. by 100 to obtain a percentage. This method is summarized in the following formula:

$$\text{Leak rate (\% per year)} = \frac{\text{pounds of refrigerant added over past 365 days (or since leaks were last repaired, if that period is less than one year)}}{\text{pounds of refrigerant in full charge}} \times 100\%$$

Low-loss fitting means any device that is intended to establish a connection between hoses, appliances, or recovery or recycling machines and that is designed to close automatically or to be closed manually when disconnected, minimizing the release of refrigerant from hoses, appliances, and recovery or recycling machines.

Low-pressure appliance means an appliance that uses a refrigerant with a liquid phase saturation pressure below 45 psia at 104 °F. This definition includes but is not limited to appliances using R–11, R–123, and R–113.

Major maintenance, service, or repair means any maintenance, service, or repair that involves the removal of any or all of the following appliance components: compressor, condenser, evaporator, or auxiliary heat exchange coil; or any maintenance, service, or repair that involves uncovering an opening of more than four (4) square inches of "flow area" for more than 15 minutes.

Medium-pressure appliance means an appliance that uses a refrigerant with a liquid phase saturation pressure between 45 psia and 170 psia at 104 °F. This definition includes but is not limited to appliances using R–114, R–124, R–12, R–401C, R–406A, and R–500.

Motor vehicle air conditioner (MVAC) means any appliance that is a motor vehicle air conditioner as defined in 40 CFR part 82, subpart B.

MVAC-like appliance means mechanical vapor compression, open-drive compressor appliances with a normal charge of 20 pounds or less of refrigerant used to cool the driver's or passenger's compartment of an off-road motor vehicle. This includes the air-conditioning equipment found on agricultural or construction vehicles. This definition is not intended to cover appliances using R–22 refrigerant.

Normal operating characteristics or conditions means, for the purposes of §82.156(i), temperatures, pressures, fluid flows, speeds and other characteristics that would normally be expected for a given process load and ambient condition during operation. Normal operating characteristics and conditions are marked by the absence of atypical conditions affecting the operation of the refrigeration appliance.

Normally containing a quantity of refrigerant means containing the quantity of refrigerant within the appliance or appliance component when the appliance is operating with a full charge of refrigerant.

One-time expansion device means an appliance that relies on the one-time release of its refrigerant charge to the environment in order to provide a cooling effect.

Opening an appliance means any service, maintenance, repair, or disposal of an appliance that would release refrigerant from the appliance to the atmosphere unless the refrigerant was recovered previously from the appliance. Connecting and disconnecting hoses and gauges to and from the appliance to measure pressures within the appliance and to add refrigerant to or recover refrigerant from the appliance shall not be considered "opening."

Parent company means an individual, corporation, partnership, association, joint-stock company, or an unincorporated organization that can direct or cause the direction of management and policies of another entity, through the ownership of shares or otherwise.

Person means any individual or legal entity, including an individual, corporation, partnership, association, state, municipality, political subdivision of a state, Indian tribe, and any agency, department, or instrumentality of the United States, and any officer, agent, or employee thereof.

Process stub means a length of tubing that provides access to the refrigerant inside a small appliance or room air conditioner and that can be resealed at the conclusion of repair or service.

Reclaim refrigerant means to reprocess refrigerant to all of the specifications in appendix A to 40 CFR part 82, subpart F (based on ARI Standard 700–1995, Specification for Fluorocarbons and Other Refrigerants) that are applicable to that refrigerant and to verify that the refrigerant meets these specifications using the analytical methodology prescribed in section 5 of appendix A of 40 CFR part 82, subpart F.

Recover refrigerant means to remove refrigerant in any condition from an appliance and to store it in an external container without necessarily testing or processing it in any way.

Recovery efficiency means the percentage of refrigerant in an appliance that is recovered by a piece of recycling or recovery equipment.

Recycle refrigerant means to extract refrigerant from an appliance and clean refrigerant for reuse without meeting all of the requirements for reclamation. In general, recycled refrigerant is refrigerant that is cleaned using oil separation and single or multiple passes through devices, such as replaceable core filter-driers, which reduce moisture, acidity, and particulate matter. These procedures are usually implemented at the field job site.

Refrigerant means, for purposes of this subpart, any substance consisting in part or whole of a class I or class II ozone-depleting substance that is used for heat transfer purposes and provides a cooling effect.

Refrigerant circuit means the parts of an appliance that are normally connected to each other (or are separated only by internal valves) and are designed to contain refrigerant.

Self-contained recovery equipment means refrigerant recovery or recycling equipment that is capable of removing the refrigerant from an appliance without the assistance of components contained in the appliance.

Small appliance means any appliance that is fully manufactured, charged, and hermetically sealed in a factory with five (5) pounds or less of a class I or class II substance used as a refrigerant, including, but not limited to, refrigerators and freezers (designed for home, commercial, or consumer use), medical or industrial research refrigeration equipment, room air conditioners (including window air conditioners and packaged terminal air heat pumps), dehumidifiers, under-the-counter ice makers, vending machines, and drinking water coolers.

Substitute means any chemical or product, whether existing or new, that is used by any person as an EPA approved replacement for a class I or II ozone-depleting substance in a given refrigeration or air-conditioning end-use.

Suitable replacement refrigerant means, for the purposes of §82.156(i)(7)(i), a refrigerant that is acceptable under section 612(c) of the Clean Air Act Amendments of 1990 and all regulations promulgated under that section, compatible with other materials with which it may come into contact, and able to achieve the temperatures required for the affected industrial process in a technically feasible manner.

System-dependent recovery equipment means refrigerant recovery equipment that requires the assistance of components contained in an appliance to remove the refrigerant from the appliance.

System mothballing means the intentional shutting down of a refrigeration appliance undertaken for an extended period of time by the owners or operators of that facility, where the refrigerant has been evacuated from the appliance or the affected isolated section of the appliance, at least to atmospheric pressure.

Technician means any person who performs maintenance, service, or repair, that could be reasonably expected to release refrigerants from appliances, except for MVACs, into the atmosphere. Technician also means any person who performs disposal of appliances, except for small appliances, MVACs, and MVAC-like appliances, that could be reasonably expected to release refrigerants from the appliances into the atmosphere. Performing maintenance, service, repair, or disposal could be reasonably expected to release refrigerants only if the activity is reasonably expected to violate the integrity of the refrigerant circuit. Activities reasonably expected to violate the integrity of the refrigerant circuit include activities such as attaching and detaching hoses and gauges to and from the appliance to add or remove refrigerant or to measure pressure and adding refrigerant to and removing refrigerant from the appliance. Activities such as painting the appliance, rewiring an external electrical circuit, replacing insulation on a length of pipe, or tightening nuts and bolts on the appliance are not reasonably expected to violate the integrity of the refrigerant circuit. Performing maintenance, service, repair, or disposal of appliances that have been evacuated pursuant to §82.156 could not be reasonably expected to release refrigerants from the appliance unless the maintenance, service, or repair consists of adding refrigerant to the appliance. Technician includes but is not limited to installers, contractor employees, in-house service personnel, and in some cases owners and/or operators.

Very high-pressure appliance means an appliance that uses a refrigerant with a critical temperature below 104 °F or with a liquid phase saturation pressure above 355 psia at 104 °F. This definition includes but is not limited to appliances using R–13 or R–503.

Voluntary certification program means a technician testing program operated by a person before that person obtained approval of a technician certification program pursuant to §82.161(c).

[58 FR 28712, May 14, 1993, as amended at 59 FR 42956, Aug. 19, 1994; 59 FR 55925, Nov. 9, 1994; 60 FR 40439, Aug. 8, 1995; 68 FR 43806, July 24, 2003; 69 FR 11978, Mar. 12, 2004; 70 FR 1991, Jan. 11, 2005; 70 FR 19278, Apr. 13, 2005]

§ 82.154 Prohibitions.

(a)(1) Effective June 13, 2005, 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:

(i) Ammonia in commercial or industrial process refrigeration or in absorption units;

(ii) Hydrocarbons in industrial process refrigeration (processing of hydrocarbons);

(iii) Chlorine in industrial process refrigeration (processing of chlorine and chlorine compounds);

(iv) Carbon dioxide in any application;

(v) Nitrogen in any application; or

(vi) Water in any application.

(2) The knowing release of a refrigerant or non-exempt substitute subsequent to its recovery from an

appliance shall be considered a violation of this prohibition. De minimis releases associated with good faith attempts to recycle or recover refrigerants or non-exempt substitutes are not subject to this prohibition. Refrigerant releases shall be considered de minimis only if they occur when:

(i) The required practices set forth in §82.156 are observed, recovery or recycling machines that meet the requirements set forth in §82.158 are used, and the technician certification provisions set forth in §82.161 are observed; or

(ii) The requirements set forth in subpart B of this part are observed.

(b) No person may open appliances except MVACs and MVAC-like appliances for maintenance, service, or repair, and no person may dispose of appliances except for small appliances, MVACs, and MVAC-like appliances:

(1) Without observing the required practices set forth in §82.156; and

(2) Without using equipment that is certified for that type of appliance pursuant to §82.158.

(c) No person may manufacture or import recycling or recovery equipment for use during the maintenance, service, or repair of appliances except MVACs and MVAC-like appliances, and no person may manufacture or import recycling or recovery equipment for use during the disposal of appliances except small appliances, MVACs, and MVAC-like appliances, unless the equipment is certified pursuant to §82.158 (b) or (d), as applicable.

(d) Effective June 14, 1993, no person shall alter the design of certified refrigerant recycling or recovery equipment in a way that would affect the equipment's ability to meet the certification standards set forth in §82.158 without resubmitting the altered design for certification testing. Until it is tested and shown to meet the certification standards set forth in §82.158, equipment so altered will be considered uncertified for the purposes of §82.158.

(e) Effective August 12, 1993, no person may open appliances except MVACs for maintenance, service, or repair, and no person may dispose of appliances except for small appliances, MVACs, and MVAC-like appliances, unless such person has certified to the Administrator pursuant to §82.162 that such person has acquired certified recovery or recycling equipment and is complying with the applicable requirements of this subpart.

(f) Effective August 12, 1993, no person may recover refrigerant from small appliances, MVACs, and MVAC-like appliances for purposes of disposal of these appliances unless such person has certified to the Administrator pursuant to §82.162 that such person has acquired recovery equipment that meets the standards set forth in §82.158 (l) and/or (m), as applicable, and that such person is complying with the applicable requirements of this subpart.

(g) No person may sell, distribute, or offer for sale or distribution for use as a refrigerant any class I or class II substance consisting wholly or in part of used refrigerant unless:

(1) The class I or class II substance has been reclaimed as defined in §82.152 by a person who has been certified as a reclaimer pursuant to §82.164;

(2) The class I or class II substance was used only in an MVAC or MVAC-like appliance and is to be used only in an MVAC or MVAC-like appliance and recycled in accordance with §82.34(d);

(3) The class I or class II substance is contained in an appliance that is sold or offered for sale together with

the class I or class II substance;

(4) The class I or class II substance is being transferred between or among a parent company and one or more of its subsidiaries, or between or among subsidiaries having the same parent company; or

(5) The class I or class II substance is being transferred between or among a Federal agency or department and a facility or facilities owned by the same Federal agency or department.

(h) [Reserved]

(i) Effective August 12, 1993, no person reclaiming refrigerant may release more than 1.5% of the refrigerant received by them.

(j) Effective November 15, 1993, no person may sell or distribute, or offer for sale or distribution, any appliances, except small appliances, unless such equipment is equipped with a servicing aperture to facilitate the removal of refrigerant at servicing and disposal.

(k) Effective November 15, 1993, no person may sell or distribute, or offer for sale or distribution any small appliance unless such equipment is equipped with a process stub to facilitate the removal of refrigerant at servicing and disposal.

(l) No technician training or testing program may issue certificates pursuant to §82.161 unless the program complies with all of the standards of §82.161 and appendix D, and has been granted approval.

(m) No person may sell or distribute, or offer for sale or distribution, any substance that consists in whole or in part of a class I or class II substance for use as a refrigerant to any person unless:

(1) The buyer has been certified as a Type I, Type II, Type III, or Universal technician pursuant to §82.161;

(2) The buyer complies with §82.166(b) and employs at least one technician who is certified as a Type I, Type II, Type III, or Universal technician in accordance with §82.161;

(3) The buyer has been certified in accordance with 40 CFR part 82, subpart B and the refrigerant is either R–12 or an approved substitute consisting wholly or in part of a class I or class II substance for use in motor vehicle air conditioners in accordance with 40 CFR part 82, subpart G;

(4) The buyer complies with §82.166 (b) and employs at least one technician who is certified in accordance with 40 CFR part 82, subpart B, and the refrigerant is either R–12 or an approved substitute consisting wholly or in part of a class I or class II substance for use in motor vehicle air conditioners pursuant to 40 CFR part 82, subpart G. Nothing in this provision shall be construed to relieve persons of the requirements of §82.34(b) or §82.42 (b);

(5) The refrigerant is sold only for eventual resale to certified technicians or to appliance manufacturers (*e.g.,* sold by a manufacturer to a wholesaler, sold by a technician to a reclaimer);

(6) The refrigerant is sold to an appliance manufacturer;

(7) The refrigerant is contained in an appliance with a fully assembled refrigerant circuit; or

(8) The refrigerant is charged into an appliance by a certified technician or an apprentice during maintenance, service, or repair of the appliance.

(n) It is a violation of this subpart to accept a signed statement pursuant to §82.156(f)(2) if the person knew

or had reason to know that such a signed statement is false.

(o) Rules stayed for consideration. Not withstanding any other provisions of this subpart, the effectiveness of 40 CFR 82.154(m), only as it applies to refrigerant contained in appliances without fully assembled refrigerant circuits, is stayed from April 27, 1995, until EPA takes final action on its reconsideration of these provisions. EPA will publish any such final action in theFederal Register.

(p) No person may manufacture or import one-time expansion devices that contain other than exempted refrigerants.

[58 FR 28712, May 14, 1993, as amended at 59 FR 42956, Aug. 19, 1994; 59 FR 55926, Nov. 9, 1994; 60 FR 14610, Mar. 17, 1995; 60 FR 24680, May 9, 1995; 61 FR 7726, Feb. 29, 1996; 61 FR 68508, Dec. 27, 1996; 68 FR 43806, July 24, 2003; 69 FR 11979, Mar. 12, 2004; 70 FR 19278, Apr. 13, 2005]

§ 82.156 Required practices.

(a) All persons disposing of appliances, except for small appliances, MVACs, and MVAC-like appliances must evacuate the refrigerant, including all the liquid refrigerant, in the entire unit to a recovery or recycling machine certified pursuant to §82.158. All persons opening appliances except for MVACs and MVAC-like appliances for maintenance, service, or repair must evacuate the refrigerant, including all the liquid refrigerant (except as provided in paragraph (a)(2)(i)(B) of this section), in either the entire unit or the part to be serviced (if the latter can be isolated) to a system receiver (*e.g.,* the remaining portions of the appliance, or a specific vessel within the appliance) or a recovery or recycling machine certified pursuant to §82.158. A technician must verify that the applicable level of evacuation has been reached in the appliance or the part before it is opened.

(1) Persons opening appliances except for small appliances, MVACs, and MVAC-like appliances for maintenance, service, or repair must evacuate to the levels in table 1 before opening the appliance, unless

(i) Evacuation of the appliance to the atmosphere is not to be performed after completion of the maintenance, service, or repair, and the maintenance, service, or repair is not major as defined at §82.152; or

(ii) Due to leaks in the appliance, evacuation to the levels in table 1 is not attainable, or would substantially contaminate the refrigerant being recovered; or

(iii) The recycling or recovery equipment was certified pursuant to §82.158(b)(2). In any of these cases, the requirements of §82.156(a)(2) must be followed.

(2)(i) If evacuation of the appliance to the atmosphere is not to be performed after completion of the maintenance, service, or repair, and if the maintenance, service, or repair is not major as defined at §82.152, the appliance must:

(A) Be evacuated to a pressure no higher than 0 psig before it is opened if it is a high- or very high-pressure appliance;

(B) Be pressurized to a pressure no higher than 0 psig before it is opened if it is a low-pressure appliance. Persons must cover openings when isolation is not possible. Persons pressurizing low-pressure appliances that use refrigerants with boiling points at or below 85 degrees Fahrenheit at 29.9 inches of mercury (standard atmospheric pressure), (*e.g.* R–11 and R–123), must not use methods such as nitrogen, that require subsequent purging. Persons pressurizing low-pressure appliances that use refrigerants with boiling

points above 85 degrees Fahrenheit at 29.9 inches of mercury, *e.g.,* R–113, must use heat to raise the internal pressure of the appliance as much as possible, but may use nitrogen to raise the internal pressure of the appliance from the level attainable through use of heat to atmospheric pressure; or

(C) For the purposes of oil changes, be evacuated or pressurized to a pressure no higher than 5 psig, before it is opened; or drain the oil into a system receiver to be evacuated or pressurized to a pressure no higher than 5 psig.

(ii) If, due to leaks in the appliance, evacuation to the levels in table 1 is not attainable, or would substantially contaminate the refrigerant being recovered, persons opening the appliance must:

(A) Isolate leaking from non-leaking components wherever possible;

(B) Evacuate non-leaking components to be opened to the levels specified in table 1; and

(C) Evacuate leaking components to be opened to the lowest level that can be attained without substantially contaminating the refrigerant. In no case shall this level exceed 0 psig.

(iii) If the recycling or recovery equipment was certified pursuant to §82.158(b)(2), technicians must follow the manufacturer's directions for achieving the required recovery efficiency.

(3) Persons disposing of appliances except for small appliances, MVACs, and MVAC-like appliances, must evacuate to the levels in table 1 unless, due to leaks in the appliance, evacuation to the levels in table 1 is not attainable, or would substantially contaminate the refrigerant being recovered. If, due to leaks in the appliance, evacuation to the levels in table 1 is not attainable, or would substantially contaminate the refrigerant being recovered, persons disposing of the appliance must:

(i) Isolate leaking from non-leaking components wherever possible;

(ii) Evacuate non-leaking components to the levels specified in table 1; and

(iii) Evacuate leaking components to the lowest level that can be attained without substantially contaminating the refrigerant. In no case shall this level exceed 0 psig.

Table 1—Required Levels of Evacuation for Appliances

[Except for small appliances, MVACs, and MVAC-like appliances]

Type of appliance	Inches of Hg vacuum (relative to standard atmospheric pressure of 29.9 inches Hg)	
	Using recovery or recycling equipment manufactured or imported before November 15, 1993	**Using recovery or recycling equipment manufactured or imported on or after November 15, 1993**
Very high-pressure appliance	0	0
High-pressure appliance, or isolated component of such appliance, normally containing less than 200 pounds of refrigerant	0	0

High-pressure appliance, or isolated component of such appliance, normally containing 200 pounds or more of refrigerant	4	10
Medium-pressure appliance, or isolated component of such appliance, normally containing less than 200 pounds of refrigerant	4	10
Medium-pressure appliance, or isolated component of such appliance, normally containing 200 pounds or more of refrigerant	4	15
Low-pressure appliance	25	25 mm Hg absolute

(4) Persons opening small appliances for maintenance, service, or repair must:

(i) When using recycling and recovery equipment manufactured before November 15, 1993, recover 80% of the refrigerant in the small appliance; or

(ii) When using recycling or recovery equipment manufactured on or after November 15, 1993, recover 90% of the refrigerant in the appliance when the compressor in the appliance is operating, or 80% of the refrigerant in the appliance when the compressor in the appliance is not operating; or

(iii) Evacuate the small appliance to four inches of mercury vacuum.

(5) Persons opening MVAC-like appliances for maintenance, service, or repair may do so only while properly using, as defined at §82.32(e), recycling or recovery equipment certified pursuant to §82.158 (f) or (g), as applicable.

(b) All persons opening appliances except for small appliances, MVACs, and MVAC-like appliances for maintenance, service, or repair and all persons disposing of appliances except small appliances, MVACs, and MVAC-like appliances must have at least one piece of certified, self-contained recovery or recycling equipment available at their place of business. Persons who maintain, service, repair, or dispose of only appliances that they own and that contain pump-out units are exempt from this requirement. This exemption does not relieve such persons from other applicable requirements of this section.

(c) System-dependent equipment shall not be used with appliances normally containing more than 15 pounds of refrigerant, unless the system-dependent equipment is permanently attached to the appliance as a pump-out unit.

(d) All recovery or recycling equipment shall be used in accordance with the manufacturer's directions unless such directions conflict with the requirements of this subpart.

(e) Refrigerant may be returned to the appliance from which it is recovered or to another appliance owned by the same person without being recycled or reclaimed, unless the appliance is an MVAC or MVAC-like appliance.

(f) Effective July 13, 1993, persons who take the final step in the disposal process (including but not limited to scrap recyclers and landfill operators) of a small appliance, room air conditioning, MVACs, or MVAC-like appliances must either:

(1) Recover any remaining refrigerant from the appliance in accordance with paragraph (g) or (h) of this section, as applicable; or

(2) Verify that the refrigerant has been evacuated from the appliance or shipment of appliances previously. Such verification must include a signed statement from the person from whom the appliance or shipment of appliances is obtained that all refrigerant that had not leaked previously has been recovered from the appliance or shipment of appliances in accordance with paragraph (g) or (h) of this section, as applicable. This statement must include the name and address of the person who recovered the refrigerant and the date the refrigerant was recovered or a contract that refrigerant will be removed prior to delivery.

(3) Persons complying with paragraph (f)(2) of this section must notify suppliers of appliances that refrigerant must be properly removed before delivery of the items to the facility. The form of this notification may be warning signs, letters to suppliers, or other equivalent means.

(g) All persons recovering refrigerant from MVACs and MVAC-like appliances for purposes of disposal of these appliances must reduce the system pressure to or below 102 mm of mercury vacuum, using equipment that meets the standards set forth in §82.158(l).

(h) All persons recovering the refrigerant from small appliances for purposes of disposal of these appliances must either:

(1) Recover 90% of the refrigerant in the appliance when the compressor in the appliance is operating, or 80% of the refrigerant in the appliance when the compressor in the appliance is not operating; or

(2) Evacuate the small appliance to four inches of mercury vacuum.

