California Environmental Protection Agency

Air Resources Board


# INITIAL STATEMENT OF REASONS FOR PROPOSED REGULATION FOR SMALL CONTAINERS OF AUTOMOTIVE REFRIGERANT

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**December 5, 2008**

State of California
AIR RESOURCES BOARD

# INITIAL STATEMENT OF REASONS FOR PROPOSED RULEMAKING

## Public Hearing to Consider

## ADOPTION OF THE PROPOSED REGULATION FOR SMALL CONTAINERS OF AUTOMOTIVE REFRIGERANT

To be considered by the California Air Resources Board
On January 22, 2009

at

Cal/EPA Headquarters
1001 I Street
Sacramento, California

Air Resources Board
P.O. Box 2815
Sacramento, CA 95812

State of California
AIR RESOURCES BOARD

# PROPOSED REGULATION FOR SMALL CONTAINERS OF AUTOMOTIVE REFRIGERANT

Prepared by:

Research Division
California Air Resources Board

**Lead Authors**

Winston Potts, P.E.
Dorothy Shimer
John Collins, Ph.D.
Tao Zhan, Ph.D.

**Contributing Authors**

Professor Harry Dwyer*
Reza Mahdavi, Ph.D.
Pablo Cicero-Fernandez, Ph.D.

**Legal Counsel**

Alex Wang, P.E., J.D., Office of Legal Affairs

Reviewed by:

Tao Huai, Ph.D., Manager, Climate Change Mitigation & Emissions Research Section
Alberto Ayala, Ph.D., Chief, Climate Change Mitigation & Emissions Branch
Richard Corey, M.B.A, Assistant Chief, Research Division
Bart Croes, P.E., Chief, Research Division
Mike Scheible, Deputy Executive Officer, Executive Office

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*Special Consultant to ARB and Retired Professor of Mechanical and Aeronautical Engineering, University of California, Davis.

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## DISCLAIMER

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## ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| AAIA | Automotive Aftermarket Industry Association |
| AB 1493 | Assembly Bill 1493 |
| AB 32 | Assembly Bill 32, California Global Warming Solutions Act of 2006 |
| AC | Air conditioning |
| ACEA | European Automobile Manufacturers Association |
| ARB | Air Resources Board |
| ARI | Air Conditioning and Refrigeration Institute |
| ARPI | Automotive Refrigeration Products Institute |
| BAU | Business-as-usual |
| CAA | Federal Clean Air Act |
| CFC | Chlorofluorocarbon |
| CFR | Code of Federal Regulations |
| CIWMB | California Integrated Waste Management Board |
| CPSC | California Product Stewardship Council |
| $CO_2$ | Carbon dioxide |
| DIY | Do-it-yourself |
| DIYers | Do-it-yourselfers |
| EMFAC | EMission FACtors model |
| EPR | Extended producer responsibility |
| EU | European Union |
| GHG | Greenhouse gas |
| GWP | Global warming potential |
| HFC | Hydrofluorocarbon |
| JAMA | Japan Automobile Manufacturers Association |
| LCCP | Life cycle climate performance |
| MACS | Mobile Air Conditioning Society Worldwide |
| $MMTCO_2E$ | Million metric tons of carbon dioxide equivalents |
| MVAC | Motor vehicle air conditioning |
| ODS | Ozone depleting substance |
| PY | Person years |
| SAE | Society of Automotive Engineers International |
| SKU | Stock Keeping Unit |
| U.S. EPA | U.S. Environmental Protection Agency |

# EXECUTIVE SUMMARY

Staff of the California Air Resources Board (ARB or Board) is proposing a Discrete Early Action regulation as described in the California Global Warming Solutions Act of 2006 (Assembly Bill 32, AB 32, Núñez, 2006) to reduce the greenhouse gas (GHG) emissions associated with do-it-yourself (DIY) re-charging of auto air conditioners (ARB, 2007a). The automotive refrigerant currently in wide use, HFC-134a, is a potent GHG with a global warming impact 1,300 times greater than carbon dioxide ($CO_2$). A single 12-ounce small can of this refrigerant is equivalent to 1,000 lbs of $CO_2$ or the emissions from an automobile burning 50 gallons of gasoline. Since adoption of the AB 32 Early Action Plan in October 2007, ARB staff has worked with a broad spectrum of stakeholders, including the affected industry, and has taken input during a series of public workshops and workgroup meetings to develop a proposal that achieves emission reductions in the most cost-effective manner possible.