(i)(1) Owners or operators of commercial refrigeration equipment normally containing more than 50 pounds of refrigerant must have leaks repaired in accordance with paragraph (i)(9) of this section, if the appliance is leaking at a rate such that the loss of refrigerant will exceed 35 percent of the total charge during a 12-month period, except as described in paragraphs (i)(6), (i)(8), and (i)(10) of this section and paragraphs (i)(1)(i), (i)(1)(ii), and (i)(1)(iii) of this section. Repairs must bring the annual leak rate to below 35 percent.

(i) If the owners or operators of the federally-owned commercial refrigerant appliances determine that the leaks cannot be repaired in accordance with paragraph (i)(9) of this section and that an extension in accordance with the requirements discussed in this paragraph (i)(1)(i) of this section apply, they must document all repair efforts, and notify EPA of their inability to comply within the 30-day repair requirement, and the reason for the inability must be submitted to EPA in accordance with §82.166(n). Such notification must be made within 30 days of discovering the leaks. EPA will determine if the extension requested in accordance with the requirements discussed in paragraph (i)(1)(i) of this section is justified. If the extension is not justified, EPA will notify the owner/operator within 30 days of receipt of the notification.

(ii) Owners or operators of federally-owned commercial refrigeration equipment may have more than 30 days to repair leaks if the refrigeration appliance is located in an area subject to radiological contamination or where the shutting down of the appliance will directly lead to radiological contamination. Only the additional time needed to conduct and complete repairs in a safe working environment will be permitted.

(iii) Owners or operators of federally-owned commercial refrigeration equipment requesting or who are granted time extensions under this paragraph must comply with paragraphs (i)(3) and (i)(4) of this section.

(2) The owners or operators of industrial process refrigeration equipment normally containing more than 50 pounds of refrigerant must have leaks repaired if the appliance is leaking at a rate such that the loss of refrigerant will exceed 35 percent of the total charge during a 12-month period in accordance with paragraph (i)(9) of this section, except as described in paragraphs (i)(6), (i)(7) and (i)(10) of this section, and

paragraphs (i)(2)(i) and (i)(2)(ii) of this section. Repairs must bring annual leak rates to below 35 percent during a 12-month period. If the owners or operators of the industrial process refrigeration equipment determine that the leak rate cannot be brought to below 35 percent during a 12-month period within 30 days (or 120 days, where an industrial process shutdown in accordance with paragraph (i)(2)(ii) of this section is required,) and in accordance with paragraph (i)(9) of this section, and that an extension in accordance with the requirements discussed in this paragraph apply, the owners or operators of the appliance must document all repair efforts, and notify EPA of the reason for the inability in accordance with §82.166(n) within 30 days of making this determination. Owners or operators who obtain an extension pursuant to this section or elect to utilize the additional time provided in paragraph (i)(2)(i) of this section, must conduct all necessary leak repairs, if any, that do not require any additional time beyond the initial 30 or 120 days.

(i) The owners or operators of industrial process refrigeration equipment are permitted more than 30 days (or 120 days where an industrial process shutdown in accordance with paragraph (i)(2)(ii) of this section is required) to repair leaks, if the necessary parts are unavailable or if requirements of other applicable federal, state, or local regulations make a repair within 30 or 120 days impossible. Only the additional time needed to receive delivery of the necessary parts or to comply with the pertinent regulations will be permitted.

(ii) Owners or operators of industrial process refrigeration equipment will have a 120-day repair period, rather than a 30-day repair period, to repair leaks in instances where an industrial process shutdown is needed to repair a leak or leaks from industrial process refrigeration equipment.

(3) Owners or operators of industrial process refrigeration equipment and owners or operators of federally-owned commercial refrigeration equipment or of federally-owned comfort cooling appliances who are granted additional time under paragraphs (i)(1) or (i)(5) of this section, must have repairs performed in a manner that sound professional judgment indicates will bring the leak rate below the applicable allowable leak rate. When an industrial process shutdown has occurred or when repairs have been made while an appliance is mothballed, the owners or operators shall conduct an initial verification test at the conclusion of the repairs and a follow-up verification test. The follow-up verification test shall be conducted within 30 days of completing the repairs or within 30 days of bringing the appliance back on-line, if taken off-line, but no sooner than when the appliance has achieved normal operating characteristics and conditions. When repairs have been conducted without an industrial process shutdown or system mothballing, an initial verification test shall be conducted at the conclusion of the repairs, and a follow-up verification test shall be conducted within 30 days of the initial verification test. In all cases, the follow-up verification test shall be conducted at normal operating characteristics and conditions, unless sound professional judgment indicates that tests performed at normal operating characteristics and conditions will produce less reliable results, in which case the follow-up verification test shall be conducted at or near the normal operating pressure where practicable, and at or near the normal operating temperature where practicable.

(i) If the owners or operators of industrial process refrigeration equipment takes the appliance off-line, or if the owners or operators of federally-owned commercial refrigeration or of federally-owned comfort cooling appliances who are granted additional time under paragraphs (i)(1) or (i)(5) of this section take the appliance off-line, they cannot bring the appliance back on-line until an initial verification test indicates that the repairs undertaken in accordance with paragraphs (i)(1)(i), (ii), (iii), or (i)(2)(i) and (ii), or (5)(i), (ii), and (iii) of this section have been successfully completed, demonstrating the leak or leaks are repaired. The owners or operators of the industrial process refrigeration equipment, federally-owned commercial refrigeration appliances, or federally-owned comfort cooling appliances are exempted from this requirement only where the owners or operators will retrofit or retire the industrial process refrigeration equipment, federally-owned commercial refrigeration appliance, or federally-owned comfort cooling appliance in accordance with paragraph (i)(6) of this section. Under this exemption, the owner or operators may bring the industrial process refrigeration equipment, federally-owned commercial refrigeration appliance, or federally-owned comfort cooling appliance back on-line without successful completion of an initial verification test.

(ii) If the follow-up verification test indicates that the repairs to industrial process refrigeration equipment, federally-owned commercial refrigeration equipment, or federally-owned comfort cooling appliances have not been successful, the owner or operator must retrofit or retire the equipment in accordance with paragraph (i)(6) and any such longer time period as may apply under paragraphs (i)(7)(i), (ii) and (iii) or (i)(8)(i) and (ii) of this section. The owners and operators of the industrial process refrigeration equipment, federally-owned commercial refrigeration equipment, or federally-owned comfort cooling appliances are relieved of this requirement if the conditions of paragraphs (i)(3)(iv) and/or (i)(3)(v) of this section are met.

(iii) The owner or operator of industrial process refrigeration equipment that fails a follow-up verification test must notify EPA within 30 days of the failed follow-up verification test in accordance with §82.166(n).

(iv) The owner or operator is relieved of the obligation to retrofit or replace the industrial process refrigeration equipment as discussed in paragraph (i)(6) of this section if second repair efforts to fix the same leaks that were the subject of the first repair efforts are successfully completed within 30 days or 120 days where an industrial process shutdown is required, after the initial failed follow-up verification test. The second repair efforts are subject to the same verification requirements of paragraphs (i)(3), (i)(3) (i) and (ii) of this section. The owner or operator is required to notify EPA within 30 days of the successful follow-up verification test in accordance with §82.166(n) and the owner or operator is no longer subject to the obligation to retrofit or replace the appliance that arose as a consequence of the initial failure to verify that the leak repair efforts were successful.

(v) The owner or operator of industrial process refrigeration equipment is relieved of the obligation to retrofit or replace the equipment in accordance with paragraph (i)(6) of this section if within 180 days of the initial failed follow-up verification test, the owner or operator establishes that the appliance's annual leak rate does not exceed the applicable allowable annual leak rate, in accordance with paragraph (i)(4) of this section. If the appliance's owner or operator establishes that the appliance's annual leak rate does not exceed the applicable allowable annual leak rate, the owner or operator is required to notify EPA within 30 days of that determination in accordance with §82.166(n) and the owner or operator would no longer be subject to the obligation to retrofit or replace the equipment that arose as a consequence of the initial failure to verify that the leak repair efforts were successful.

(4) In the case of a failed follow-up verification test subject to paragraph (i)(3)(v) of this section, the determination of whether industrial process refrigeration equipment has an annual leak rate that exceeds the applicable allowable annual leak rate will be made in accordance with parameters identified by the owner or operator in its notice to EPA regarding the failure of the initial follow-up verification test, if those parameters are acceptable to EPA; otherwise by parameters selected by EPA. The determination must be based on the full charge for the affected industrial process refrigeration equipment. The leak rate determination parameters in the owner's or operator's notice will be considered acceptable unless EPA notifies the owners or operators within 30 days of receipt of the notice. Where EPA does not accept the parameters identified by the owner or operator in its notice, EPA will not provide additional time beyond the additional time permitted in paragraph (i)(3)(v) of this section unless specifically stated in the parameters selected by EPA.

(5) Owners or operators of comfort cooling appliances normally containing more than 50 pounds of refrigerant and not covered by paragraph (i)(1) or (i)(2) of this section must have leaks repaired in accordance with paragraph (i)(9) of this section if the appliance is leaking at a rate such that the loss of refrigerant will exceed 15 percent of the total charge during a 12-month period, except as described in paragraphs (i)(6), (i)(8) and (i)(10) of this section and paragraphs (i)(5)(i), (i)(5)(ii) and (i)(5)(iii) of this section. Repairs must bring the annual leak rate to below 15 percent.

(i) If the owners or operators of federally-owned comfort-cooling appliances determine that the leaks cannot be repaired in accordance with paragraph (i)(9) of this section and that an extension in accordance with the requirements discussed in paragraph (i)(5) of this section apply, they must document all repair efforts, and notify EPA of their inability to comply within the 30-day repair requirement, and the reason for the inability must be submitted to EPA in accordance with §82.166(n). Such notification must be made within 30 days of discovering that leak repair efforts cannot be completed within 30 days.

(ii) Owners or operators of federally-owned comfort-cooling appliances may have more than 30 days to repair leaks where the refrigeration appliance is located in an area subject to radiological contamination or where the shutting down of the appliance will directly lead to radiological contamination. Only the additional time needed to conduct and complete work in a safe environment will be permitted.

(iii) Owners or operators of federally-owned comfort-cooling appliances requesting, or who are granted, time extensions under this paragraph must comply with paragraphs (i)(3) and (i)(4) of this section.

(6) Owners or operators are not required to repair leaks as provided in paragraphs (i)(1), (i)(2), and (i)(5) of this section if, within 30 days of discovering a leak greater than the applicable allowable leak rate, or within 30 days of a failed follow-up verification test, or after making good faith efforts to repair the leaks as described in paragraph (i)(6)(i) of this section, they develop a one-year retrofit or retirement plan for the leaking appliance. Owners or operators who decide to retrofit the appliance must use a refrigerant or substitute with a lower or equivalent ozone-depleting potential than the previous refrigerant and must include such a change in the retrofit plan. Owners or operators who retire and replace the appliance must replace the appliance with an appliance that uses a refrigerant or substitute with a lower or equivalent ozone-depleting potential and must include such a change in the retirement plan. The retrofit or retirement plan (or a legible copy) must be kept at the site of the appliance. The original plan must be made available for EPA inspection upon request. The plan must be dated, and all work performed in accordance with the plan must be completed within one year of the plan's date, except as described in paragraphs (i)(6)(i), (i)(7), and (i)(8) of this section. Owners or operators are temporarily relieved of this obligation if the appliance has undergone system mothballing as defined in §82.152.

(i) If the owner or operator has made good faith efforts to repair leaks from the appliance in accordance with paragraphs (i)(1), (i)(2), or (i)(5) of this section and has decided prior to completing a follow-up verification test, to retrofit or retire the appliance in accordance with paragraph (i)(6) of this section, the owner or operator must develop a retrofit or retirement plan within 30 days of the decision to retrofit or retire the appliance. The owner or operator must complete the retrofit or retirement of the appliance within one year and 30 days of when the owner or operator discovered that the leak rate exceeded the applicable allowable leak rate, except as provided in paragraphs (i)(7) and (i)(8) of this section.

(ii) In all cases, subject to paragraph (i)(6)(i) of this section, the written plan shall be prepared no later than 30 days after the owner or operator has determined to proceed with retrofitting or retiring the appliance. All reports required under §82.166(o) shall be due at the time specified in the paragraph imposing the specific reporting requirement, or no later than 30 days after the decision to retrofit or retire the appliance, whichever is later.

(iii) In cases where the owner or operator of industrial process refrigeration equipment has made good faith efforts to retrofit or retire industrial process refrigeration equipment prior to August 8, 1995, and where these efforts are not complete, the owner or operator must develop a retrofit or retirement plan that will complete the retrofit or retirement of the affected appliance by August 8, 1996. This plan (or a legible copy) must be kept at the site of the appliance. The original must be made available for EPA inspection upon request. Where the conditions of paragraphs (i)(7) and (i)(8) of this section apply, and where the length of

time necessary to complete the work is beyond August 8, 1996, all records must be submitted to EPA in accordance with §82.166(o), as well as maintained on-site.

(7) The owners or operators of industrial process refrigeration equipment will be allowed additional time to complete the retrofit or retirement of industrial process refrigeration equipment if the conditions described in paragraphs (i)(7)(i) or (i)(7)(ii) of this section are met. The owners or operators of industrial process refrigeration equipment will be allowed additional time beyond the additional time provided in paragraph (i)(7)(ii) of this section if the conditions described in paragraph (i)(7)(iii) of this section are met.

(i) Additional time, to the extent reasonably necessary will be allowed for retrofitting or retiring industrial process refrigeration equipment due to delays occasioned by the requirements of other applicable federal, state, or local laws or regulations, or due to the unavailability of a suitable replacement refrigerant with a lower ozone depletion potential. If these circumstances apply, the owner or operator of the facility must notify EPA within six months after the 30-day period following the discovery of an exceedance of the 35 percent leak rate. Records necessary to allow EPA to determine that these provisions apply and the length of time necessary to complete the work must be submitted to EPA in accordance with §82.166(o), as well as maintained on-site. EPA will notify the owner or operator of its determination within 60 days of receipt the submittal.

(ii) An additional one-year period beyond the initial one-year retrofit period is allowed for industrial process refrigeration equipment where the following criteria are met:

(A) The new or the retrofitted industrial process refrigerant equipment is custom-built;

(B) The supplier of the appliance or one or more of its critical components has quoted a delivery time of more than 30 weeks from when the order is placed;

(C) The owner or operator notifies EPA within six months of the expiration of the 30-day period following the discovery of an exceedance of the 35 percent leak rate to identify the owner or operator, describe the appliance involved, explain why more than one year is needed, and demonstrate that the first two criteria are met in accordance with §82.166(o); and

(D) The owner or operator maintains records that are adequate to allow a determination that the criteria are met.

(iii) The owners or operators of industrial process refrigeration equipment may request additional time to complete retrofitting or retiring industrial process refrigeration equipment beyond the additional one-year period if needed and where the initial additional one year was granted in accordance with paragraph (i)(7)(ii) of this section. The request shall be submitted to EPA before the end of the ninth month of the first additional year and shall include revisions of information required under §82.166(o). Unless EPA objects to this request submitted in accordance with §82.166(o) within 30 days of receipt, it shall be deemed approved.

(8) Owners or operators of federally-owned commercial or comfort-cooling appliances will be allowed an additional year to complete the retrofit or retirement of the appliances if the conditions described in paragraph (i)(8)(i) of this section are met, and will be allowed one year beyond the additional year if the conditions in paragraph (i)(8)(ii) of this section are met.

(i) Up to one additional one-year period beyond the initial one-year retrofit period is allowed for such equipment where the following criteria are met:

(A) Due to complications presented by the federal agency appropriations and/or procurement process, a delivery time of more than 30 weeks from the beginning of the official procurement process is quoted, or

where the appliance is located in an area subject to radiological contamination and creating a safe working environment will require more than 30 weeks;

(B) The operator notifies EPA within six months of the expiration of the 30-day period following the discovery of an exceedance of the applicable allowable annual leak rate to identify the operator, describe the appliance involved, explain why more than one year is needed, and demonstrate that the first criterion is met in accordance with §82.166(o); and

(C) The operator maintains records adequate to allow a determination that the criteria are met.

(ii) The owners or operators of federally-owned commercial or comfort-cooling appliances may request additional time to complete retrofitting, replacement or retiring such appliances beyond the additional one-year period if needed and where the initial additional one year was granted in accordance with paragraph (i)(8)(i) of this section. The request shall be submitted to EPA before the end of the ninth month of the first additional year and shall include revisions of information earlier submitted as required under §82.166(o). Unless EPA objects to this request submitted in accordance with §82.166(o) within 30 days of receipt, it shall be deemed approved.

(9) Owners or operators must repair leaks pursuant to paragraphs (i)(1), (i)(2) and (i)(5) of this section within 30 days after discovery, or within 30 days after when the leaks should have been discovered if the owners intentionally shielded themselves from information which would have revealed a leak, unless granted additional time pursuant to §82.156(i).

(10) The amount of time for owners and operators to complete repairs, retrofit plans or retrofits/replacements/ retirements under paragraphs (i)(1), (i)(2), (i)(5), (i)(6), (i)(7), (i)(8), and (i)(9) of this section is temporarily suspended at the time an appliance is mothballed as defined in §82.152. The time for owners and operators to complete repairs, retrofit plans, or retrofits/replacements will resume on the day the appliance is brought back on-line and is no longer considered mothballed. All initial and follow-up verification tests must be performed in accordance with paragraphs (i)(3), (i)(3)(i), and (i)(3)(ii) of this section.

(11) In calculating annual leak rates, purged refrigerant that is destroyed at a verifiable destruction efficiency of 98 percent or greater will not be counted toward the leak rate. Owners or operators destroying purged refrigerants must maintain information as set forth in §82.166(p)(1) and submit to EPA, within 60 days after the first time such exclusion is used by that facility, information set forth in §82.166(p)(2).

[58 FR 28712, May 14, 1993, as amended at 59 FR 42956, 42962, Aug. 19, 1994; 59 FR 55926, Nov. 9, 1994; 60 FR 40440, Aug. 8, 1995; 68 FR 43807, July 24, 2003; 69 FR 11979, Mar. 12, 2004; 70 FR 1991, Jan. 11, 2005]

§ 82.158 Standards for recycling and recovery equipment.

(a) Effective September 22, 2003, all manufacturers and importers of recycling and recovery equipment intended for use during the maintenance, service, or repair of appliances except MVACs and MVAC-like appliances or during the disposal of appliances except small appliances, MVACs, and MVAC-like appliances, shall have had such equipment certified by an approved equipment testing organization to meet the applicable requirements in paragraph (b)(1), (b)(2), or (d) of this section. All manufacturers and importers of recycling and recovery equipment intended for use during the maintenance, service, or repair of MVAC-like appliances shall have had such equipment certified pursuant to §82.36(a).

(b) Equipment manufactured or imported on or after November 15, 1993 and before September 22, 2003,

for use during the maintenance, service, or repair of appliances except small appliances, MVACs, and MVAC-like appliances or during the disposal of appliances except small appliances, MVACs, and MVAC-like appliances must be certified by an approved equipment testing organization to meet the requirements of paragraph (b)(1) of this section and the following requirements below. Equipment manufactured or imported on or after September 22, 2003, for use during the maintenance, service, or repair of appliances except small appliances, MVACs, and MVAC-like appliances or during the disposal of appliances except small appliances, MVACs, and MVAC-like appliances must be certified by an approved equipment testing organization to meet the requirements of paragraph (b)(2) of this section and the following requirements.

(1) In order to be certified, the equipment must be capable of achieving the level of evacuation specified in Table 2 of this section under the conditions of appendix B1 of this subpart (based upon the ARI Standard 740–1993, Performance of Refrigerant Recovery, Recycling and/or Reclaim Equipment):

Table 2—Levels of Evacuation Which Must Be Achieved by Recovery or Recycling Equipment Intended for Use With Appliances[1]

[Manufactured on or after November 15, 1993]

Type of appliance with which recovery or recycling machine is intended to be used	Inches of Hg vacuum
HCFC-22 appliances, or isolated component of such appliances, normally containing less than 200 pounds of refrigerant	0
HCFC-22 appliances, or isolated component of such appliances, normally containing 200 pounds or more of refrigerant	10
Very high-pressure appliances	0
Other high-pressure appliances, or isolated component of such appliances, normally containing less than 200 pounds of refrigerant	10
Other high-pressure appliances, or isolated component of such appliances, normally containing 200 pounds or more of refrigerant	15
Low-pressure appliances	[2]25

[1]Except for small appliances, MVACs, and MVAC-like appliances.

[2]mm Hg absolute.

The vacuums specified in inches of Hg vacuum must be achieved relative to an atmospheric pressure of 29.9 inches of Hg absolute.

(2) In order to be certified, the equipment must be capable of achieving the level of evacuation specified in Table 2 of paragraph (b)(1) of this section under the conditions of appendix B2 of this subpart (based upon the ARI Standard 740–1995, Performance of Refrigerant Recovery, Recycling and/or Reclaim Equipment).

(3) Recovery or recycling equipment whose recovery efficiency cannot be tested according to the procedures in appendix B1 or B2 of this subpart as applicable may be certified if an approved third-party testing organization adopts and performs a test that demonstrates, to the satisfaction of the Administrator, that the recovery efficiency of that equipment is equal to or better than that of equipment that:

(i) Is intended for use with the same type of appliance; and

(ii) Achieves the level of evacuation in Table 2. The manufacturer's instructions must specify how to achieve the required recovery efficiency, and the equipment must be tested when used according to these instructions.

(4) The equipment must meet the minimum requirements for certification under appendix B1 or B2 of this subpart as applicable.

(5) If the equipment is equipped with a noncondensables purge device, the equipment must not release more than three (3) percent of the quantity of refrigerant being recycled through noncondensables purging under the conditions of appendix B1 and B2 of this subpart as applicable.

(6) The equipment must be equipped with low-loss fittings on all hoses.

(7) The equipment must have its liquid recovery rate and its vapor recovery rate measured under the conditions of appendix B1 or B2 as applicable, unless the equipment has no inherent liquid or vapor recovery rate.

(c) Equipment manufactured or imported before November 15, 1993 for use during the maintenance, service, or repair of appliances except small appliances, MVACs, and MVAC-like appliances or during the disposal of appliances except small appliances, MVACs, and MVAC-like appliances will be considered certified if it is capable of achieving the level of evacuation specified in Table 3 of this section when tested using a properly calibrated pressure gauge:

Table 3—Levels of Evacuation Which Must Be Achieved by Recovery or Recycling Machines Intended for Use With Appliances[1]

[Manufactured before November 15, 1993]

Type of air-conditioning or refrigeration equipment with which recovery or recycling machine is intended to be used	Inches of vacuum (relative to standard atmospheric pressure of 29.9 inches Hg)
HCFC-22 equipment, or isolated component of such equipment, normally containing less than 200 pounds of refrigerant	0
HCFC-22 equipment, or isolated component of such equipment, normally containing 200 pounds or more of refrigerant	4
Very high-pressure equipment	0
Other high-pressure equipment, or isolated component of such equipment, normally containing less than 200 pounds of refrigerant	4
Other high-pressure equipment, or isolated component of such equipment, normally containing 200 pounds or more of refrigerant	4
Low-pressure equipment	25

[1]Except for small appliances, MVACs, and MVAC-like appliances.

(d) Equipment manufactured or imported on or after November 15, 1993 and before September 22, 2003, for use during the maintenance, service, or repair of small appliances must be certified by an approved equipment testing organization to be capable of achieving the requirements described in either paragraph

(d)(1) or (d)(2) of this section. Equipment manufactured or imported on or after September 22, 2003, for use during the maintenance, service, or repair of small appliances must be certified by an approved equipment testing organization to be capable of either paragraph (d)(1) or (d)(3) of this section:

(1) Recovering 90% of the refrigerant in the test stand when the compressor of the test stand is operating and 80% of the refrigerant when the compressor of the test stand is not operating when used in accordance with the manufacturer's instructions under the conditions of appendix C, Method for Testing Recovery Devices for Use with Small Appliances; or

(2) Achieving a four-inch vacuum under the conditions of appendix B1 of this subpart, based upon ARI Standard 740–1993; or

(3) Achieving a four-inch vacuum under the conditions of appendix B2 of this subpart, based upon ARI Standard 740–1995.

(e) Equipment manufactured or imported before November 15, 1993 for use with small appliances will be considered certified if it is capable of either:

(1) Recovering 80% of the refrigerant in the system, whether or not the compressor of the test stand is operating, when used in accordance with the manufacturer's instructions under the conditions of appendix C, Method for Testing Recovery Devices for Use with Small Appliances; or

(2) Achieving a four-inch vacuum when tested using a properly calibrated pressure gauge.

(f) Equipment manufactured or imported on or after November 15, 1993 for use during the maintenance, service, or repair of MVAC-like appliances must be certified in accordance with §82.36(a).

(g) Equipment manufactured or imported before November 15, 1993 for use during the maintenance, service, or repair of MVAC-like appliances must be capable of reducing the system pressure to 102 mm of mercury vacuum under the conditions of the SAE Standard, SAE J1990 (appendix A to 40 CFR part 82, subpart B).

(h) Manufacturers and importers of equipment certified under paragraphs (b) and (d) of this section must place a label on each piece of equipment stating the following:

THIS EQUIPMENT HAS BEEN CERTIFIED BY [APPROVED EQUIPMENT TESTING ORGANIZATION] TO MEET EPA's MINIMUM REQUIREMENTS FOR RECYCLING OR RECOVERY EQUIPMENT INTENDED FOR USE WITH [APPROPRIATE CATEGORY OF APPLIANCE].

The label shall also show the date of manufacture and the serial number (if applicable) of the equipment. The label shall be affixed in a readily visible or accessible location, be made of a material expected to last the lifetime of the equipment, present required information in a manner so that it is likely to remain legible for the lifetime of the equipment, and be affixed in such a manner that it cannot be removed from the equipment without damage to the label.

(i) The Administrator will maintain a list of equipment certified pursuant to paragraphs (b), (d), and (f) of this section by manufacturer and model. Persons interested in obtaining a copy of the list should send written inquiries to the address in §82.160(a).

(j) Manufacturers or importers of recycling or recovery equipment intended for use during the maintenance, service, or repair of appliances except MVACs or MVAC-like appliances or during the disposal of appliances except small appliances, MVACs, and MVAC-like appliances must periodically have approved equipment testing organizations conduct either:

(1) Retests of certified recycling or recovery equipment in accordance with paragraph (a) of this section or

(2) Inspections of recycling or recovery equipment at manufacturing facilities to ensure that each equipment model line that has been certified under this section continues to meet the certification criteria.

Such retests or inspections must be conducted at least once every three years after the equipment is first certified.

(k) An equipment model line that has been certified under this section may have its certification revoked if it is subsequently determined to fail to meet the certification criteria. In such cases, the Administrator or her or his designated representative shall give notice to the manufacturer or importer setting forth the basis for her or his determination.

(l) Equipment used to evacuate refrigerant from MVACs and MVAC-like appliances before they are disposed of must be certified in accordance with §82.36(a).

(m) Equipment used to evacuate refrigerant from small appliances before they are disposed of must be capable of either:

(1) Removing 90% of the refrigerant when the compressor of the small appliance is operating and 80% of the refrigerant when the compressor of the small appliance is not operating, when used in accordance with the manufacturer's instructions under the conditions of appendix C, Method for Testing Recovery Devices for Use With Small Appliances; or

(2) Evacuating the small appliance to four inches of vacuum when tested using a properly calibrated pressure gauge.

(n) Effective October 22, 2003, equipment that is advertised or marketed as “recycling equipment” must be capable of recycling the standard contaminated refrigerant sample of appendix B2 of this subpart (based upon ARI Standard 740–1995), section 5, to the levels in the following table when tested under the conditions of appendix B2 of this subpart:

Maximum Levels of Contaminants Permissible in Refrigerant Processed Through Equipment Advertised as “Recycling” Equipment

Contaminants	Low-pressure (R–11, R–123, R–113) systems	R–12 systems	All other systems
Acid Content (by wt.)	1.0 PPM	1.0 PPM	1.0 PPM.
Moisture (by wt.)	20 PPM	10 PPM	20 PPM.
Noncondensable Gas (by vol.)	N/A	2.0%	2.0%.
High Boiling Residues (by vol.)	1.0%	0.02%	0.02%.
Chlorides by Silver Nitrate Test	No turbidity	No turbidity	No turbidity.
Particulates	Visually clean	Visually clean	Visually clean.

[58 FR 28712, May 14, 1993, as amended at 59 FR 42957, Aug. 19, 1994; 68 FR 43807, July 24, 2003; 73 FR 34649, June 18, 2008]

§ 82.160 Approved equipment testing organizations.

(a) Any equipment testing organization may apply for approval by the Administrator to certify equipment pursuant to the standards in §82.158 and appendices B2 or C of this subpart. The application shall be mailed to: Section 608 Recycling Program Manager; Global Programs Division; Mail Code: 6205J; U.S. Environmental Protection Agency; 1200 Pennsylvania Avenue, NW.; Washington, DC 20460.

(b) Applications for approval must include written information verifying the following:

(1) The list of equipment present at the organization that will be used for equipment testing.

(2) Expertise in equipment testing and the technical experience of the organization's personnel.

(3) Thorough knowledge of the standards and recordkeeping and reporting requirements as they appear in §§82.158 and 82.166 and Appendices B2 and/or C (as applicable) of this subpart.

(4) The organization must describe its program for verifying the performance of certified recycling and recovery equipment manufactured over the long term, specifying whether retests of equipment or inspections of equipment at manufacturing facilities will be used.

(5) The organization must have no conflict of interest and receive no direct or indirect financial benefit from the outcome of certification testing.

(6) The organization must agree to allow the Administrator access to records and personnel to verify the information contained in the application.

(c) Organizations may not certify equipment prior to receiving approval from EPA. If approval is denied under this section, the Administrator or her or his designated representative shall give written notice to the organization setting forth the basis for her or his determination.

(d) If at any time an approved testing organization is found to be conducting certification tests for the purposes of this subpart in a manner not consistent with the representations made in its application for approval under this section, the Administrator reserves the right to revoke approval in accordance with §82.169. In such cases, the Administrator or her or his designated representative shall give notice to the organization setting forth the basis for her or his determination.

[58 FR 28712, May 14, 1993, as amended at 59 FR 42962, Aug. 19, 1994; 68 FR 43808, July 24, 2003]

§ 82.161 Technician certification.

(a) Effective November 14, 1994, technicians, except technicians who successfully completed voluntary certification programs that apply for approval under §82.161(g) by December 9, 1994, must be certified by an approved technician certification program under the requirements of this paragraph (a). Effective May 15, 1995, all technicians must be certified by an approved technician certification program under the requirements of this paragraph (a).

(1) Technicians, as defined in §82.152, who maintain, service, or repair small appliances must be properly certified as Type I technicians.

(2) Technicians who maintain, service, or repair medium-, high-, or very high-pressure appliances, except

small appliances, MVACs, and MVAC-like appliances, or dispose of medium-, high-, or very high-pressure appliances, except small appliances, MVACs, and MVAC-like appliances, must be properly certified as Type II technicians.

(3) Technicians who maintain, service, or repair low-pressure appliances or dispose of low-pressure appliances must be properly certified as Type III technicians.

(4) Technicians who maintain, service, or repair low- and high-pressure equipment as described in §82.161(a) (1), (2) and (3) must be properly certified as Universal technicians.

(5) Technicians who maintain, service, or repair MVAC-like appliances must either be properly certified as Type II technicians or complete the training and certification test offered by a training and certification program approved under §82.40.

(6) Apprentices are exempt from this requirement provided the apprentice is closely and continually supervised by a certified technician while performing any maintenance, service, repair, or disposal that could reasonably be expected to release refrigerant from appliances into the environment. The supervising certified technician is responsible for ensuring that the apprentice complies with this subpart.

(b) *Test Subject Material.* The Administrator shall maintain a bank of test questions divided into four groups, including a core group and three technical groups. The Administrator shall release this bank of questions only to approved technician certification programs. Tests for each type of certification shall include a minimum of 25 questions drawn from the core group and a minimum of 25 questions drawn from each relevant technical group. These questions shall address the subject areas listed in appendix D.

(c) *Program Approval.* Persons may seek approval of any technician certification program (program), in accordance with the provisions of this paragraph, by submitting to the Administrator at the address in §82.160(a) verification that the program meets all of the standards listed in appendix D and the following standards:

(1) *Alternative Examinations.* Programs are encouraged to make provisions for non-English speaking technicians by providing tests in other languages or allowing the use of a translator when taking the test. If a translator is used, the certificate received must indicate that translator assistance was required. A test may be administered orally to any person who makes this request, in writing, to the program at least 30 days before the scheduled date for the examination. The letter must explain why the request is being made.

(2) *Recertification.* The Administrator reserves the right to specify the need for technician recertification at some future date, if necessary, by placing a notice in theFederal Register.

(3) *Proof of Certification.* Programs must issue individuals a wallet-sized card to be used as proof of certification, upon successful completion of the test. Programs must issue an identification card to technicians that receive a score of 70 percent or higher on the closed-book certification exam, within 30 days. Programs providing Type I certification using the mail-in format, must issue a permanent identification card to technicians that receive a score of 84 percent or higher on the certification exam, no later than 30 days after the program has received the exam and any additional required material. Each card must include, at minimum, the name of the certifying program, and the date the organization became a certifying program, the name of the person certified, the type of certification, a unique number for the certified person, and the following text:

[Name of person] has been certified as a [Type I, Type II, Type III, and/or Universal, as appropriate] technician as required by 40 CFR part 82, subpart F.

(4) The Administrator reserves the right to consider other factors deemed relevant to ensure the effectiveness of certification programs.

(d) If approval is denied under this section, the Administrator shall give written notice to the program setting forth the basis for her or his determination.

(e) If at any time an approved program violates any of the above requirements, the Administrator reserves the right to revoke approval in accordance with §82.169. In such cases, the Administrator or her or his designated representative shall give notice to the organization setting forth the basis for her or his determination.

(f) Authorized representatives of the Administrator may require technicians to demonstrate on the business entity's premises their ability to perform proper procedures for recovering and/or recycling refrigerant. Failure to demonstrate or failure to properly use the equipment may result in revocation of the certificate. Failure to abide by any of the provisions of this subpart may also result in revocation or suspension of the certificate. If a technician's certificate is revoked, the technician would need to recertify before maintaining, servicing, repairing or disposing of any appliances.

(g)(1) Any person seeking approval of a technician certification program may also seek approval to certify technicians who successfully completed a voluntary certification program operated previously by that person. Interested persons must submit to the Administrator at the address in §82.160(a) verification that the voluntary certification program substantially complied with most of the standards of §82.161(c) and appendix D of subpart F of this part. If the program did not test or train participants on some elements of the test subject material, the person must submit supplementary information on the omitted material to the Administrator for approval and verify that the approved information will be provided to technicians pursuant to section j of appendix D of subpart F of this part. In this case, the person may not issue a certification card to a technician until he or she has received a signed statement from the technician indicating that the technician has read the supplementary information. Approval may be granted for Type I, Type II, or Type III certification, or some combination of these, depending upon the coverage in the voluntary certification program of the information in each Type. In order to have their voluntary programs considered for approval, persons must submit applications both for approval as a technician certification program and for approval as a voluntary program by December 9, 1994.

(2)(i) Persons who are approved to certify technicians who successfully completed their voluntary programs pursuant to §82.161(g)(1) must:

(A) Notify technicians who successfully completed their voluntary programs of the Administrator's decision within 60 days of that decision;

(B) Send any supplementary materials required pursuant to §82.161(g)(1) to technicians who successfully completed their voluntary programs within 60 days of the Administrator's decision; and

(C) Send certification cards to technicians who successfully completed their voluntary programs within 60 days of receipt of signed statements from the technicians indicating that the technicians have read the supplementary information.

(ii) Persons who are disapproved to certify technicians who successfully completed their voluntary programs pursuant to §82.161(g)(1) must notify technicians who successfully completed their voluntary programs of the Administrator's decision within 30 days of that decision.

(iii) Persons who withdraw applications for voluntary program approval submitted pursuant to §82.161(g)(1)

must inform technicians who successfully completed their voluntary programs of the withdrawal by the later of 30 days after the withdrawal or December 9, 1994.

(3) Technicians who successfully completed voluntary certification programs may receive certification in a given Type through that program only if:

(i) The voluntary certification program successfully completed by the technician is approved for that Type pursuant to §82.161(g)(1);

(ii) The technician successfully completed the portions of the voluntary certification program that correspond to that Type; and

(iii) The technician reads any supplementary materials required by the Administrator pursuant to §82.161(g)(1) and section j of appendix D of subpart F of this part, and returns the signed statement required by §82.161(g)(1).

[58 FR 28712, May 14, 1993, as amended at 59 FR 42957, 42962, Aug. 19, 1994; 68 FR 43808, July 24, 2003; 69 FR 11980, Mar. 12, 2004]

§ 82.162 Certification by owners of recovery and recycling equipment.

(a) No later than August 12, 1993, or within 20 days of commencing business for those persons not in business at the time of promulgation, persons maintaining, servicing, or repairing appliances except for MVACs, and persons disposing of appliances except for small appliances and MVACs, must certify to the Administrator that such person has acquired certified recovery or recycling equipment and is complying with the applicable requirements of this subpart. Such equipment may include system-dependent equipment but must include self-contained equipment, if the equipment is to be used in the maintenance, service, or repair of appliances except for small appliances. The owner or lessee of the recovery or recycling equipment may perform this certification for his or her employees. Certification shall take the form of a statement signed by the owner of the equipment or another responsible officer and setting forth:

(1) The name and address of the purchaser of the equipment, including the county name;

(2) The name and address of the establishment where each piece of equipment is or will be located;

(3) The number of service trucks (or other vehicles) used to transport technicians and equipment between the establishment and job sites and the field;

(4) The manufacturer name, the date of manufacture, and if applicable, the model and serial number of the equipment; and

(5) The certification must also include a statement that the equipment will be properly used in servicing or disposing of appliances and that the information given is true and correct. Owners or lessees of recycling or recovery equipment having their places of business in:

Connecticut

Maine

Massachusetts

New Hampshire

Rhode Island

Vermont

must send their certifications to:

CAA section 608 Enforcement Contact; EPA Region I; Mail Code SEA; JFK Federal Building; One Congress Street, Suite 1100; Boston, MA 02114–2023.

Owners or lessees of recycling or recovery equipment having their places of business in:

New York

New Jersey

Puerto Rico

Virgin Islands

must send their certifications to:

CAA section 608 Enforcement Contact; EPA Region II (2DECA-AC); 290 Broadway, 21st Floor; New York, NY 10007–1866.

Owners or lessees of recycling or recovery equipment having their places of business in:

Delaware

District of Columbia

Maryland

Pennsylvania

Virginia

West Virginia

must send their certifications to:

CAA section 608 Enforcement Contact; EPA Region III—Wheeling Operations Office; Mail Code 3AP12; 303 Methodist Building; 11th and Chapline Streets; Wheeling, WV 26003.

Owners or lessees of recycling or recovery equipment having their places of business in:

Alabama

Florida

Georgia

Kentucky

Mississippi

North Carolina

South Carolina

Tennessee

must send their certifications to:

CAA section 608 Enforcement Contact; EPA Region IV(APT-AE); Atlanta Federal Center; 61 Forsyth Street, SW.; Atlanta, GA

30303.

Owners or lessees of recycling or recovery equipment having their places of business in:

Illinois

Indiana

Michigan

Minnesota

Ohio

Wisconsin

must send their certifications to:

CAA section 608 Enforcement Contact, EPA Region V (AE17J); 77 West Jackson Blvd.; Chicago, IL 60604–3507.

Owners or lessees of recycling or recovery equipment having their places of business in:

Arkansas

Louisiana

New Mexico

Oklahoma

Texas

must send their certifications to:

CAA section 608 Enforcement Contact; EPA Region VI (6EN-AA); 1445 Ross Avenue, Suite 1200; Dallas, Texas 75202.

Owners or lessees of recycling or recovery equipment having their places of business in:

Iowa

Kansas

Missouri

Nebraska

must send their certifications to:

CAA section 608 Enforcement Contact; EPA Region VII; Mail Code APCO/ARTD; 901 North 5th Street; Kansas City, KS; 66101.

Owners or lessees of recycling or recovery equipment having their places of business in:

Colorado

Montana

North Dakota

South Dakota

Utah

Wyoming

must send their certifications to:

CAA section 608 Enforcement Contact, EPA Region VIII, Mail Code 8ENF-T, 999 18th Street, Suite 500, Denver, CO 80202–2466.

Owners or lessees of recycling or recovery equipment having their places of business in:

American Samoa

Arizona

California

Guam

Hawaii

Nevada

must send their certifications to:

CAA section 608 Enforcement Contact; EPA Region IX; Mail Code AIR–5; 75 Hawthorne Street; San Francisco, CA 94105.

Owners or lessees of recycling or recovery equipment having their places of business in:

Alaska

Idaho

Oregon

Washington

must send their certifications to:

CAA section 608 Enforcement Contact; EPA Region X (OAQ–107); 1200 Sixth Avenue; Seattle, WA 98101.

(b) Certificates under paragraph (a) of this section are not transferable. In the event of a change of ownership of an entity that maintains, services, or repairs appliances except MVACs, or that disposes of appliances except small appliances, MVACs, and MVAC-like appliances, the new owner of the entity shall certify within 30 days of the change of ownership pursuant to paragraph (a) of this section.

(c) No later than August 12, 1993, persons recovering refrigerant from small appliances, MVACs, and MVAC-like appliances for purposes of disposal of these appliances must certify to the Administrator that such person has acquired recovery equipment that meets the standards set forth in §82.158 (l) and/or (m), as applicable, and that such person is complying with the applicable requirements of this subpart. Such equipment may include system-dependent equipment but must include self-contained equipment, if the equipment is to be used in the disposal of appliances except for small appliances. The owner or lessee of the recovery or recycling equipment may perform this certification for his or her employees. Certification shall take the form of a statement signed by the owner of the equipment or another responsible officer and setting forth:

(1) The name and address of the purchaser of the equipment, including the county name;

(2) The name and address of the establishment where each piece of equipment is or will be located;

(3) The number of service trucks (or other vehicles) used to transport technicians and equipment between the establishment and job sites and the field;

(4) The manufacturer's name, the date of manufacture, and if applicable, the model and serial number of the equipment; and

(5) The certification must also include a statement that the equipment will be properly used in recovering refrigerant from appliances and that the information given is true and correct. The certification shall be sent to the appropriate address in paragraph (a).

(d) Failure to abide by any of the provisions of this subpart may result in revocation or suspension of certification under paragraph (a) or (c) of this section. In such cases, the Administrator or her or his designated representative shall give notice to the organization setting forth the basis for her or his determination.

[58 FR 28712, May 14, 1993, as amended at 59 FR 42962, Aug. 19, 1994; 69 FR 11980, Mar. 12, 2004]

§ 82.164 Reclaimer certification.

Effective May 11, 2004, all persons reclaiming used refrigerant for sale to a new owner, except for persons who properly certified under this section prior to May 11, 2004, must certify to the Administrator that such person will:

(a) Reprocess refrigerant to all of the specifications in Appendix A of this subpart (based on ARI Standard 700–1995, *Specification for Fluorocarbons and Other Refrigerants*) that are applicable to that refrigerant;

(b) Verify that the refrigerant meets these specifications using the analytical methodology prescribed in Appendix A, which includes the primary methodologies included in the appendix to the ARI Standard 700–1995;

(c) Release no more than 1.5 percent of the refrigerant during the reclamation process; and

(d) Dispose of wastes from the reclamation process in accordance with all applicable laws and regulations.

(e) The data elements for certification are as follows:

(1) The name and address of the reclaimer;

(2) A list of equipment used to reprocess and analyze the refrigerant; and

(3) The owner or a responsible officer of the reclaimer must sign the certification stating that the refrigerant will be reprocessed to all of the specifications in Appendix A of this subpart (based on ARI Standard 700–1995, *Specification for Fluorocarbons and Other Refrigerants*) that are applicable to that refrigerant, that the refrigerant's conformance to these specifications will be verified using the analytical methodology prescribed in Appendix A (which includes the primary methodologies included in the appendix to the ARI Standard 700–1995), that no more than 1.5 percent of the refrigerant will be released during the reclamation process, that wastes from the reclamation process will be properly disposed of, that the owner or responsible officer of the reclaimer will maintain records and submit reports in accordance with §82.166(g) and (h), and that the information given is true and correct. The certification should be sent to the following address: U.S. Environmental Protection Agency; Global Programs Division (6205J); 1200 Pennsylvania Avenue, NW., Washington, DC 20460; Attn: Section 608 Recycling Program Manager—Reclaimer Certification.

(f) Certificates are not transferable. In the event of a change in ownership of an entity which reclaims refrigerant, the new owner of the entity shall certify within 30 days of the change of ownership pursuant to this section.

(g) Failure to abide by any of the provisions of this subpart may result in revocation or suspension of the certification of the reclaimer in accordance with §82.169. In such cases, the Administrator or her or his designated representative shall give notice to the organization setting forth the basis for her or his determination.

[58 FR 28712, May 14, 1993, as amended at 59 FR 42957, 42962, Aug. 19, 1994; 59 FR 55927, Nov. 9, 1994; 68 FR 43809, July 24, 2003; 69 FR 11980, Mar. 12, 2004]

§ 82.166 Reporting and recordkeeping requirements.

(a) All persons who sell or distribute or offer to sell or distribute any refrigerant must retain invoices that indicate the name of the purchaser, the date of sale, and the quantity of refrigerant purchased.

(b) Purchasers of refrigerant who employ certified technicians may provide evidence that at least one technician is properly certified to the wholesaler who sells them refrigerant; the wholesaler must then keep this information on file and may sell refrigerant to the purchaser or his authorized representative even if such purchaser or authorized representative is not a properly certified technician. In such cases, the purchaser must notify the wholesaler in the event that the purchaser no longer employs at least one properly certified technician. The wholesaler is then prohibited from selling refrigerants to the purchaser until such time as the purchaser employs at least one properly certified technician. At that time, the purchaser must provide new evidence that at least one technician is properly certified.

(c) Approved equipment testing organizations must maintain records of equipment testing and performance and a list of equipment that meets EPA requirements. A list of all certified equipment shall be submitted to EPA within 30 days of the organization's approval by EPA and annually at the end of each calendar year thereafter.

(d) Approved equipment testing organizations shall submit to EPA within 30 days of the certification of a new model line of recycling or recovery equipment the name of the manufacturer and the name and/or serial number of the model line.

(e) Approved equipment testing organizations shall notify EPA if retests of equipment or inspections of manufacturing facilities conducted pursuant to §82.158(j) show that a previously certified model line fails to meet EPA requirements. Such notification must be received within thirty days of the retest or inspection.

(f) Programs certifying technicians must maintain records in accordance with section (g) of appendix D of this subpart.

(g) Reclaimers must maintain records of the names and addresses of persons sending them material for reclamation and the quantity of the material (the combined mass of refrigerant and contaminants) sent to them for reclamation. Such records shall be maintained on a transactional basis.

(h) Reclaimers must maintain records of the quantity of material sent to them for reclamation, the mass of refrigerant reclaimed, and the mass of waste products. Reclaimers must report this information to the Administrator annually within 30 days of the end of the calendar year.

(i) Persons disposing of small appliances, MVACs, and MVAC-like appliances must maintain copies of signed statements obtained pursuant to §82.156(f)(2).

(j) Persons servicing appliances normally containing 50 or more pounds of refrigerant must provide the owner/operator of such appliances with an invoice or other documentation, which indicates the amount of refrigerant added to the appliance.

(k) Owners/operators of appliances normally containing 50 or more pounds of refrigerant must keep servicing records documenting the date and type of service, as well as the quantity of refrigerant added. The owner/operator must keep records of refrigerant purchased and added to such appliances in cases where owners add their own refrigerant. Such records should indicate the date(s) when refrigerant is added.

(l) Technicians certified under §82.161 must keep a copy of their certificate at their place of business.

(m) All records required to be maintained pursuant to this section must be kept for a minimum of three years unless otherwise indicated. Entities that dispose of appliances must keep these records on-site.

(n) The owners or operators of appliances must maintain on-site and report to EPA Headquarters at the address listed in §82.160 the information specified in paragraphs (n)(1), (n)(2), and (n)(3) of this section, within the timelines specified under §82.156 (i)(1), (i)(2), (i)(3) and (i)(5) where such reporting or recordkeeping is required. This information must be relevant to the affected appliance.

(1) An initial report to EPA under §82.156(i)(1)(i), (i)(2), or (i)(5)(i) regarding why more than 30 days are needed to complete repairs must include: Identification of the facility; the leak rate; the method used to determine the leak rate and full charge; the date a leak rate above the applicable leak rate was discovered; the location of leak(s) to the extent determined to date; any repair work that has been completed thus far and the date that work was completed; the reasons why more than 30 days are needed to complete the work and an estimate of when the work will be completed. If changes from the original estimate of when work will be completed result in extending the completion date from the date submitted to EPA, the reasons for these changes must be documented and submitted to EPA within 30 days of discovering the need for such a change.

(2) If the owners or operators intend to establish that the appliance's leak rate does not exceed the applicable allowable leak rate in accordance with §82.156(i)(3)(v), the owner or operator must submit a plan to fix other outstanding leaks for which repairs are planned but not yet completed to achieve a rate below the applicable allowable leak rate. A plan to fix other outstanding leaks in accordance with §82.156(i)(3)(v) must include the following information: The identification of the facility; the leak rate; the method used to determine the leak rate and full charge; the date a leak rate above the applicable allowable leak rate was discovered; the location of leak(s) to the extent determined to date; and any repair work that has been completed thus far, including the date that work was completed. Upon completion of the repair efforts described in the plan, a second report must be submitted that includes the date the owner or operator submitted the initial report concerning the need for additional time beyond the 30 days and notification of the owner or operator's determination that the leak rate no longer exceeds the applicable allowable leak rate. This second report must be submitted within 30 days of determining that the leak rate no longer exceeds the applicable allowable leak rate.

(3) Owners or operators must maintain records of the dates, types, and results of all initial and follow-up verification tests performed under §82.156(i)(3). Owners or operators must submit this information to EPA within 30 days after conducting each test only where required under §82.156 (i)(1), (i)(2), (i)(3) and (i)(5). These reports must also include: Identification and physical address of the facility; the leak rate; the method

used to determine the leak rate and full charge; the date a leak rate above the applicable allowable leak rate was discovered; the location of leak(s) to the extent determined to date; and any repair work that has been completed thus far and the date that work was completed. Submitted reports must be dated and include the name of the owner or operator of the appliance, and must be signed by an authorized company official.

(o) The owners or operators of appliances must maintain on-site and report to EPA at the address specified in §82.160 the following information where such reporting and recordkeeping is required and in the timelines specified in §82.156 (i)(7) and (i)(8), in accordance with §82.156 (i)(7) and (i)(8). This information must be relevant to the affected appliance and must include:

(1) The identification of the industrial process facility;

(2) The leak rate;

(3) The method used to determine the leak rate and full charge;

(4) The date a leak rate above the applicable allowable rate was discovered.

(5) The location of leaks(s) to the extent determined to date;

(6) Any repair work that has been completed thus far and the date that work was completed;

(7) A plan to complete the retrofit or retirement of the system;

(8) The reasons why more than one year is necessary to retrofit or retire the system;

(9) The date of notification to EPA; and

(10) An estimate of when retrofit or retirement work will be completed. If the estimated date of completion changes from the original estimate and results in extending the date of completion, the owner or operator must submit to EPA the new estimated date of completion and documentation of the reason for the change within 30 days of discovering the need for the change, and must retain a dated copy of this submission.

(p)(1) Owners or operators who wish to exclude purged refrigerants that are destroyed from annual leak rate calculations must maintain records on-site to support the amount of refrigerant claimed as sent for destruction. Records shall be based on a monitoring strategy that provides reliable data to demonstrate that the amount of refrigerant claimed to have been destroyed is not greater than the amount of refrigerant actually purged and destroyed and that the 98 percent or greater destruction efficiency is met. Records shall include flow rate, quantity or concentration of the refrigerant in the vent stream, and periods of purge flow.

(2) Owners or operators who wish to exclude purged refrigerants that are destroyed from annual leak rate calculations must maintain on-site and make available to EPA upon request the following information after the first time the exclusion is utilized by the facility:

(i) The identification of the facility and a contact person, including the address and telephone number;

(ii) A general description of the refrigerant appliance, focusing on aspects of the appliance relevant to the purging of refrigerant and subsequent destruction;

(iii) A description of the methods used to determine the quantity of refrigerant sent for destruction and type of records that are being kept by the owners or operators where the appliance is located;

(iv) The frequency of monitoring and data-recording; and

(v) A description of the control device, and its destruction efficiency.

This information must also be included, where applicable, in any reporting requirements required for compliance with the leak repair and retrofit requirements for industrial process refrigeration equipment, as set forth in paragraphs (n) and (o) of this section.

(q) Owners or operators choosing to determine the full charge as defined in §82.152 of an affected appliance by using an established range or using that methodology in combination with other methods for determining the full charge as defined in §82.152 must maintain the following information:

(1) The identification of the owner or operator of the appliance;

(2) The location of the appliance;

(3) The original range for the full charge of the appliance, its midpoint, and how the range was determined;

(4) Any and all revisions of the full charge range and how they were determined; and

(5) The dates such revisions occurred.

[58 FR 28712, May 14, 1993, as amended at 59 FR 42957, Aug. 19, 1994; 60 FR 40443, Aug. 8, 1995; 69 FR 11981, Mar. 12, 2004; 70 FR 1992, Jan. 11, 2005]

§ 82.169 Suspension and revocation procedures.

(a) Failure to abide by any of the provisions of this subpart may result in the revocation or suspension of the approval to certify technicians (under §82.161), approval to act as a recovery/recycling equipment testing organization (under §82.160), or reclaimer certification (under §82.164), hereafter referred to as the "organization." In such cases, the Administrator or her or his designated representative shall give notice of an impending suspension to the person or organization setting forth the facts or conduct that provide the basis for the revocation or suspension.

(b) Any organization that has received notice of an impending suspension or revocation may choose to request a hearing and must file that request in writing within 30 days of the date of the Agency's notice at the address listed in §82.160 and shall set forth their objections to the revocation or suspension and data to support the objections.

(c) If the Agency does not receive a written request for a hearing within 30 days of the date of the Agency's notice, the revocation will become effective upon the date specified in the notice of an impending suspension.

(d) If after review of the request and supporting data, the Administrator or her or his designated representative finds that the request raises a substantial factual issue, she or he shall provide the organization with a hearing.

(e) After granting a request for a hearing the Administrator or her or his designated representative shall designate a Presiding Officer for the hearing.

(f) The hearing shall be held as soon as practicable at a time and place determined by the Administrator, the designated representative, or the Presiding Officer.

(g) The Administrator or her or his designated representative may, at his or her discretion, direct that all argument and presentation of evidence be concluded within a specified period established by the Administrator or her or his designated representative. Said period may be no less than 30 days from the date that the first written offer of a hearing is made to the applicant. To expedite proceedings, the Administrator or her or his designated representative may direct that the decision of the Presiding Officer (who need not be the Administrator) shall be the final EPA decision.

(h) Upon appointment pursuant to paragraph (e) of this section, the Presiding Officer will establish a hearing file. The file shall consist of the following:

(1) The notice issued by the Administrator under §82.169(a);

(2) the request for a hearing and the supporting data submitted therewith;

(3) all documents relating to the request for certification and all documents submitted therewith; and

(4) correspondence and other data material to the hearing.

(i) The hearing file will be available for inspection by the petitioner at the office of the Presiding Officer.

(j) An applicant may appear in person or may be represented by counsel or by any other duly authorized representative.

(k) The Presiding Officer, upon the request of any party or at his or her discretion, may arrange for a pre-hearing conference at a time and place he or she specifies. Such pre-hearing conferences will consider the following:

(1) Simplification of the issues;

(2) Stipulations, admissions of fact, and the introduction of documents;

(3) Limitation of the number of expert witnesses;

(4) Possibility of agreement disposing of any or all of the issues in dispute; and

(5) Such other matters as may aid in the disposition of the hearing, including such additional tests as may be agreed upon by the parties.

(l) The results of the conference shall be reduced to writing by the Presiding Officer and made part of the record.

(m) Hearings shall be conducted by the Presiding Officer in an informal but orderly and expeditious manner. The parties may offer oral or written evidence, subject to the exclusion by the Presiding Officer of irrelevant, immaterial, and repetitious evidence.

(n) Witnesses will not be required to testify under oath. However, the Presiding Officer shall call to the attention of witnesses that their statements may be subject to the provisions of 18 U.S.C. 1001, which imposes penalties for knowingly making false statements or representations or using false documents in any matter within the jurisdiction of any department or agency of the United States.

(o) Any witness may be examined or cross-examined by the Presiding Officer, the parties, or their representatives.

(p) Hearings shall be reported verbatim. Copies of transcripts of proceedings may be purchased by the petitioner from the reporter.

(q) All written statements, charts, tabulations, and similar data offered in evidence at the hearings shall, upon a showing satisfactory to the Presiding Officer of their authenticity, relevancy, and materiality, be received in evidence and shall constitute a part of the record.

(r) Oral argument may be permitted at the discretion of the Presiding Officer and shall be reported as part of the record unless otherwise ordered by the Presiding Officer.

(s) The Presiding Officer shall make an initial decision that shall include written findings and conclusions and the reasons or basis regarding all the material issues of fact, law, or discretion presented on the record. The findings, conclusions, and written decision shall be provided to the parties and made a part of the record. The initial decision shall become the decision of the Administrator without further proceedings, unless there is an appeal to the Administrator or motion for review by the Administrator within 20 days of the date the initial decision was filed.

(t) On appeal from or review of the initial decision, the Administrator or her or his designated representative shall have all the powers which he or she would have in making the initial decision, including the discretion to require or allow briefs, oral argument, the taking of additional evidence, or a remand to the Presiding Officer for additional proceedings. The decision by the Administrator or her or his designated representative shall include written findings and conclusions and the reasons or basis therefore on all the material issues of fact, law, or discretion presented on the appeal or considered in the review.

[68 FR 43809, July 24, 2003]

Appendix A to Subpart F of Part 82—Specifications for Fluorocarbon and Other Refrigerants

This appendix is based on the Air-Conditioning and Refrigeration Institute Standard 700–1995.

Section 1. Purpose

1.1 *Purpose.* The purpose of this standard is to evaluate and accept/reject refrigerants regardless of source (*i.e.,* new, reclaimed and/or repackaged) for use in new and existing refrigeration and air-conditioning products as required under 40 CFR part 82.

1.1.1 *Intent.* This standard is intended for the guidance of the industry including manufacturers, refrigerant reclaimers, repackagers, distributors, installers, servicemen, contractors and for consumers.

1.1.2 *Review and Amendment.* This standard is subject to review and amendment as the technology advances.

Section 2. Scope

2.1 *Scope.* This standard specifies acceptable levels of contaminants (purity requirements) for various fluorocarbon and other refrigerants regardless of source and lists acceptable test methods. These refrigerants are R–113; R–123; R–11; R–114; R–124; R–12; R–401C; R–406A; R–500; R–401A; R–409A; R–401B; R–411A; R–22; R–411B; R–502; R–402B; R–408A; R–402A; R–13; R–503 as referenced in the ANSI/ASHRAE Standard 34–1992. (American Society of Heating, Refrigerating and Air-conditioning Engineers, Inc., Standard 34–1992). Copies may be obtained from ASHRAE Publications Sales, 1791 Tullie Circle, NE, Atlanta, GA 30329. Copies may also be inspected at Environmental Protection Agency; Office

of Air and Radiation Docket; 1301 Constitution Ave., NW., Room B108; Washington, DC 20460.

Section 3. Definitions

3.1 *"Shall," "Should," "Recommended,"* or *"It Is Recommended."* "Shall," "should," "recommended," or "it is recommended" shall be interpreted as follows:

3.1.1 *Shall.* Where "shall" or "shall not" is used for a provision specified, that provision is mandatory if compliance with the appendix is claimed.

3.1.2 *Should, Recommended,* or *It is Recommended.* "Should", "recommended", or "it is recommended" is used to indicate provisions which are not mandatory but which are desirable as good practice.

Section 4. Characterization of Refrigerants and Contaminants

4.1 *Characterization.* Characterization of refrigerants and contaminants addressed are listed in the following general classifications:

4.1.1 *Characterization*

a. Gas Chromatography

b. Boiling point and boiling point range

4.1.2 *Contaminants*

a. Water

b. Chloride

c. Acidity

d. High boiling residue

e. Particulates/solids

f. Non-condensables

g. Impurities including other refrigerants

Section 5. Sampling, Summary of Test Methods and Maximum Permissible Contaminant Levels

5.1 *Referee Test.* The referee test methods for the various contaminants are summarized in the following paragraphs. Detailed test procedures are included in *Appendix C to ARI Standard 700–1995: Analytical Procedures for ARI Standard 700–1995,* 1995, Air-Conditioning and Refrigeration Institute. *Appendix C to ARI Standard 700–1995* is incorporated by reference. [This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be obtained from the Air-Conditioning and Refrigeration Institute, 4301 North Fairfax Drive, Arlington, Virginia 22203. Copies may also be inspected at Public Docket No. A–92–01, Environmental Protection Agency, 1301 Constitution Ave., NW., Washington, DC, 20460 or at the Office of the Federal Register, 800 North Capitol Street, NW., Suite 700, Washington, DC.] If alternative test methods are employed, the user must be able to demonstrate that they produce results equivalent to the specified referee method.

5.2 *Refrigerant Sampling*

5.2.1 *Sampling Precautions.* Special precautions should be taken to assure that representative samples are obtained for analysis. Sampling shall be done by trained laboratory personnel following accepted sampling and safety procedures.

5.2.2 *Gas Phase Sample.* A gas phase sample shall be obtained for determining the non-condensables. Since non-condensable gases, if present, will concentrate in the vapor phase of the refrigerant, care must be exercised to eliminate introduction of air during the sample transfer. Purging is not an acceptable procedure for a gas phase sample since it may introduce a foreign product. Since R–11, R–113, and R–123 have normal boiling points at or above room temperature, non-condensable determination is not required for these refrigerants.

5.2.2.1 *Connection.* The sample cylinder shall be connected to an evacuated gas sampling bulb by means of a manifold. The manifold should have a valve arrangement that facilitates evacuation of all connecting tubing leading to the sampling bulb.

5.2.2.2 *Equalizing Pressures.* After the manifold has been evacuated, close the valve to the pump and open the valve on the system. Allow the pressure to equilibrate and close valves.

5.2.3 *Liquid Phase Sample.* A liquid phase sample is required for all tests listed in this standard except the test for non-condensables.

5.2.3.1 *Preparation.* Place a clean, empty sample cylinder with the valve open in an oven at 110 °C (230 °F) for one hour. Remove it from the oven while hot, immediately connect to an evacuation system and evacuate to less than 1 mm mercury (1000 microns). Close the valve and allow it to cool. Weigh the empty cylinder.

5.2.3.2 *Manifolding.* The valve and lines from the unit to be sampled shall be clean and dry. The cylinder shall be connected to an evacuated gas sampling cylinder by means of a manifold. The manifold should have a valve arrangement that facilitates evacuation of all connecting tubing leading to the sampling cylinder.

5.2.3.3 *Liquid Sampling.* After the manifold has been evacuated, close the valve to the pump and open the valve on the system. Take the sample as a liquid by chilling the sample cylinder slightly. Accurate analysis requires that the sample container be filled to at least 60% by volume, however under no circumstances should the cylinder be filled to more than 80% by volume. This can be accomplished by weighing the empty cylinder and then the cylinder with refrigerant. When the desired amount of refrigerant has been collected, close the valve(s) and disconnect the sample cylinder immediately.

5.2.3.4 *Record Weight.* Check the sample cylinder for leaks and record the gross weight.

5.3 *Refrigerant Characterization.*

5.3.1 *Primary Method.* The primary method shall be gas chromatography (GC) as described in *Appendix C to ARI Standard 700–1995.* The chromatogram of the sample shall be compared to known standards.

5.3.2 *Alternative Method.* Determination of the boiling point and boiling point range is an acceptable alternative test method which can be used to characterize refrigerants. The test method shall be that described in the Federal Specification for "Fluorocarbon Refrigerants," BB–F–1421 B, dated March 5, 1982, section 4.4.3.

5.3.3 *Required Values.* The required values for boiling point and boiling point range are given in Table 1A, *Physical Properties of Single Component Refrigerants;* Table 1B, *Physical Properties of Zeotropic Blends (400 Series Refrigerants);* and Table 1C, *Physical Properties of Azeotropic Blends (500 Series Refrigerants).*

5.4 *Water Content.*

5.4.1 *Method.* The Coulometric Karl Fischer Titration shall be the primary test method for determining the water content of refrigerants. This method is described in *Appendix C to ARI Standard 700–1995.* This method can be used for refrigerants that are either a liquid or a gas at room temperature, including refrigerants 11, 113, and 123. For all refrigerants, the sample for water analysis shall be taken from the liquid phase of the container to be tested. Proper operation of the analytical method requires special equipment and an experienced operator. The precision of the results is excellent if proper sampling and handling procedures are followed. Refrigerants containing a colored dye can be successfully analyzed for water using this method.

5.4.2 *Limits.* The value for water content shall be expressed as parts per million (ppm) by weight and shall not exceed the maximum specified (*see* Tables 1A, 1B, and 1C).

5.5 *Chloride.*

The refrigerant shall be tested for chloride as an indication of the presence of hydrochloric acid and/or metal chlorides. The recommended procedure is intended for use with new or reclaimed refrigerants. Significant amounts of oil may interfere with the results by indicating a failure in the absence of chloride.

5.5.1 *Method.* The test method shall be that described in *Appendix C to ARI Standard 700–1995.* The test will show noticeable turbidity at chloride levels of about 3 ppm by weight or higher.

5.5.2 *Turbidity.* The results of the test shall not exhibit any sign of turbidity. Report the results as “pass” or “fail.”

5.6 *Acidity.*

5.6.1 *Method.* The acidity test uses the titration principle to detect any compound that is highly soluble in water and ionizes as an acid. The test method shall be that described in *Appendix C to ARI Standard 700–1995.* This test may not be suitable for determination of high molecular weight organic acids; however these acids will be found in the high boiling residue test outlined in 5.7. The test requires a 100 to 120 gram sample and has a detection limit of 0.1 ppm by weight calculated as HCl.

5.6.2 *Limits.* The maximum permissible acidity is 1 ppm by weight as HCl.

5.7 *High Boiling Residue.*

5.7.1 *Method.* High boiling residue shall be determined by measuring the residue of a standard volume of refrigerant after evaporation. The refrigerant sample shall be evaporated at room temperature or at a temperature 45 °C (115 °F) for all refrigerants, except R–113 which shall be evaporated at 60 °C (140 °F), using a Goetz bulb as specified in *Appendix C to ARI Standard 700–1995.* Oils and/or organic acids will be captured by this method.

5.7.2 *Limits.* The value for high boiling residue shall be expressed as a percentage by volume and shall not exceed the maximum percent specified (*see* Tables 1A, 1B, and 1C). An alternative gravimetric method is

described in *Appendix C to ARI Standard 700–1995.*

5.8 *Method of Tests for Particulates and Solids.*

5.8.1 *Method.* A measured amount of sample is evaporated from a Goetz bulb under controlled temperature conditions. The particulates/solids shall be determined by visual examination of the Goetz bulb prior to the evaporation of refrigerant. Presence of dirt, rust or other particulate contamination is reported as "fail." For details of this test method, refer to Part 3 of *Appendix C to ARI Standard 700–1995.*

5.9 *Non-Condensables.*

5.9.1 *Sample.* A vapor phase sample shall be used for determination of non-condensables. Non-condensable gases consist primarily of air accumulated in the vapor phase of refrigerants. The solubility of air in the refrigerants liquid phase is extremely low and air is not significant as a liquid phase contaminant. The presence of non-condensable gases may reflect poor quality control in transferring refrigerants to storage tanks and cylinders.

5.9.2 *Method.* The test method shall be gas chromatography with a thermal conductivity detector as described in *Appendix C to ARI Standard 700–1995.*

5.9.3 *Limit.* The maximum level of non-condensables in the vapor phase of a refrigerant in a container shall not exceed 1.5% by volume (*see* Tables 1A, 1B, and 1C).

5.10 *Impurities, including Other Refrigerants.*

5.10.1 *Method.* The amount of other impurities including other refrigerants in the subject refrigerant shall be determined by gas chromatography as described in *Appendix C to ARI Standard 700–1995.*

5.10.2 *Limit.* The subject refrigerant shall not contain more than 0.5% by weight of impurities including other refrigerants (*see* Tables 1A, 1B, and 1C).

Section 6. Reporting Procedure

6.1 *Reporting Procedure.* The source (manufacturer, reclaimer or repackager) of the packaged refrigerant shall be identified. The refrigerant shall be identified by its accepted refrigerant number and/or its chemical name. Maximum permissible levels of contaminants are shown in Tables 1A, 1B, and 1C. Test results shall be tabulated in a like manner.

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Table 1A. Physical Properties of Single Component Refrigerants

	REPORTING UNITS	REFERENCE (SUBCLAUSE)	R-11	R-12	R-13	R-22	R-113	R-114	R-123	R-124
CHARACTERISTICS:										
BOILING POINT[1]	°F · 1.00 ATM	—	74.9	-21.6	-114.6	-41.4	117.6	38.8	82.6	12.2
	°C · 1.00 ATM	—	23.8	-29.8	-81.4	-40.8	47.6	3.8	27.9	-11.0
BOILING POINT RANGE[1]	K	—	0.3	0.3	0.5	0.3	0.3	0.3	0.3	0.3
TYPICAL ISOMER CONTENT	BY WEIGHT	—					0-1% R-113A	0-30% R-114A	0-8% R-123A	0-5% R-124A
VAPOR PHASE CONTAMINANTS:										
AIR AND OTHER NON-CONDENSABLES	% BY VOLUME · 25°C	5.9	N/A[2]	1.5	1.5	1.5	N/A[2]	1.5	N/A[2]	1.5
LIQUID PHASE CONTAMINANTS:										
WATER	PPM BY WEIGHT	5.4	20	10	10	10	20	10	20	10
ALL OTHER IMPURITIES INCLUDING REFRIGERANTS	% BY WEIGHT	5.1	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
HIGH BOILING RESIDUE	% BY VOLUME	5.7	0.01	0.01	0.05	0.01	0.03	0.01	0.01	0.01
PARTICULATES/SOLIDS	VISUALLY CLEAN TO PASS	5.8	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
ACIDITY	PPM BY WEIGHT	5.6	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
CHLORIDES[3]	NO VISIBLE TURBIDITY	5.5	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS

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Table 1B. Physical Properties of Zeotropic Blends (400 Series Refrigerants)

	REPORTING UNITS	REFERENCE (SUBCLAUSE)	R-401A	R-401B	R-402A	R-402B	R-406A [3]
CHARACTERISTICS:							
REFRIGERANT COMPONENTS			R-22/152A/124	R-22/152A/124	R-125/290/22	R-125/290/22	R-22/600A/142B
NOMINAL COMP, WEIGHT%			53/13/34	61/11/28	60/2/38	38/2/60	55/4/41
ALLOWABLE COMP, WEIGHT%			51-54/11.5-13.5/33-35	59-63/9.5-11.5/27-29	58-62/1-3/36-40	36-40/1-3/58-62	53-57/3-5/40-42
BOILING POINT [1]	°F · 1.00 ATM	—	-27.7 TO -18.1	-30.4 TO -21.2	-54.8 TO -53.9	-53.3 TO -49.0	-32.7 TO -15.0
	°C · 1.00 ATM	—	-33.2 TO -27.8	-34.7 TO -29.6	-48.2 TO -47.7	-47.4 TO -45.0	-36.0 TO -26.1
BOILING POINT RANGE [1]	K	—	5.4	5.1	0.5	2.4	9.9
VAPOR PHASE CONTAMINANTS:							
AIR AND OTHER NON-CONDENSABLES	% BY VOLUME 25°C	5.9	1.5	1.5	1.5	1.5	1.5
LIQUID PHASE CONTAMINANTS:							
WATER	PPM BY WEIGHT	5.4	10	10	10	10	10
ALL OTHER IMPURITIES INCLUDING REFRIGERANTS	% BY WEIGHT	5.1	0.50	0.50	0.50	0.50	0.50
HIGH BOILING RESIDUE	% BY VOLUME	5.7	0.01	0.01	0.01	0.01	0.01
PARTICULATES/SOLIDS	VISUALLY CLEAN TO PASS	5.8	PASS	PASS	PASS	PASS	PASS
ACIDITY	PPM BY WEIGHT	5.6	1.0	1.0	1.0	1.0	1.0

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Table 1B (continued). Physical Properties of Zeotropic Blends (400 Series Refrigerants)

	REPORTING UNITS	REFERENCE (SUBCLAUSE)	R-407C	R-408A	R-409A	R-410A	R-410B	R-411A [3]	R-411B [3]
CHARACTERISTICS:									
REFRIGERANT COMPONENTS			R-32/125/134A	R125/143A/22	R22/124/142B	R32/125	R32/125	R1270/22/152A	R1270/22/152A
NOMINAL COMP. WEIGHT%			23/25/52	7/46/47	60/25/15	50/50	45/55	1.5/87.5/11.0	3/94/3
ALLOWABLE COMP. WEIGHT%			22-24/23-27/50-54	5-9/45-47/45-49	58-62/23-27/14-16	48.5-50.5/49.4-51.5	44-46/54-56	0.5-1.5/87.5-89.5/10-11	2-3/94-96/2-3
BOILING POINT [1]	-F - 1.00 ATM -C - 1.00 ATM	— —	46.4 TO -33.0 -43.6 TO -36.6	-48.8 TO -47.9 -44.9 TO -44.4	-32.4 TO -18.2 -35.8 TO -27.9	-60.1 TO -60.0 -51.2 TO -51.1	-60.3 TO -60.2 -51.3 TO -51.2		
BOILING POINT RANGE [1]	K	—	7.0	0.5	7.9	0.1	0.1		
VAPOR PHASE CONTAMINANTS: AIR AND OTHER NON-CONDENSABLES	% BY VOLUME - 25-C	5.9	1.5	1.5	1.5	1.5	1.5	1.5	1.5
LIQUID PHASE CONTAMINANTS:									
WATER	PPM BY WEIGHT	5.4	10	10	10	10	10	10	10
ALL OTHER IMPURITIES INCLUDING REFRIGERANTS	% BY WEIGHT	5.1	0.50	0.50	0.50	0.50	0.50	0.50	0.50
HIGH BOILING RESIDUE	% BY VOLUME	5.7	0.01	0.01	0.01	0.01	0.01	0.01	0.01
PARTICULATES/SOLIDS	VISUALLY CLEAN TO PASS	5.8	PASS	PASS	PASS	PASS	PASS	PASS	PASS
ACIDITY	PPM BY WEIGHT	5.6	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Table 1C. Physical Properties of Azeotropic Blends (500 Series Refrigerants)

	REPORTING UNITS	REFERENCE (SUBCLAUSE)	R500	R502	R503	R507	R508 [3]
CHARACTERISTICS:							
REFRIGERANT COMPONENTS			R12/152A	R22/115	R23/13	R125/143A	R23/116
NOMINAL COMP. WEIGHT%			73.8/26.2	48.8/51.2	40.1/59.9	50/50	39/61
ALLOWABLE COMP. WEIGHT%			72.8-74.8/ 25.2-27.2	44.8-52.8/ 47.2-55.2	39-41/ 59-61	49-51/ 49-51	37-41/ 59-63
BOILING POINT [1]	°F @ 1.00 ATM	—	-28.1	-49.7	-127.7	-52.1	-123.5
	°C @ 1.00 ATM	—	-33.4	-45.4	-88.7	-46.7	-86.4
BOILING POINT RANGE [1]	K	—	0.5	0.5	0.5	0.5	0.5
VAPOR PHASE CONTAMINANTS:							
AIR AND OTHER NON-CONDENSABLES	% BY VOLUME 25°C	5.9	1.5	1.5	1.5	1.5	1.5
LIQUID PHASE CONTAMINANTS:							
WATER	PPM BY WEIGHT	5.4	10	10	10	10	10
ALL OTHER IMPURITIES INCLUDING REFRIGERANTS	% BY WEIGHT	5.1	0.50	0.50	0.50	0.50	0.50
HIGH BOILING RESIDUE	% BY VOLUME	5.7	0.03	0.01	0.01	0.01	0.01
PARTICULATES/SOLIDS	VISUALLY CLEAN TO PASS	5.8	PASS	PASS	PASS	PASS	PASS
ACIDITY	PPM BY WEIGHT	5.6	1.0	1.0	1.0	1.0	1.0
CHLORIDES [2]	NO VISIBLE TURBIDITY	5.5	PASS	PASS	PASS	PASS	PASS

[1] BOILING POINTS AND BOILING POINT RANGES, ALTHOUGH NOT REQUIRED, ARE PROVIDED FOR INFORMATIONAL PURPOSES.

[2] RECOGNIZED CHLORIDE LEVEL FOR PASS/FAIL IS 30PPM.

[3] SHADED COLUMNS DENOTE REFRIGERANTS FOR WHICH ANALYTICAL DATA IS NOT AVAILABLE.

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Appendix A. References—Normative

Listed here are all standards, handbooks, and other publications essential to the formation and implementation of the standard. All references in this appendix are considered as part of this standard.

ASHRAE Terminology of Heating, Ventilating, Air Conditioning and Refrigeration, American Society of Heating Refrigeration and Air-Conditioning Engineers, 1992, 1791 Tullie Circle NE., Atlanta, GA 30329–2305; U.S.A.

ASHRAE Standard 34–1992, *Number Designation and Safety Classification of Refrigerants,* American Society of Heating Refrigeration and Air-Conditioning Engineers, 1992, 1791 Tullie Circle NE., Atlanta, GA 30329–2305; U.S.A.

Appendix C to ARI Standard 700–1995: Analytical Procedures to ARI Standard 700–1995, Specifications for Fluorocarbon and Other Refrigerants, Air-Conditioning and Refrigeration Institute, 1995, 4301 North Fairfax Drive, Suite 425, Arlington, VA 22203; U.S.A.

Federal Specification for *Fluorocarbon Refrigerants, BB–F–1421–B,* dated March 5, 1992, Office of the Federal Register, National Archives and Records Administration, 1992, 800 North Capitol Street, NW., Washington, D.C. 20402; U.S.A.

[69 FR 11981, Mar. 12, 2004]

Appendix A1 to Subpart F of Part 82—Generic Maximum Contaminant Levels

Contaminant	Reporting units
Air and Other Non-condensables	1.5% by volume @ 25 °C (N/A for refrigerants used in low-pressure appliances[1]).
Water	10 ppm by weight 20 ppm by weight (for refrigerants used in low-pressure appliances[1]).
Other Impurities Including Refrigerant	0.50% by weight.
High boiling residue	0.01% by volume.
Particulates/solids	visually clean to pass.
Acidity	1.0 ppm by weight.
Chlorides (chloride level for pass/fail is 3ppm)	No visible turbidity.

[1]Low-pressure appliances means an appliance that uses a refrigerant with a liquid phase saturation pressure below 45 psia at 104 °F.

Blend Compositions (Where Applicable)

Nominal composition (by weight%)	Allowable composition (by weight%)
Component constitutes 25% or more	±2.0
Component constitutes less than 25% but greater than 10%	±1.0
Component constitutes less than or equal to 10%	±0.5

[69 FR 11988, Mar. 12, 2004]

Appendix B1 to Subpart F of Part 82—Performance of Refrigerant Recovery, Recycling and/or Reclaim Equipment

This appendix is based on the Air-Conditioning and Refrigeration Institute Standard 740–1993.

Refrigerant Recovery/Recycling Equipment

Section 1. Purpose

1.1 *Purpose.* The purpose of this standard is to establish methods of testing for rating and evaluating the performance of refrigerant recovery, and/or recycling equipment, and general equipment requirements (herein referred to as “equipment”) for containment or purity levels, capacity, speed, and purge loss to minimize emission into the atmosphere of designated refrigerants.

1.1.1 This standard is intended for the guidance of the industry, including manufacturers, refrigerant reclaimers, repackers, distributors, installers, servicemen, contractors and for consumers.

1.1.2 This standard is not intended to be used as a guide in defining maximum levels of contaminants in recycled or reclaimed refrigerants used in various applications.

1.2 *Review and Amendment.* This standard is subject to review and amendment as the technology advances.

Section 2. Scope

2.1 *Scope.* This standard defines general equipment requirements and the test apparatus, test mixtures, sampling and analysis techniques that will be used to determine the performance of recovery and/or recycling equipment for various refrigerants including R11, R12, R13, R22, R113, R114, R123, R134a, R500, R502, and R503, as referenced in the ANSI/ASHRAE Standard 34–1992, "Number Designation of Refrigerants" (American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc.).

Section 3. Definitions

3.1 *Recovered refrigerant.* Refrigerant that has been removed from a system for the purpose of storage, recycling, reclamation or transportation.

3.2 Recover. Reference 40 CFR 82.152.

3.3 Recycle. Reference 40 CFR 82.152.

3.4 Reclaim. Reference 40 CFR 82.152.

3.5 *Standard Contaminated Refrigerant Sample.* A mixture of new and/or reclaimed refrigerant and specified quantities of identified contaminants which are representative of field obtained, used refrigerant samples and which constitute the mixture to be processed by the equipment under test.

3.6 *Push/Pull Method.* The push/pull refrigerant recovery method is defined as the process of transferring liquid refrigerant from a refrigeration system to a receiving vessel by lowering the pressure in the vessel and raising the pressure in the system, and by connecting a separate line between the system liquid port and the receiving vessel.

3.7 *Recycle Rate.* The amount of refrigerant processed (in pounds) divided by the time elapsed in the recycling mode in pounds per minute. For equipment which uses a separate recycling sequence, the recycle rate does not include the recovery rate (or elapsed time). For equipment which does not use a separate recycling sequence, the recycle rate is a maximum rate based solely on the higher of the liquid or vapor recovery rate, by which the rated contaminant levels can be achieved.

3.8 *Equipment Classification.*

3.8.1 *Self Contained Equipment.* A refrigerant recovery or recycling system which is capable of refrigerant extraction without the assistance of components contained within an air conditioning or refrigeration system.

3.8.2 *System Dependent Equipment.* Refrigerant recovery equipment which requires for its operation the assistance of components contained in an air conditioning or refrigeration system.

3.9 *"Shall", "Should", "Recommended"* or *"It is Recommended",* "Shall" "Should", "recommended", or

"it is recommended" shall be interpreted as follows:

3.9.1 *Shall.* Where "shall" or "shall not" is used for a provision specified, that provision is mandatory if compliance with the standard is claimed.

3.9.2 *Should, Recommended,* or *It is Recommended,* "Should", "recommended", is used to indicate provisions which are not mandatory but which are desirable as good practice.

Section 4. General Equipment Requirements

4.1 The equipment manufacturer shall provide operating instructions, necessary maintenance procedures, and source information for replacement parts and repair.

4.2 The equipment shall indicate when any filter/drier(s) needs replacement. This requirement can be met by use of a moisture transducer and indicator light, by use of a sight glass/moisture indicator, or by some measurement of the amount of refrigerant processed such as a flow meter or hour meter. Written instructions such as "to change the filter every 400 pounds, or every 30 days" shall not be acceptable except for equipment in large systems where the Liquid Recovery Rate is greater than 25 lbs/min [11.3 Kg/min] where the filter/drier(s) would be changed for every job.

4.3 The equipment shall either automatically purge non-condensables if the rated level is exceeded or alert the operator that the non-condensable level has been exceeded. While air purge processes are subject to the requirements of this section, there is no specific requirement to include an air purge process for "recycle" equipment.

4.4 The equipment's refrigerant loss due to non-condensable purging shall not be exceeded 5% by weight of total recovered refrigerant. (See Section 9.4)

4.5 Internal hose assemblies shall not exceed a permeation rate of 12 pounds mass per square foot [5.8 g/cm^2] of internal surface per year at a temperature of 120 F [48.8 °C] for any designated refrigerant.

4.6 The equipment shall be evaluated at 75 F [24 °C] per 7.1. Normal operating conditions range from 50 °F to 104 F [10 °C to 40 °C].

4.7 *Exemptions:*

4.7.1 Equpment intended for recovery only shall be exempt from sections 4.2 and 4.3.

Table 1—Standard Contaminated Refrigerant Samples

	R11	R12	R13	R22	R113	R114	R123	R134a	R500	R502	R503
Moisture content:											
PPM by weight of pure refrigerant	100	80	30	200	100	85	100	200	200	200	30
Particulate content:											
PPM by weight of pure refrigerant characterized by[1]	80	80	80	80	80	80	80	80	80	80	80
Acid content:											
PPM by weight of pure refrigerant—(mg KOH per kg refrig.) characterized by[2]	500	100	NA	500	400	200	500	100	100	100	NA

Mineral oil content:											
% by weight of pure refrigerant	20	5	NA	5	20	20	20	5	5	5	NA
Viscosity (SUS)	300	150		300	300	300	300	150	150	150	
Non condensable gases air content % volume[3]>	NA	3	3	3	NA	3	3	3	3	3	3

[1]Particulate content shall consist of inert materials and shall comply with particulate requirements in *ASHRAE* Standard 63.2, "Method of Testing of Filtration Capacity of Refrigerant Liquid Line Filters and Filter Driers."

[2]Acid consists of 60% oleic acid and 40% hydrochloric acid on a total number basis.

[3]Synthetic ester based oil.

Section 5. Contaminated Refrigerants

5.1 The standard contaminated refrigerant sample shall have the characteristics specified in Table 1, except as provided in 5.2

5.2 Recovery equipment not rated for any specific contaminant can be tested with new or reclaimed refrigerant.

Section 6. Test Apparatus

6.1 Self Contained Equipment Test Apparatus. The apparatus as shown in Figure 1 consists of a 3 cubic foot [0.085 m^3] mixing chamber with a conical-shaped bottom, although a larger mixing chamber is permissible. The size of the mixing chamber depends upon the size of the equipment. The outlet at the bottom of the cone and all restrictions and valves for liquid and vapor refrigerant lines in the test apparatus shall be a minimum of 0.375 in. [9.5 mm] inside diameter or equivalent. The minimum inside diameter for large equipment for use on chillers shall be 1.5 in. [38 mm.]. The mixing chamber shall contain various ports for receiving liquid refrigerant, oil, and contaminants. A recirculating line connected from the bottom outlet through a recirculating pump and then to a top vapor port shall be provided for stirring of the mixture. Isolation valves may be required for the pump. Alternative stirring means may be used if demonstrated to be equally effective.

6.1.1 For liquid refrigerant feed, the liquid valve is opened. For vapor refrigerant feed, the vapor valve is opened and refrigerant passes through an evaporator coil. Flow is controlled by a thermostatic expansion valve to create 5 F [3 °C] superheat at an evaporator temperature of 70 F ±3 F[21 °C±2°]. The evaporator coil or equivalent evaporator means shall be either sized large enough for the largest system or be sized for each system.

6.1.2 An alternative method for vapor refrigerant feed is to pass through a boiler and then an automatic pressure regulating valve set at refrigerant saturation pressure at 75 F ±3 F [24 °C ±2 °C].

6.2 System Dependent Equipment Test Apparatus. This test apparatus is to be used for final recovery vacuum rating of all system dependent equipment.

6.2.1 The test apparatus shown in Figure 2 consists of a complete refrigeration system. The manufacturer shall identify the refrigerants to be tested. The test apparatus can be modified to facilitate operation or testing of the system dependent equipment if the modifications to the apparatus are specifically described

within the manufacturer's literature. (*See Figure 2* .) A1/4inch [6.3 mm] balance line shall be connected across the test apparatus between the high and low pressure sides, with an isolation valve located at the connection to the compressor high side. A1/4inch [6.3 mm] access port with a valve core shall be located in the balance line for the purpose of measuring final recovery vacuum at the conclusion of the test.

FIGURE 1

Test Apparatus for Self-Contained Equipment

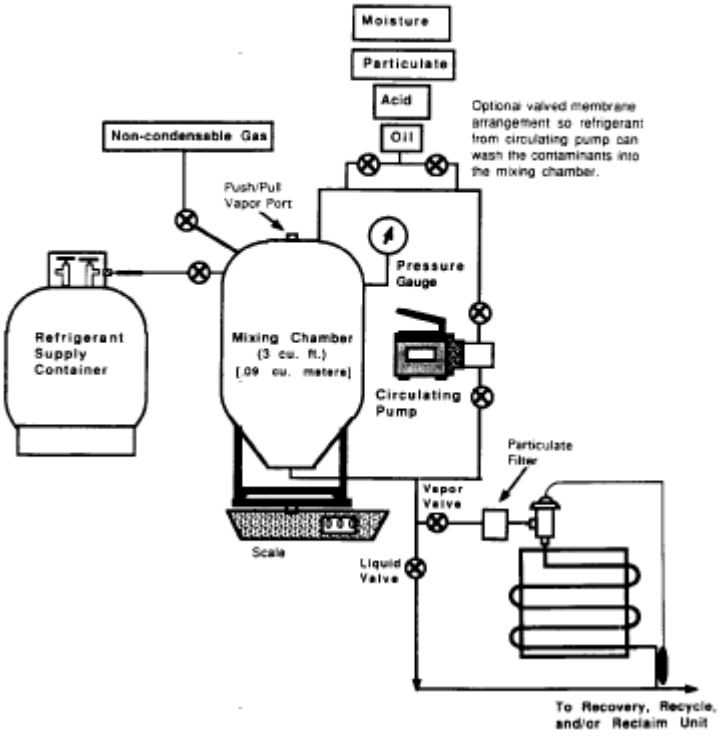

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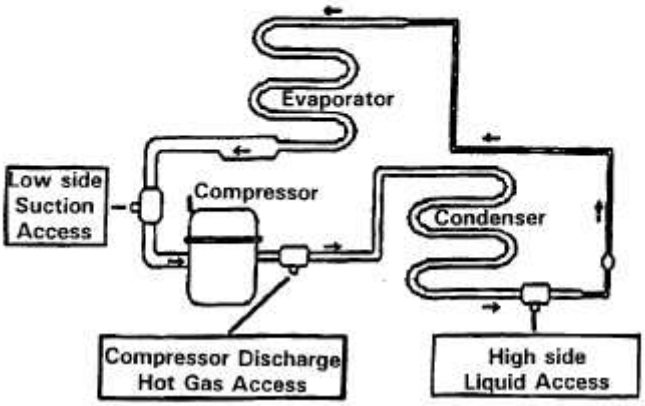
FIGURE 2

System-Dependent Equipment Test Apparatus

Configuration of a standard air conditioning or refrigeration system for use as a test apparatus



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Section 7. Performance Testing

7.1 Contaminant removal and performance testing shall be conducted at 75 F ±2 F [23.9 °C ±1.1 °C].

7.1.1 The equipment shall be prepared for operation per the instruction manual.

7.1.2 The contaminated sample batch shall consist of not less than the sum of the amounts required to complete steps 7.1.2.2 and 7.1.2.3 below.

7.1.2.1 A liquid sample shall be drawn from the mixing chamber prior to starting the test to assure quality control of the mixing process.

7.1.2.2 Vapor refrigerant feed testing, if elected, shall normally be processed first. After the equipment reaches stabilized conditions of condensing temperature and/or storage tank pressure, the vapor feed recovery rate shall be measured. One method is to start measuring the vapor refrigerant recovery rate when 85% of refrigerant remains in the mixing chamber and continue for a period of time sufficient to achieve the accuracy in 9.2. If liquid feed is not elected, complete Step 7.1.2.4.

7.1.2.3 Liquid refrigerant feed testing, if elected, shall be processed next. After the equipment reaches stabilized conditions, the liquid feed recovery rate shall be measured. One method is to wait 2 minutes after starting liquid feed and then measure the liquid refrigerant recovery rate for a period of time sufficient to achieve the accuracy in 9.1. Continue liquid recovery operation as called for in 7.1.2.4.

7.1.2.4 Continue recovery operation until all liquid is removed from the mixing chamber and vapor is removed to the point where the equipment shuts down per automatic means or is manually stopped per the operating instructions.

7.1.2.5 After collecting the first contaminated refrigerant sample batch, the liquid and vapor value of the apparatus shall be closed and the mixing chamber pressure recorded after 1 minute as required in 9.5. After preparing a second contaminated refrigerant sample batch, continue recovery until the storage container reaches 80% liquid fill level. After recycling and measuring the recycle rate per section 7.1.3, set this container aside for the vapor sample in 8.2.2.

7.1.2.6 Interruptions in equipment operations as called for in instruction manual are allowable.

7.1.3 Recycle as called for in equipment operating instructions. Determine recycle rate by appropriate means as required in 9.3.

7.1.4 Repeat steps 7.1.2, 7.1.2.4, and 7.1.3 with contaminated refrigerant sample until equipment indicator(s) show need to change filter(s). It will not be necessary to repeat the recycle rate determination in 7.1.3.

7.1.4.1 For equipment with a multiple pass recirculating filter system, analyze the contents of the previous storage container.

7.1.4.2 For equipment with a single pass filter system, analyze the contents of the current storage container.

7.1.5 Refrigerant loss due to the equipment's non-condensable gas purge shall be determined by appropriate means. (See Section 9.4.)

7.2 System Dependent Equipment. This procedure shall be used for vacuum rating of all system dependent

equipment. Liquid refrigerant recovery rate, vapor refrigerant recovery rate, and recycle rate are not tested on system dependent systems.

7.2.1 The apparatus operation and testing shall be conducted at 75 F ±2 F. [23.9 °C. ±/1.1. °C.].

7.2.2 The apparatus shall be charged with refrigerant per its system design specifications.

7.2.3 For measurement of final recovery vacuum as required in 9.5, first shut the balance line isolation valve and wait 1 minute for pressure to balance. Then connect and operate the recovery system per manufacturers recommendations. When the evacuation is completed, open the balance line isolation valve and measure the pressure in the balance line.

Section 8. Sampling and Chemical Analysis Methods

8.1 The referee test methods for the various contaminants are summarized in the following paragraphs. Detailed test procedures are included in Appendix A "Test Procedures for ARI STD 700." If alternate test methods are employed, the user must be able to demonstrate that they produce results equivalent to the specified referee method.

8.2 *Refrigerant Sampling.*

8.2.1 *Sampling Precautions.* Special precautions should be taken to assure that representative samples are obtained for analysis. Sampling shall be done by trained laboratory personnel following accepted sampling and safety procedures.

8.2.2 *Gas Phase Sample.* A gas phase sample shall be obtained for determining the non-condensables. Since non-condensable gases, if present, will concentrate in the vapor phase of the refrigerant, care must be exercised to eliminate introduction of air during the sample transfer. Purging is not and acceptable procedure for a gas phase sample since it may introduce a foreign product. Since R11, R113 and R123 have normal boiling points at or above room temperature, noncondensable determination is not required for these refrigerants.

8.2.2.1 The sample cylinder shall be connected to an evacuated gas sampling bulb by means of a manifold. The manifold should have a valve arrangement that facilitates evacuation of all connecting tubing leading to the sampling bulb.

8.2.2.2 After the manifold has been evacuated, close the valve to the pump and open the valve on the system. Allow the pressure to equilibrate and close valves.

8.2.3 *Liquid Phase Sample.* A liquid phase sample is required for all tests listed in this standard, except the test for non-condensables.

8.2.3.1 Place an empty sample cylinder with the valve open in an oven at 230 F [110 °C] for one hour. Remove it from the oven while hot, immediately connect to an evacuation system and evacuate to less than 1mm. mercury (1000 microns). Close the valve and allow it to cool.

8.2.3.2 The valve and lines from the unit to be sampled shall be clean and dry. Connect the line to the sample cylinder loosely. Purge through the loose connection. Make the connection tight at the end of the purge period. Take the sample as a liquid by chilling the sample cylinder slightly. Accurate analysis requires that the sample container be filled to at least 60% by volume; however under no circumstances should the cylinder be filled to more than 80% by volume. This can be accomplished by weighing the empty cylinder and then the cylinder with refrigerant. When the desired amount of refrigerant has been collected, close the

valve(s) and disconnect the sample cylinder immediately.

8.2.3.3 Check the sample cylinder for leaks and record the gross weight.

8.3 *Water Content.*

8.3.1. The Coulometric Karl Fischer Titration shall be the primary test method for determining the water content of refrigerants. This method is described in Appendix A. This method can be used for refrigerants that are either a liquid or a gas at room temperature, including Refrigerants 11 and 13. For all refrigerants, the sample for water analysis shall be taken from the liquid phase of the container to be tested. Proper operation of the analytical method requires special equipment and an experienced operator. The precision of the results is excellent if proper sampling and handling procedures are followed. Refrigerants containing a colored dye can be successfully analyzed for water using this method.

8.3.2 The Karl Fischer Test Method is an acceptable alternative test method for determining the water content of refrigerants. This method is described in ASTM Standard for "Water in gases Using Karl Fisher Reagent" E700–79, reapproved 1984 (American Society for Testing and Materials, Philadelphia, PA).

8.3.3 Report the moisture level in parts per million by weight if a sample is required.

8.4 *Chloride.* The refrigerant shall be tested for chlorides as an indication of the presence of hydrochloric or similar acids. The recommended procedure is intended for use with new or reclaimed refrigerants. Significant amounts of oil may interfere with the results by indicating a failure in the absence of chlorides.

8.4.1 The test method shall be that described in Appendix A "Test Procedures for ARI–700." The test will show noticeable turbidity at equivalent chloride levels of about 3 ppm by weight or higher.

8.4.2 The results of the test shall not exhibit any sign of turbity. Report results as "pass" or "fail."

8.5 *Acidity.*

8.5.1 The acidity test uses the titration principle to detect any compound that is highly soluble in water and ionizes as an acid. The test method shall be that described in Appendix A. "Test Procedures for ARI–700." The test may not be suitable for determination of high molecular weight organic acids; however these acids will be found in the high boiling residue test outlined in Section 5.7. The test requires about a 100 to 120 gram sample and has a low detection limit of 0.1 ppm by weight as HC1.

8.6 High Boiling Residue.

8.6.1 High boiling residue will be determined by measuring the residue of a standard volume of refrigerant after evaporation. The refrigerant sample shall be evaporated at room temperature or a temperature 50 F [10°.0C], above the boiling point of the sample using a Goetz tube as specified in Appendix A "Test Procedures for ARI–700." Oils and or organic acids will be captured by this method.

8.6.2 The value for high boiling residue shall be expressed as a percentage by volume.

8.7 Particulates/Solids.

8.7.1 A measured amount of sample is evaporated from a Goetz bulb under controlled temperature conditions. The particulates/solids shall be determined by visual examination of the empty Goetz bulb after the sample has evaporated completely. Presence of dirt, rust or other particulate contamination is reported a "fail." For details of this test method, refer to Appendix B "Test Procedures for ARI–700."

8.8 Non-Condensables

8.8.1 A vapor phase sample shall be used for determination of non-condensables. Non-condensable gases consist primarily of air accumulated in the vapor phase of refrigerant containing tanks. The solubility of air in the refrigerants liquid phase is extremely low and air is not significant as a liquid phase contaminant. The presence of non-condensable gases may reflect poor quality control in transferring refrigerants to storage tanks and cylinders.

8.8.2 The test method shall be gas chromatography with a thermal conductivity detector as described in Appendix A "Test Procedures for ARI–700."

8.8.2.1 The Federal Specification for "Fluorocarbon Refrigerants," BB–F–1421B, dated March 5, 1992, section 4.4.2 (perchloroethylene method) is an acceptable alternate test method.

8.8.3 Report the level of non-condensable as percent by volume.

Section 9. Performance Calculation and Rating

9.1 The liquid refrigerant recovery rate shall be expressed in pounds per minute [kg/min] and measured by weight change at the mixing chamber (See Figure 1) divided by elapsed time to an accuracy within .02 lbs/min. [.009 kg/min]. Ratings using the Push/Pull method shall be identified "Push/Pull". Equipment may be rated by both methods.

9.2 The vapor refrigerant recovery rate shall be expressed in pounds per minute [kg/min] and measured by weight change at the mixing chamber (See Figure 1) divided by elapsed time to an accuracy within .02 lbs/min. [.0.009 kg/min].

9.3 The recycle rate is defined in 3.7 and expressed in pounds per minute [kg/min] of flow and shall be per ASHRAE 41.7–84 "Procedure For Fluid Measurement Of Gases" or ASHRAE 41.8–89 "Standard Method of Flow of Fluids—Liquids."

9.3.1 For equipment using multipass recycling or a separate sequence, the recycle rate shall be determined by dividing the net weight W of the refrigerant to be recycled by the actual time T required to recycle the refrigerant. Any set-up or operator interruptions shall not be included in the time T. The accuracy of the recycle rate shall be within .02 lbs/min. [.009 kg/min].

9.3.2 If no separate recycling sequence is used, the recycle rate shall be the higher of the vapor refrigerant recovery rate or the liquid refrigerant recovery rate. The recycle rate shall match a process which leads to contaminant levels in 9.6. Specifically, a recovery rate determined from bypassing a contaminant removal device cannot be used as a recycle rate when the contaminant levels in 9.6 are determined by passing the refrigerant through the containment removal device.

9.4 Refrigerant loss due to non-condensable purging shall be less than 5%. This rating shall be expressed as "passed" if less than 5%.

This calculation will be based upon net loss of non-condensables and refrigerant due to the purge divided by the initial net content. The net loss shall be determined by weighing before and after the purge, by collecting purged gases, or an equivalent method.

9.5 The final recovery vacuum shall be the mixing chamber pressure called for in 7.1.2.5 expressed in inches of mercury vacuum, [mm Hg or kP]. The accuracy of the measurement shall be within ±.1 inch

[±2.5mm] of Hg and rounding down to the nearest whole number.

9.6 The contaminant levels remaining after testing shall be published as follows:

Moisture content, PPM by weight

Chloride ions, Pass/Fail

Acidity, PPM by weight

High boiling residue, percentage by volume

Particulate/solid, Pass/Fail

Non-condensables, % by volume

9.7 Product Literature: Except as provided under product labelling in Section 11. performance ratings per 9.1, 9.2, 9.3, and 9.5 must be grouped together and shown for all listed refrigerants (11.2) subject to limitations of 9.8. Wherever any contaminant levels per 9.6 are rated, all ratings in 9.6 must be shown for all listed refrigerants subject to limitations of 9.8. The type of equipment in 11.1 must be included with either grouping. Optional ratings in 9.8 need not be shown.

9.8 Ratings shall include all of the parameters for each designed refrigerant in 11.2 as shown in Tables 2 and 3.

Table 2—Performance

Parameter/type of equipment	Recovery	Recovery/ recycle	Recycle	System dependent equipment
Liquid refrigerant recovery rate	([2])	([2])	N/A	N/A
Vapor refrigerant recovery rate	([2])	([2])	N/A	N/A
Final recovery vacuum	([1])	([1])	N/A	([1])
Recycle rate	N/A	([1])	([1])	N/A
Refrigerant loss due to non-condensable purging	([3])	([1])	([1])	N/A

[1]Mandatory rating.

[2]For a recovery or recovery/recycle unit, one must rate for either liquid feed only or vapor feed only or can rate for both. If rating only the one, the other shall be indicated by “N/A.”

[3]For Recovery Equipment, these parameters are optional. If not rated, use N/A.

Table 3—Contaminants

Contaminant/type of equipment	Recovery	Recovery/recycle	Recycle	System dependent equipment
Moisture content	(*)	x	x	NA.
Chloride ions	(*)	x	x	NA.

Acidity	(*)	x	x	NA.
High boiling residue	(*)	x	x	NA.
Particulates	(*)	x	x	NA.
Non-condensables	(*)	x	x	NA.

*For Recovery Equipment, these parameters are optional. If not rated, use N/A.

xMandatory rating.

Section 10. Tolerances

10.1 Any equipment tested shall produce contaminant levels not higher than the published ratings. The liquid refrigerant recovery rate, vapor refrigerant recovery rate, final recovery vacuum and recycle rate shall not be less than the published ratings.

Section 11. Product Labelling

11.1 *Type of equipment.* The type of equipment shall be as listed:

11.1.1 Recovery only

11.1.2 System Dependent Recovery

11.1.3 Recovery/Recycle

11.1.4 Recycle only

11.2 Designated refrigerants and the following as applicable for each:

11.2.1 Liquid Recovery Rate

11.2.2 Vapor Recovery Rate

11.2.3 Final Recovery Vacuum

11.2.4 Recycle Rate

11.3 The nameplate shall also conform to the labeling requirements established for certified recycling and recovery equipment established at 40 CFR 82.158(h).

Attachment to Appendix B1

Particulate Used in Standard Contaminated Refrigerant Sample.

1. Particulate Specification

1.1 The particulate material pm will be a blend of 50% coarse air cleaner dust as received, and 50% retained on a 200-mesh screen. The coarse air cleaner dust is available from: AC Spark Plug Division, General Motors Corporation, Flint, Michigan.

1.2 Preparation of Particulate Materials

To prepare the blend of contaminant, first wet screen a quantity of coarse air cleaner dust on a 200-mesh screen (particle retention 74 pm). This is done by placing a portion of the dust on a 200-mesh screen and running water through the screen while stirring the dust with the fingers. The fine contaminant particles passing through the screen are discarded. The +200 mesh particles collected on the screen are removed and dried for one hour at 230 F [110 °C]. The blend of standard contaminant is prepared by mixing 50% by weight of coarse air cleaner dust as received after drying for one hour at 230 F [110 °C] with 50% by weight of the +200 mesh screened dust.

1.3 The coarse air cleaner dust as received and the blend used as the standard contaminant have the following approximate particle size analysis: Wt. % in various size ranges, pm.

Size range	As received	Blend
0–5	12	6
5–10	12	6
10–20	14	7
20–40	23	11
40–80	30	32
80–200	9	38

[58 FR 28712, May 14, 1993, as amended at 59 FR 42960, Aug. 19, 1994. Redesignated and amended at 68 FR 43815, July 24, 2003]

Appendix B2 to Subpart F of Part 82—Performance of Refrigerant Recovery, Recycling, and/or Reclaim Equipment

This appendix is based on the Air-Conditioning and Refrigeration Institute Standard 740–1995.

Section 1. Purpose

1.1 *Purpose.* The purpose of this standard is to establish methods of testing for rating and evaluating the performance of refrigerant recovery, and/or recycling equipment and general equipment requirements (herein referred to as “equipment”) for contaminant or purity levels, capacity, speed and purge loss to minimize emission into the atmosphere of designated refrigerants.

Section 2. Scope

2.1 *Scope.* This standard applies to equipment for recovering and/or recycling single refrigerants, azeotropics, zeotropic blends, and their normal contaminants from refrigerant systems. This standard defines the test apparatus, test gas mixtures, sampling procedures and analytical techniques that will be used to determine the performance of refrigerant recovery and/or recycling equipment (hereinafter, “equipment”).

Section 3. Definitions

3.1 *Definitions.* All terms in this appendix will follow the definitions in §82.152 unless otherwise defined in this appendix.

3.2 *Clearing Refrigerant.* Procedures used to remove trapped refrigerant from equipment before switching from one refrigerant to another.

3.3 *High Temperature Vapor Recovery Rate.* For equipment having at least one designated refrigerant (see

11.2) with a boiling point in the range of −50 to +10 °C, the rate will be measured for R–22, or the lowest boiling point refrigerant if R–22 is not a designated refrigerant.

3.4 *Published Ratings.* A statement of the assigned values of those performance characteristics, under stated rating conditions, by which a unit may be chosen to fit its application. These values apply to all units of like nominal size and type (identification) produced by the same manufacturer. As used herein, the term "published rating" includes the rating of all performance characteristics shown on the unit or published in specifications, advertising or other literature controlled by the manufacturer, at stated rating conditions.

3.5 *Push/Pull Method.* The push/pull refrigerant recovery method is defined as the process of transferring liquid refrigerant from a refrigeration system to a receiving vessel by lowering the pressure in the vessel and raising the pressure in the system, and by connecting a separate line between the system liquid port and the receiving vessel.

3.6 *Recycle Flow Rate.* The amount of refrigerant processed divided by the time elapsed in the recycling mode. For equipment which uses a separate recycling sequence, the recycle rate does not include the recovery rate (or elapsed time). For equipment which does not use a separate recycling sequence, the recycle rate is a rate based solely on the higher of the liquid or vapor recovery rate, by which the contaminant levels were measured.

3.7 *Residual Trapped Refrigerant.* Refrigerant remaining in equipment after clearing.

3.8 *Shall, Should, Recommended* or *It Is Recommended* shall be interpreted as follows:

3.8.1 *Shall.* Where "shall" or "shall not" is used for a provision specified, that provision is mandatory if compliance with this appendix is claimed.

3.8.2 *Should, Recommended* or *It Is Recommended* is used to indicate provisions which are not mandatory but which are desirable as good practice.

3.9 Standard Contaminated Refrigerant Sample. A mixture of new or reclaimed refrigerant and specified quantities of identified contaminants which constitute the mixture to be processed by the equipment under test. These contaminant levels are expected only from severe service conditions.

3.10 *Trapped Refrigerant.* The amount of refrigerant remaining in the equipment after the recovery or recovery/recycling operation but before clearing.

3.11 *Vapor Recovery Rate.* The average rate that refrigerant is withdrawn from the mixing chamber between two pressures as vapor recovery rate is changing pressure and temperature starting at saturated conditions either 24 °C or at the boiling point 100 kPa (abs), whichever is higher. The final pressure condition is 10% of the initial pressure, but not lower than the equipment final recovery vacuum and not higher than 100 kPa (abs).

Section 4. General Equipment Requirements

4.1 *Equipment Information.* The equipment manufacturer shall provide operating instructions, necessary maintenance procedures and source information for replacement parts and repair.

4.2 *Filter Replacement.* The equipment shall indicate when any filter/drier(s) needs replacement. This requirement can be met by use of a moisture transducer and indicator light, by use of a sight glass/moisture indicator or by some measurement of the amount of refrigerant processed such as a flow meter or hour meter. Written instructions such as "to change the filter every 181 kg, or every 30 days" shall not be

acceptable except for equipment in large systems where the liquid recovery rate is greater than 11.3 kg/min where the filter/drier(s) would be changed for every job.

4.3 *Purge of Non-Condensable.* If non-condensables are purged, the equipment shall either automatically purge non-condensables or provide indicating means to guide the purge process.

4.4 *Purge Loss.* The total refrigerant loss due to purging non-condensables, draining oil and clearing refrigerant (*see* 9.5) shall be less than 3% (by weight) of total processed refrigerant.

4.5 *Permeation Rate.* High pressure hose assemblies5/8in. [16 mm] nominal and smaller shall not exceed a permeation rate of 3.9 g/cm^2 /yr (internal surface) at a temperature of 48.8 °C. Hose assemblies that UL recognized as having passed ANSI/UL 1963 requirements shall be accepted without testing. See 7.1.4.

4.6 *Clearing Trapped Refrigerant.* For equipment rated for more than one refrigerant, the manufacturer shall provide a method and instructions which will accomplish connections and clearing within 15 minutes. Special equipment, other than a vacuum pump or manifold gauge set shall be furnished. The clearing procedure shall not rely upon the storage cylinder below saturated pressure conditions at ambient temperature.

4.7 *Temperature.* The equipment shall be evaluated at 24 °C with additional limited evaluation at 40 °C. Normal operating conditions range from 10 °C to 40 °C.

4.8 *Exemptions.* Equipment intended for recovery only shall be exempt from 4.2 and 4.3.

Section 5. Contaminated Refrigerants

5.1 *Sample Characteristics.* The standard contaminated refrigerant sample shall have the characteristics specified in Table 1, except as provided in 5.2.

5.2 *Recovery-Only Testing.* Recovery equipment not rated for any specific contaminant shall be tested with new or reclaimed refrigerant.

Section 6. Test Apparatus

6.1 *General Recommendations.* The recommended test apparatus is described in the following paragraphs. If alternate test apparatus are employed, the user shall be able to demonstrate that they produce results equivalent to the specified referee apparatus.

6.2 *Self-Contained Equipment Test Apparatus.* The apparatus, shown in Figure 1, shall consist of:

6.2.1 *Mixing Chamber.* A mixing chamber consisting of a tank with a conical-shaped bottom, a bottom port and piping for delivering refrigerant to the equipment, various ports and valves for adding refrigerant to the chamber and stirring means for mixing.

6.2.2 *Filling Storage Cylinder.* The storage cylinder to be filled by the refrigerant transferred shall be cleaned and at the pressure of the recovered refrigerant at the beginning of the test. It will not be filled over 80%, by volume.

6.2.3 *Vapor Feed.* Vapor refrigerant feed consisting of evaporator, control valves and piping to create a 3.0 °C superheat condition at an evaporating temperature of 21 °C ±2K.

6.2.4 *Alternative Vapor Feed.* An alternative method for vapor feed shall be to pass the refrigerant through

a boiler and then through an automatic pressure regulating valve set at different saturation pressures, moving from saturated pressure at 24 °C to final pressure of recovery.

6.2.5 *Liquid Feed.* Liquid refrigerant feed consisting of control valves, sampling port and piping.

6.2.6 *Instrumentation.* Instrumentation capable of measuring weight, temperature, pressure and refrigerant loss, as required.

Table 1—Standard Contaminated Refrigerant Samples

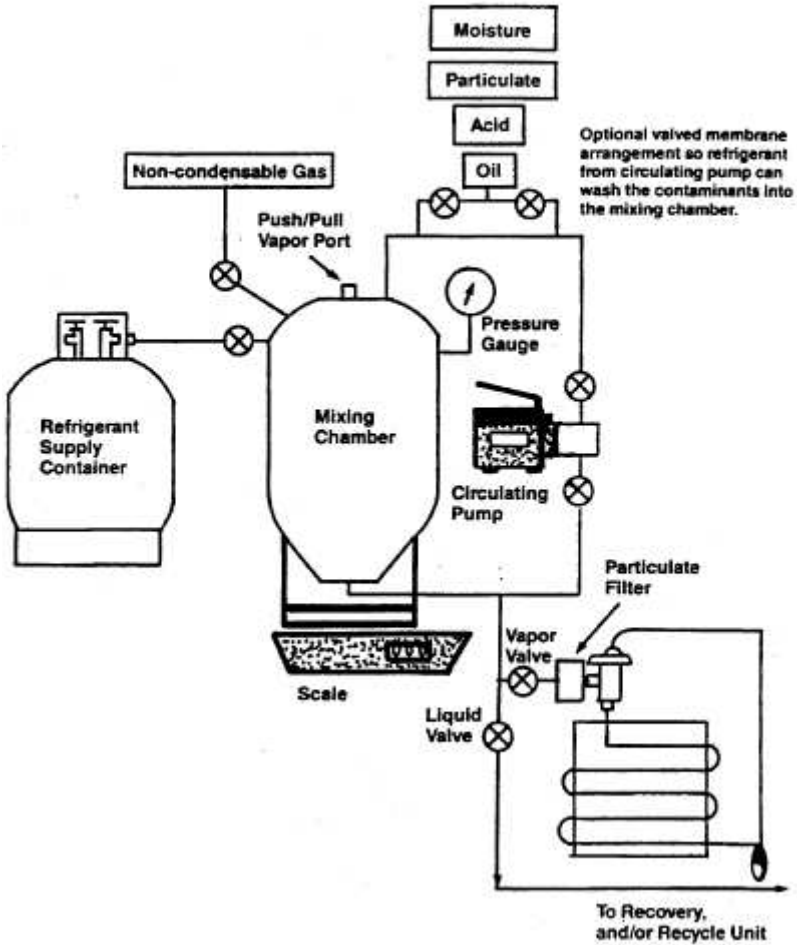
	R11	R12	R13	R22	R113	R114	R123	R134a	R500	R502	R503
Moisture Content: ppm by Weight of Pure refrigerant	100	80	30	200	100	85	200	200	200	200	30
Particulate Content: ppm by Weight of Pure Refrigerant Characterized by[1]	80	80	NA	80	80	80	80	80	80	80	NA
Acid Content: ppm by Weight of Pure Refrigerant—(mg KOH per kg Refrigerant) Characterized by[2]	500	100	NA	500	400	200	500	100	100	100	NA
Mineral Oil Content:											
% by Weight of Pure Refrigerant	20	5	NA	5	20	20	20	5	5	5	NA
Viscosity (SUS)	300	150		300	300	300	300	150[3]	150	150	
Non-Condensable Gases (Air Content): % by Volume	NA	3	3	3	NA	3	NA	3	3	3	3

[1]Particulate content shall consist of inert materials and shall comply with particulate requirements in appendix B.

[2]Acid consists of 60% oleic acid and 40% hydrochloric acid on a total number basis.

[3]Synthetic ester-based oil.

Figure 1. Test Apparatus for Self-Contained Equipment



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6.3 *Size.* The size of the mixing chamber shall be a minimum of .09 m^3 . The bottom port and the refrigerant feed shall depend on the size of the equipment. Typically, the mixing valves and piping shall be 9.5 mm. For large equipment to be used on chillers, the minimum inside diameter of ports, valves and pipings shall be the smaller of the manufacturer's recommendation or 37 mm.

6.4 *System Dependent Equipment Test Apparatus.* This test apparatus is to be used for final recovery vacuum rating of all system dependent equipment.

6.4.1 *Test Setup.* The test apparatus shown in Figure 2 consists of a complete refrigeration system. The manufacturer shall identify the refrigerants to be tested. The test apparatus can be modified to facilitate operation or testing of the system dependent equipment if the modifications to the apparatus are specifically described within the manufacturer's literature. (*See* Figure 2.) A 6.3 mm balance line shall be connected across the test apparatus between the high and low-pressure sides, with an isolation valve located at the connection to the compressor high side. A 6.3 mm access port with a valve core shall be located in the balance line for the purpose of measuring final recovery vacuum at the conclusion of the test.

Section 7. Performance Testing

7.1 *General Testing.*

7.1.1 *Temperatures.* Testing shall be conducted at an ambient temperature of 24 °C ±1K except high temperature vapor recovery shall be at 40 °C ±1K. The evaporator conditions of 6.2.3 shall be maintained as long as liquid refrigerant remains in the mixing chamber.

7.1.2 *Refrigerants.* The equipment shall be tested for all designated refrigerants (*see* 11.2). All tests in Section 7 shall be completed for each refrigerant before starting tests with the next refrigerant.

7.1.3 *Selected Tests.* Tests shall be as appropriate for the equipment type and ratings parameters selected (*see* 9.9, 11.1 and 11.2).

7.1.4 *Hose Assemblies.* For the purpose of limiting refrigerant emissions to the atmosphere, hose assemblies shall be tested for permeation according to ANSI/UL Standard 1963, Section 40.10.

7.2 *Equipment Preparation and Operation.* The equipment shall be prepared and operated per the operating instructions.

7.3 *Test Batch.* The test batch consisting of refrigerant sample (*see* Section 5) of the test refrigerant shall be prepared and thoroughly mixed. Continued mixing or stirring shall be required during the test while liquid refrigerant remains in the mixing chamber. The mixing chamber shall be filled to 80% level by volume.

7.3.1 *Control Test Batch.* Prior to starting the test for the first batch for each refrigerant, a liquid sample will be drawn from the mixing chamber and analyzed per Section 8 to assure that contaminant levels match Table 1 within ±10 ppm for moisture, ±20 ppm for particulate, ±20 ppm for oleic acid and ±0.5% for oil.

7.4 *Recovery Tests (Recovery and Recovery/Recycle Equipment).*

7.4.1 *Determining Recovery Rates.* The liquid and vapor refrigerant recovery rates shall be measured during the first test batch for each refrigerant (*see* 9.1, 9.2 and 9.4). Equipment preparation and recovery cylinder changeover shall not be included in elapsed time measurements for determining vapor recovery rate and liquid refrigerant recovery rate. Operations such as subcooling the recovery cylinder shall be included. Recovery cylinder shall be the same size as normally furnished or specified in the instructions by the equipment manufacturer. Oversized tanks shall not be permitted.

7.4.1.1 *Liquid Refrigerant Recovery Rate.* If elected, the recovery rate using the liquid refrigerant feed means (*see* 6.2.5) shall be determined. After the equipment reaches stabilized conditions of condensing temperature and/or recovery cylinder pressure, the recovery process shall be stopped and an initial weight shall be taken of the mixing chamber (*see* 9.2). The recovery process shall be continued for a period of time sufficient to achieve the accuracy in 9.4. The recovery process shall be stopped and a final weight shall be taken of the mixing chamber.

Configuration of standard air conditioning or refrigeration system for use as a test apparatus

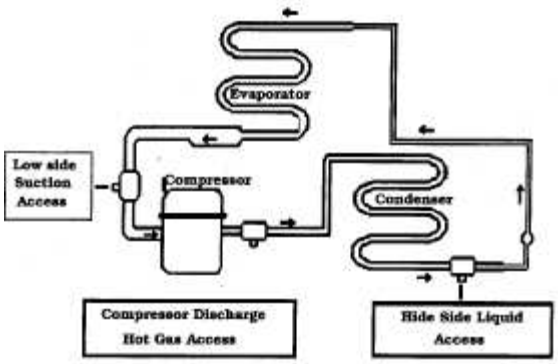

Figure 2. System Dependent Equipment Test Apparatus

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7.4.1.2 *Vapor Refrigerant Recovery Rate.* If elected, the average vapor flow rate shall be measured to accuracy requirements in clause 9.4 under conditions with no liquid refrigerant in the mixing chamber. The liquid recovery feed means shall be used. At initial conditions of saturated vapor at the higher of 24 °C or the boiling temperature (100 kPa absolute pressure), the weight of the mixing chamber and the pressure shall be recorded. At final conditions representing pressure in the mixing chamber of 10% of the initial condition, but not less than the final recovery vacuum (*see* 9.6) nor more than 100 kPa, measure the weight of the mixing chamber and the elapsed time.

7.4.1.3 *High Temperature Vapor Recovery Rate.* Applicable for equipment having at least one designated refrigerant (*see* 11.2) with a boiling point between −50 °C and +10 °C. Measure the rate for R–22, or the refrigerant with the lowest boiling point if R–22 is not a designated refrigerant. Repeat the test in 7.4.1.2 at saturated conditions at 40 °C and continue to operate equipment to assure it will achieve the final recovery vacuum (*see* 7.4.3).

7.4.2 *Recovery Operation.* This test is for determining the final recovery vacuum and the ability to remove contaminants as appropriate. If equipment is rated for liquid recovery (*see* 7.4.1.3), liquid recovery feed means described in 6.2.5 shall be used. If not, vapor recovery means described in 6.2.3 or 6.2.4 shall be used. Continue recovery operation until all liquid is removed from the test apparatus and vapor is removed to the point where equipment shuts down by automatic means or is manually shut off per operating instructions.

7.4.2.1 *Oil Draining.* Capture oil from the equipment at intervals as required in the instructions. Record the weight of the container. Completely remove refrigerant from oil by evacuation or other appropriate means. The weight difference shall be used in 9.5.2.

7.4.3 *Final Recovery Vacuum.* At the end of the first test batch for each refrigerant, the liquid valve and vapor valve of the apparatus shall be closed. After waiting 1 minute, the mixing chamber pressure shall be recorded (*see* 9.6).

7.4.4 *Residual Refrigerant.* This test will measure the mass of remaining refrigerant in the equipment after clearing and therefore the potential for mixing refrigerants (*see* 4.6).

7.4.4.1 *Initial Conditions.* At the end of the last test for each batch for each refrigerant, the equipment shall be disconnected from the test apparatus (Figure 1). Recycle per 7.5, if appropriate. Perform refrigerant

clearing operations as called for in the instruction manual. Capture and record the weight of any refrigerant which would have been emitted to the atmosphere during the clearing process for use in 9.5. If two loops are used for recycling, trapped refrigerant shall be measured for both.

7.4.4.2 *Residual Trapped Refrigerant.* Evacuate an empty test cylinder to 1.0 kPa absolute. Record the empty weight of the test cylinder. Open all valves to the equipment so as to provide access to all trapped refrigerant. Connect the equipment to the test cylinder and operate valves to recover the residual refrigerant. Record the weight of the test cylinder using a recovery cylinder pressure no less than specified in 6.2.2. Place the test cylinder in liquid nitrogen for a period of 30 minutes or until a vacuum of 1000 microns is reached, whichever occurs first.

7.5 *Recycling Tests (Recovery/Recycle Equipment).*

7.5.1 *Recycling Operation.* As each recovery cylinder is filled in 7.4.2, recycle according to operating instructions. There will not necessarily be a separate recycling sequence. Note non-condensable purge measurement in 9.5.

7.5.1.1 *Recycle Flow Rate.* While recycling the first recovery cylinder for each refrigerant, determine the recycling flow rate by appropriate means (*see* 9.3) to achieve the accuracy required in 9.4.

7.5.2 *Non-Condensable Sample.* After completing 7.4.3, prepare a second test batch (7.3). Recover per 7.4.2 until the current recovery cylinder is filled to 80% level by volume. Recycle per 7.5.1. Mark this cylinder and set aside for taking the vapor sample. For equipment having both an internal tank of at least 3 kg refrigerant capacity and an external recovery cylinder, two recovery cylinders shall be marked and set aside. The first is the cylinder described above. The second cylinder is the final recovery cylinder after filling it to 80% level by volume and recycling.

7.5.3 *Liquid Sample for Analysis.* Repeat steps 7.3, 7.4.2 and 7.5.1 with further test batches until indication means in 4.2 show the filter/drier(s) need replacing.

7.5.3.1 *Multiple Pass.* For equipment with a separate recycling circuit (multiple pass), set aside the current cylinder and draw the liquid sample (*see* 7.4) from the previous cylinder.

7.5.3.2 *Single Pass.* For equipment with the single pass recycling circuit, draw the liquid sample (*see* 7.4) from the current cylinder.

7.6 *Measuring Refrigerant Loss.* Refrigerant loss due to non-condensables shall be determined by appropriate means (*see* 9.5.1). The loss could occur in 7.4.1, 7.4.2 and 7.5.1.

Section 8. Sampling and Chemical Analysis Methods

8.1 *Chemical Analysis.* Chemical analysis methods shall be specified in appropriate standards such as ARI 700–95 and Appendix C to ARI Standard 700–95.

8.2 *Refrigerant Sampling.*

8.2.1 *Water Content.* The water content in refrigerant shall be measured by the Karl Fischer Analytical Method or by the Karl Fischer Coulometric techniques. Report the moisture level in parts per million by weight.

8.2.2 *Chloride Ions.* Chloride ions shall be measured by turbidity tests. At this time, quantitative results have not been defined. Report chloride content as “pass” or “fail.” In the future, when quantitative results

are possible, report chloride content as parts per million by weight.

8.2.3 *Acidity.* The acidity test uses the titration principle. Report the acidity in parts per million by weight (mg KOH/kg) of sample.

8.2.4 *High Boiling Residue.* High boiling residues shall use measurement of the volume of residue after evaporating a standard volume of refrigerant. Using weight measurement and converting to volumetric units is acceptable. Report high boiling residues as percent by volume.

8.2.5 *Particulates/Solids.* The particulates/solids measurement employs visual examination. Report results as "pass" or "fail."

8.2.6 *Non-condensables.* The level of contamination by non-condensable gases in the base refrigerant being recycled shall be determined by gas chromatography. Report results as percent by volume.

Section 9. Performance Calculation and Rating

9.1 *Vapor Refrigerant Recovery Rate.* This rate shall be measured by weight change of the mixing chamber divided by elapsed time (*see* 7.4.1.2). The units shall be kg/min and the accuracy shall be per 9.4.

9.1.1 *High Temperature Vapor Recovery Rate.*

9.2 *Liquid Refrigerant Recovery Rate.* This rate shall be measured by weight change of the mixing chamber divided by elapsed time (*see* 7.4.1.3). The units shall be kg/min and the accuracy shall be per 9.4.

9.3 *Recycle Flow Rate.* The recycle flow rate shall be as defined in 3.10, expressed in kg/min, and the accuracy shall be per 9.4.

9.3.1 For equipment using multi-pass recycling or a separate sequence, the recycle rate shall be determined by dividing the net weight W of the refrigerant to be recycled by the actual time T required to recycle. Any set-up or operator interruptions shall not be included in the time T.

9.3.2 If no separate recycling sequence is used, the recycle rate shall be the higher of the vapor refrigerant recovery rate or the liquid refrigerant recovery rate. The recycle rate shall match a process which leads to contaminant levels in 9.9. Specifically, a recovery rate determined from bypassing a contaminant removal device cannot be used as a recycle rate when the contaminant levels in 9.9 are determined by passing the refrigerant through the contaminant removal device.

9.4 *Accuracy of Flow Rates.* The accuracy of test measurements in 9.1, 9.2 and 9.3 shall be ±008 kg/min or flow rates up to .42 kg/min and ±2.0% for flow rates larger than .42 kg/min. Ratings shall be expressed to the nearest .02 kg/min.

9.5 *Refrigerant Loss.* This calculation will be based upon the net loss of refrigerant which would have been eliminated in the non-condensable purge process (*see* 7.5.1), the oil draining process (*see* 7.4.2.1) and the refrigerant clearing process (*see* 7.4.4.1), all divided by the net refrigerant content of the test batches. The refrigerant loss shall not exceed 3% by weight.

9.5.1 *Non-Condensable Purge.* Evacuate an empty container to 2 kPa absolute. Record the empty weight of the container. Place the container in a dry ice bath. Connect the equipment purge connection to the container and operate purge according to operating instructions so as to capture the non-condensables and lost refrigerant. Weigh the cylinder after the recycling is complete. Equivalent means are permissible.

9.5.2 *Oil Draining.* Refrigerant removed from the oil after draining shall be collected and measured in accordance with 7.4.2.1.

9.5.3 *Clearing Unit.* Refrigerant captured during the clearing process shall be measured in accordance with 7.4.4.1.

9.6 *Final Recovery Vacuum.* The final recovery vacuum shall be the mixing chamber pressure in 7.4.3 expressed in kPa. The accuracy of the measurement shall be within 0.33 kPa.

9.7 *Residual Trapped Refrigerant.* The amount of residual trapped refrigerant shall be the final weight minus the initial weight of the test cylinder in 7.4.4.2, expressed in kg. The accuracy shall be ±0.02 kg and reported to the nearest 0.05 kg.

9.8 *Quantity Recycled.* The amount of refrigerant processed before changing filters (*see* 7.5.3) shall be expressed in kg to an accuracy of ±1%.

9.9 *Contaminant Levels.* The contaminant levels remaining after testing shall be published as follows:

Moisture content, ppm by weight

Chloride ions, pass/fail

Acidity, ppm by weight

High boiling residue, % (by volume)

Particulates-solid, pass/fail (visual examination)

Non-condensables, % (by volume)

9.10 *Minimum Data Requirements for Published Ratings.* Published ratings shall include all of the parameters as shown in Tables 2 and 3 for each refrigerant designated by the manufacturer.

Section 10. Tolerances

10.1 *Tolerances.* Performance related parameters shall not be less favorable than the published ratings.

Section 11. Marking and Nameplate Data

11.1 *Marking and Nameplate Data.* The nameplate shall display the manufacturer's name, model designation, type of equipment, designated refrigerants, capacities and electrical characteristics where applicable. The nameplate shall also conform to the labeling requirements established for certified recycling and recovery equipment established at 40 CFR 82.158(h).

Recommended nameplate voltages for 60 Hertz systems shall include one or more of the utilization voltages shown in Table 1 of ARI Standard 110–90. Recommended nameplate voltages for 50 Hertz systems shall include one or more of the utilization voltages shown in Table 1 of IEC Standard Publication 38, IEC Standard Voltages.

11.2 *Data for Designated Refrigerants.* For each refrigerant designated, the manufacturer shall include all the following that are applicable per Table 2:

a. Liquid Recovery Rate

b. Vapor Recovery Rate

c. High Temperature Vapor Recovery Rate

d. Final Recovery Vacuum

e. Recycle Flow Rate

f. Residual Trapped Refrigerant

g. Quantity Recycled

Table 2—Performance

Parameter/Type of equipment	Recovery	Recovery/Recycle	Recycle	System dependent equipment
Liquid Refrigerant Recovery Rate	([1])	([1])	N/A	N/A
Vapor Refrigerant Recovery Rate	([1])	([1])	N/A	N/A
High Temp. Vapor Recovery Rate	([1])	([1])	N/A	N/A
Final Recovery Vacuum	([X])	([X])	N/A	([X])
Recycle Flow Rate	N/A	([X])	([X])	N/A
Refrigerant Loss	([3])	([X])	([X])	([3])
Residual Trapped Refrigerant	([2])	([2])	([2])	([2])
Quantity Recycled	N/A	([X])	([X])	N/A

[X]Mandatory rating.

[1]For a recovery or recovery/recycle unit, one must rate either liquid refrigerant recovery rate or vapor refrigerant recovery rate or one can rate for both. If rating only the one, the other shall be indicated by N/A, “not applicable.”

[2]Mandatory rating for equipment tested for multiple refrigerants.

[3]Mandatory rating if multiple refrigerants, oil separation or non-condensable purge are rated.

Note: For recovery equipment, these parameters are optional. If not rated use N/A, “not applicable.”

Table 3—Contaminants

Contaminant/Type of equipment	Recovery	Recovery/Recycle	Recycle	System dependent equipment

Moisture Content	(*)	(X)	(X)	N/A
Chloride Ions	(*)	(X)	(X)	N/A
Acidity	(*)	(X)	(X)	N/A
High Boiling Residue	(*)	(X)	(X)	N/A
Particulates	(*)	(X)	(X)	N/A
Non-Condensables	(*)	(X)	(X)	N/A

*For recovery equipment, these parameters are optional. If not rated, use N/A, "not applicable."

[X]Mandatory rating.

Attachment 1 to Appendix B2 to Subpart F of Part 82—References

Listed here are all standards, handbooks, and other publications essential to the formation and implementation of the standard. All references in this appendix are considered as part of this standard.

• ANSI/UL Standard 1963, *Refrigerant Recovery/Recycling Equipment,* First Edition, 1989, American National Standards Institute/Underwriters Laboratories, Inc.

• ARI Standard 110–90, *Air-Conditioning and Refrigerating Equipment Nameplate Voltages,* Air-Conditioning and Refrigeration Institute

• ARI Standard 700–95, *Specifications for Fluorocarbon and Other Refrigerants,* Air-Conditioning and Refrigeration Institute

• ASHRAE Terminology of Heating, Ventilation, Air Conditioning, Refrigeration, & Refrigeration, American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., 1991

• IEC Standard Publication 38, *IEC Standard Voltages,* International Electrotechnical Commission, 1983

Attachment 2 to Appendix B2 to Subpart F of Part 82-Particulate Used in Standard Contaminated Refrigerant Sample

1. Particulate Specification

B1.1 The particulate material (pm) will be a blend of 50% coarse air cleaner dust as received, and 50% retained on a 200-mesh screen. The coarse air cleaner dust is available from: AC Spark Plug Division; General Motors Corporation; Flint, Michigan.

B1.2 *Preparation of Particulate Materials.*

To prepare the blend of contaminant, first wet screen a quantity of coarse air cleaner dust on a 200-mesh screen (particle retention 74 pm). This is done by placing a portion of the dust on a 200-mesh screen and running water through the screen while stirring the dust with the fingers. The fine contaminant particles passing through the screen are discarded. The +200-mesh particles collected on the screen are removed and dried for one hour at 110 °C. The blend of standard contaminant is prepared by mixing 50% by weight of coarse air cleaner dust as received (after drying for one hour at 110 °C) with 50% by weight of the +200 mesh screened dust.

B1.3 *Particle Size Analysis.*

The coarse air cleaner dust as received and the blend used as the standard contaminant have the following approximate particle size analysis:

Wt. % in various size ranges, pm.

Size range	As received	Blend
0–5	12	6
5–10	12	6
10–20	14	7
20–40	23	11
40–80	30	32
80–200	9	38

[68 FR 43815, July 24, 2003; 68 FR 54678, Sept. 18, 2003]

Appendix C to Subpart F of Part 82—Method for Testing Recovery Devices for Use With Small Appliances

Recovery Efficiency Test Procedure for Refrigerant Recovery Equipment Used on Small Appliances

The following test procedure is utilized to evaluate the efficiency of equipment designed to recover ozone depleting refrigerants (or any substitute refrigerant subject to the recycling rules promulgated pursuant to section 608 of the Clean Air Act Amendments of 1990) from small appliances when service of those appliances requires entry into the sealed refrigeration system or when those appliances are destined for disposal. This procedure is designed to calculate on a weight or mass basis the percentage of a known charge of CFC-12 refrigerant removed and captured from a test stand refrigeration system. Captured refrigerant is that refrigerant delivered to a container suitable for shipment to a refrigerant reclaimer plus any refrigerant remaining in the recovery system in a manner that it will be transferred to a shipping container after additional recovery operations.

The test stand refrigeration system required for this procedure is constructed with standard equipment utilized in currently produced household refrigerator and freezer products. The procedure also accounts for compressor oils that might be added to or removed from the test stand compressor or any compressor used in the recovery system.

I. Test Stand

Test stands are constructed in accordance with the following standards.

1. Evaporator—5/16in. outside dia. with 30 cu. in. volume.

2. Condenser—1/4in. outside dia. with 20 cu. in volume.

3. Suction line capillary heat exchanger—appropriate for compressor used.

4. An 800–950 Btu/hr high side case (rotary) compressor; or (depending on the test senario);

5. An 800–9500 Btu/hr low side case (reciprocating) compressor.

A person seeking to have its recovery system certified shall specify the compressors by manufacturer and model that are to be used in test stands constructed for evaluation of its equipment, and the type and quantity of compressor to be used in those compressors. Only a compressor oil approved for use by the compressor's manufacturer may be specified, and the quantity of compressor oil specified shall be an appropriate quantity for the type of oil and compressor to be used. In order to reduce the cost of testing, the person seeking certification of its recovery system may supply an EPA approved third party testing laboratory with test stands meeting these standards for use in evaluating its recovery system.

II. Test Conditions

Tests are to be conducted at 75 degrees F, plus or minus 2 degrees F (23.9 C ±1.1 C). Separate tests are conducted on both high side case compressor stands and low side case compressor stands. Separate tests are also conducted with the test stand compressor running during the recovery operation, and without the test stand compressor running during the recovery operation, to calculate the system's recovery efficiency under either condition.

These tests are to be performed using a representative model of all equipment used in the recovery system to deliver recovered refrigerant to a container suitable for shipment to a refrigerant reclaimer. The test stands are to be equipped with access valves permanently installed as specific by the recovery system's vendor to represent the valves used with that system in actual field operations.

A series of five (5) recovery operations are to be performed for each compressor scenario and a recovery efficiency is calculated based on the total quantity of refrigerant captured during all five (5) recoveries. Alternatively, at the request of the recovery system's vendor, a recovery efficiency is to be calculated for each recovery event. In this case, a statistically significant number of recovery operations are to be performed. Determination of what is a statistically significant number of recoveries is to be calculated as set out below. These individual recovery efficiencies are then averaged.

There are four (4) compressor scenarios to be tested. These are a high side case compressor in working condition; a high side case compressor in nonworking condition; a low side case compressor in working condition; and a low side case compressor in nonworking condition. Recovery efficiencies calculated for the two working compressor scenarios are to be averaged to report a working compressor performance. The two nonworking compressor efficiencies are also to be averaged to report a nonworking compressor performance.

If large scale equipment is required in the system to deliver recovered refrigerant to a refrigerant reclaimer (eg. carbon desorption equipment) and it is not possible to have that equipment evaluated under the procedure, the system's vendor shall obtain engineering data on the performance of that large scale equipment that will reasonably demonstrate the percentage refrigerant lost when processed by that equipment. That data will be supplied to any person required to evaluate the performance of those systems. The following procedure will also be modified as needed to determine the weight of refrigerant recovered from a test stand and delivered to a container for shipment to the large process equipment for further processing. The percentage loss documented to occur during processing is then to be applied to the recovery efficiencies calculated in this modified procedure to determine the overall capture efficiency for the entire system.

The following are definitions of symbols used in the test procedure.

Test Stand:

“TSO” means an original test stand weight.

“TSC” means a charged test stand weight.

Shipping Containers:

“SCO” means the original or empty weight of shipping container(s).

“SCF” means the final or full weight of shipping container(s).

Recover/Transfer System:

“RSO” means the original weight of a recovery/transfer system.

“RSF” means the final weight of a recovery/transfer system.

“OL” means the net amount of oil added/removed from the recovery device and/or transfer device between the beginning and end of the test for one compressor scenario.

Weighing steps are conducted with precision and accuracy of plus or minus 1.0 gram.

III. Test Procedure

1. Evacuate the test stand to 20 microns vacuum (pressure measured at a vacuum pump) for 12 hours.

2. Weigh the test stand (TSO).

3. If this is the first recovery operation being performed for a compressor scenario (or if a recovery efficiency is to be calculated for each recovery event), then weigh all devices used in the recovery system to deliver recovered refrigerant to a container suitable for shipment or delivery to a refrigerant reclaimer. Weigh only devices that can retain refrigerant in a manner that it will ultimately be transferred to a shipping container without significant release to the atmosphere (RSO).

4. Weigh final shipping containers (SCO).

5. Charge the test stand with an appropriate CFC-12 charge (either 6 oz. or 9 oz.).

6. Run the test stand for four (4) hours with 100% run time.

7. Turn off the test stand for twelve (12) hours. During this period evaporate all condensation that has collected on the test stand during step 6.

8. Weigh the test stand (TSC).

9. Recover CFC-12 from the test stand and perform all operations needed to transfer the recovered refrigerant to one of the shipping containers weighed in step 4. All recovery and transfer operations are to be performed in accordance with the operating instructions provided by the system's vendor. The compressor in the test stand is to remain “off” or be turned “on” during the recovery operation depending on whether the test is for a nonworking or working compressor performance evaluation. If a recovery efficiency is to be calculated for each recovery event, transfer the captured refrigerant to a shipping container and then skip to step 13. Otherwise continue. If the system allows for multiple recovery operations to be performed before transferring recovered refrigerant to a shipping container, the transfer operation can be delayed until either the maximum number of recovery operations allowed before a transfer is required have been performed, or the last of the five (5) recovery operations has been performed.

10. Perform any oil removal or oil addition operations needed to properly maintain the test stand and the devices used for recovery or transfer operations. Determine the net weight of the oil added or removed from the recovery device and/or transfer device. (OP1 for oil added, OP2 for oil removed).

11. Evacuate the test stand to 20 microns vacuum for 4 hours.

12. Return to step 2 unless five (5) recovery operations have been performed.

13. Weigh all final shipping containers that received recovered refrigerant (SCF).

14. Weigh the equipment weighed in step three (3) above (RSF). If a recovery efficiency is to be calculated for each recovery event, perform calculations and return to step one (1) for additional recoveries.

IV. Calculations

A. *For Five (5) Consecutive Recoveries*

Refrigerant Recoverable equals the summation of charged test stand weights minus original test stand weights.

$$\text{Refrigerant Recoverable} = \sum_{i=1}^{5} \left(TSC_i - TSO_i\right)$$

Oil Loss equals the net weight of oil added to and removed from the recovery device and/or transfer device.

$$OL = \sum_{i=1}^{5} \left(OP1_i - OP2_i\right)$$

Refrigerant Recovered equals the final weight of shipping containers minus the initial weight of final shipping containers, plus final recovery system weight, minus original recovery system weight, plus the net value of all additions and removals of oil from the recovery and transfer devices.

$$\text{Refrigerant Recovered} = \left(\sum_{i=1}^{n} SCF_i - SCO_i\right) + RSF - RSO - OL$$

n=number of shipping containers used.

Recovery Efficiency equals Refrigerant Recovered divided by Refrigerant Recoverable times 100%.

$$\text{Recovery Efficiency} = \frac{\text{Refrigerant Recovered}}{\text{Refrigerant Recoverable}}\ 100\%$$

B. *For Individual Recoveries*

Refrigerant Recoverable equals the charged test stand weight minus the original test stand weight.

$$\text{Refrigerant Recoverable} = \text{TSCO} - \text{TSO}$$

Refrigerant Recovered equals the final weight of the shipping container minus the initial weight of the shipping container plus the final weight of the recovery system minus the original recovery system weight.

$$\text{Refrigerant Recovered} = \text{SCF} - SCO + RSF - RSO$$

Recovery Efficiency equals Refrigerant Recovered divided by Refrigerant Recoverable times 100 percent.

$$\text{Recovery Efficiency} = \frac{\text{Refrigerant Recovered}}{\text{Refrigerant Recoverable}} \; 100\%$$

C. *Calculation of a Statistically Significant Number of Recoveries*

$$N_{add} = \left((t * sd)/(.10 * X)\right)^2 - N$$

Where:

N_{add}=the number of additional samples required to achieve 90% confidence.

sd=Standard deviation, or $(X/(N-1)^5)$

X=Sample average

N=Number of samples tested

Number of samples	t for 90% confidence
2	6.814
3	2.920
4	2.353
5	2.132
6	2.015
7	1.943
8	1.895
9	1.860
10	1.833

Procedure:

1. Compute N_{add}after completing two recoveries.

2. If $N_{add}>0$, then run an additional test.

3. Re-compute N_{add}. Continue to test additional samples until $N_{add}<0$.

V. Test Procedure Approval and Certification

Each vendor of capture equipment for small appliances desiring certification will provide a representative model of its capture system and its recommended recovery procedures to an EPA approved third party laboratory for testing in accordance with this procedure. The third party laboratory will certify recovery systems that when tested in accordance with this procedure demonstrate a sufficient recovery efficiency to meet EPA regulatory requirements.

Appendix D to Subpart F of Part 82—Standards for Becoming a Certifying Program for Technicians

Standards for Certifying Programs

a. Test Preparation

Certification for Type II, Type III and Universal technicians will be dependent upon passage of a closed-book, proctored test, administered in a secure environment, by an EPA-approved certifying program.

Certification for Type I technicians will be dependent upon passage of an EPA-approved test, provided by an EPA-approved certifying program. Organizations providing Type I certification only, may chose either an on-site format, or a mail-in format, similar to what is permitted under the MVACs program.

Each certifying program must assemble tests by choosing a prescribed subset from the EPA test bank. EPA expects to have a test bank with a minimum of 500 questions, which will enable the certifying program to generate multiple tests in order to discourage cheating. Each test must include 25 questions drawn from Group 1 and 25 questions drawn from each relevant technical Group. Tests for Universal technicians will include 100 questions (25 from Group 1 and 25 from each relevant technical Group). Each 50-question test represents 10 percent of the total test bank. Questions should be divided in order to sufficiently cover each topic within the Group.

Each certifying program must show a method of randomly choosing which questions will be on the tests. Multiple versions of the test must be used during each testing event. Test answer sheets or (for those testing via the computer medium) computer files must include the name and address of the applicant, the name and address of the certifying program, and the date and location at which the test was administered.

Training material accompanying mail-in Type I tests must not include sample test questions mimicking the language of the certification test. All mail-in material will be subject to review by EPA.

Certifying programs may charge individuals reasonable fees for the administration of the tests. EPA will publish a list of all approved certifying programs periodically, including the fees charged by the programs. This information will be available from the Stratospheric Ozone Protection Hotline.

b. Proctoring

A certifying program for Type II, Type III and Universal technicians must designate or arrange for the designation of at least one proctor registered for each testing event. If more than 50 people are taking tests at the same time at a given site, the certifying organization must adhere to normal testing procedures, by designating at least one additional proctor or monitor for every 50 people taking tests at that site.

The certification test for Type II, Type III and Universal technicians is a closed-book exam. The proctors must ensure that the applicants for certification do not use any notes or training materials during testing. Desks or work space must be placed in a way that discourages cheating. The space and physical facilities are

to be conducive to continuous surveillance by the proctors and monitors during testing.

The proctor may not receive any benefit from the outcome of the testing other than a fee for proctoring. Proctors cannot know in advance which questions are on the tests they are proctoring.

Proctors are required to verify the identity of individuals taking the test by examining photo identification. Acceptable forms of identification include but are not limited to drivers' licenses, government identification cards, passports, and military identification.

Certifying programs for Type I technicians using the mail-in format, must take sufficient measures at the test site to ensure that tests are completed honestly by each technician. Each test for Type I certification must provide a means of verifying the identification of the individual taking the test. Acceptable forms of identification include but are not limited to drivers' licenses numbers, social security numbers, and passport numbers.

c. Test Security

A certifying program must demonstrate the ability to ensure the confidentiality and security of the test questions and answer keys through strict accountability procedures. An organization interested in developing a technician certification program will be required to describe these test security procedures to EPA.

After the completion of a test, proctors must collect all test forms, answer sheets, scratch paper and notes. These items are to be placed in a sealed envelope.

d. Test Content

All technician certification tests will include 25 questions from Group I. Group I will ask questions in the following areas:

I. Environmental impact of CFCs and HCFCs

II. Laws and regulations

III. Changing industry outlook

Type I, Type II and Type III certification tests will include 25 questions from Group II. Group II will ask questions covering sector-specific issues in the following areas:

IV. Leak detection

V. Recovery Techniques

VI. Safety

VII. Shipping

VII. Disposal

Universal Certification will include 75 questions from Group II, with 25 from each of the three sector-specific areas.

e. Grading

Tests must be graded objectively. Certifying programs must inform the applicant of their test results no later than 30 days from the date of the test. Type I certifying programs using the mail-in format, must notify the applicants of their test results no later than 30 days from the date the certifying programs received the completed test and any required documentation. Certifying programs may mail or hand deliver the results.

The passing score for the closed-book Type I, Type II, Type III and Universal certification test is 70 percent. For Type I certification tests using the mail-in format, passing score is 84 percent.

f. Proof of Certification

Certifying programs must issue a standard wallet-sized identification card no later than 30 days from the date of the test. Type I certifying programs using mail-in formats must issue cards to certified technicians no later than 30 days from the date the certifying program receives the completed test and any required documentation.

Each wallet-sized identification card must include, at a minimum, the name of the certifying program including the date the certifying program received EPA approval, the name of the person certified, the type of certification, a unique number for the certified person and the following text:

[name of person] has been certified as [Type I, Type II, Type III and/or Universal—as appropriate] technician as required by 40 CFR part 82, subpart F.

g. Recordkeeping and Reporting Requirements

1. Certifying programs must maintain records that include, but are not limited to, the names and addresses of all individuals taking the tests, the scores of all certification tests administered, and the dates and locations of all testing administered.

2. EPA must receive an activity report from all approved certifying programs by every January 30 and June 30, the first to be submitted following the first full six-month period for which the program has been approved by EPA. This report will include the pass/fail rate and testing schedules. This will allow the Agency to determine the relative progress and success of these programs. If the certifying program believes a test bank question needs to be modified, information about that question should also be included.

3. Approved certifying programs will receive a letter of approval from EPA. Each testing center must display a copy of that letter at their place of business.

4. Approved technician certification programs that voluntarily plan to stop providing the certification test must forward all records required by this appendix, §§82.161, and 82.166 to another program currently approved by EPA in accordance with this appendix and with §82.161. Approved technician certification programs that receive records of certified technicians from a program that no longer offers the certification test must inform EPA in writing at the address listed in §82.160 within 30 days of receiving these records. The notification notice must include the name and address of the program to which the records have been transferred. If another currently approved program willing to accept the records cannot be located, these records must be submitted to EPA at the address listed at §82.160.

5. Technician certification programs that have had their certification revoked in accordance with §82.169 must forward all records required by this appendix, §§82.161, and 82.166 to EPA at the address listed in §82.160.

h. Additional Requirements

EPA will periodically inspect testing sites to ensure compliance with EPA regulations. If testing center discrepancies are found, they must be corrected within a specified time period. If discrepancies are not corrected, EPA may suspend or revoke the certifying programs's approval. The inspections will include but are not limited to a review of the certifying programs' provisions for test security, the availability of space and facilities to conduct the administrative requirements and ensure the security of the tests, the availability of adequate testing facilities and spacing of the applicants during testing, a review of the proper procedures regarding accountability, and that there is no evidence of misconduct on the part of the certifying programs, their representatives and proctors, or the applicants for certification.

If the certifying programs offer training or provide review materials to the applicants, these endeavors are to be considered completely separate from the administration of the certification test.

i. Approval Process

EPA anticipates receiving a large number of applications from organizations seeking to become certifying programs. In order to certify as many technicians as possible in a reasonable amount of time, EPA will give priority to national programs. Below are the guidelines EPA will use:

First: Certifying programs providing at least 25 testing centers with a minimum of one site in at least 8 different states will be considered.

Second: Certifying programs forming regional networks with a minimum of 10 testing centers will be considered.

Third: Certifying programs providing testing centers in geographically isolated areas not sufficiently covered by the national or regional programs will be considered.

Fourth: All other programs applying for EPA approval will be considered.

Sample application forms may be obtained by contacting the Stratopheric Ozone Hotline at 1–800–296–1996.

j. Grandfathering

EPA will grandfather technicians who successfully completed voluntary programs whose operators seek and receive EPA approval to grandfather these technicians, in accordance with §82.161(g). As part of this process, these certifying programs may be required to send EPA-approved supplementary information to ensure the level of the technicians' knowledge. Technicians will be required to read this supplementary information as a condition of certification. The certifying programs will also issue new identification cards meeting the requirements specified above.

k. Sample Application

EPA has provided a sample application. The Agency designed the application to demonstrate the information certifying programs must provide to EPA. Programs are not required to use this form or this format.

[58 FR 28712, May 14, 1993, as amended at 59 FR 42960, 42962, Aug. 19, 1994; 59 FR 55927, Nov. 9, 1994; 68 FR 54678, Sept. 18, 2003]

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