The recommendation to be considered by the Board in January 2009 is a multi-prong approach developed collaboratively with key stakeholders that will not only reduce emissions in California, but can serve as a national model. The proposed regulation will require:

1. Better container technology – a self-sealing valve on all small containers of automotive refrigerant sold in California to prevent emissions of any content remaining in a used container,
2. Improved labeling instructions for use,
3. Deposit and recycling – a new industry-run container deposit and recycling program to recover and recycle refrigerant remaining in a used can patterned after a recent and successful pilot program by industry in Southern California, and
4. Consumer education – a manufacturer-developed education program so the consumer can use best practice techniques for recharging an air conditioner.

The proposed regulation is estimated to achieve GHG emissions reductions of over 250,000 metric tons of carbon dioxide equivalents ($MTCO_2E$) at a cost of about \$11/$MTCO_2E$. The regulation will add about \$1 to the purchase price of a can.

## Authority

AB 32 requires that ARB adopt regulations by January 1, 2010 to achieve the maximum technologically feasible and cost-effective reductions in GHGs. AB 32 creates a comprehensive, multi-year program to reduce GHG emissions in California. The AB 32 program includes an Early Action Plan approved by the Board in 2007. Under the Early Action Plan, ARB staff worked closely with

stakeholders and is proposing a Discrete Early Action regulation that would reduce GHG emissions beginning January 1, 2010.

## Scope of Regulation

The particular source of emissions targeted for reduction by the proposed Discrete Early Action measure is associated with DIY recharging of motor vehicle air conditioning (MVAC) systems (ARB, 2007a). DIY practitioners currently use HFC-134a refrigerant sold in small containers holding between 2 ounces and 2 pounds of refrigerant by weight. The proposed regulation imposes requirements on the sale, use, and disposal of small containers of any automotive refrigerant having a GWP greater than 150. These requirements will eliminate or reduce emissions from the DIY practice.

## Current Emissions

Approximately two million small containers of automotive refrigerant are sold annually to consumers in California. The portion sold to DIY consumers amounts to 0.81 million metric ton carbon dioxide equivalent per year ($MMTCO_2E/yr$). Typically a can is not fully emptied during the recharging process since the air conditioning system may only require a portion of the can, and due to incorrect technique by DIY users. Approximately 11% of the container contents are lost during servicing, approximately 22% remain in the can (can heel), and only about 67% goes into the vehicle AC system. Due to current container design, the can heel is vented almost immediately to the atmosphere. The current automotive refrigerant, HFC-134a, has a global warming potential (GWP) of 1,300, so preventing the escape of the can contents is important. The global warming impact of a 12-ounce can of this refrigerant is equivalent to the impact of an automobile burning 50 gallons of gasoline.

## Proposed Actions

This regulation would achieve emission reductions through:

1. Use of a self-sealing valve on the can.
2. Improved labeling instructions.
3. A deposit and recycling program for small containers.
4. An education program that emphasizes best practices for vehicle recharging as well as highlights the environmental risks associated with this product.

## Parties Affected

The regulation will affect all manufacturers, packagers, distributors, and retail outlets involved in the production, distribution, and sale of small containers of automotive refrigerant. The regulation would also affect the estimated 1.4 million Californians who annually service their own vehicle AC systems. It would also

affect a small number of professional businesses that choose to use the small containers rather than large canisters to recharge vehicle AC systems.

## Description of the Regulation

Prohibition
It would become illegal to dispose of or destroy any small container containing automotive refrigerant.

Registration Process
Manufacturers would submit an application to ARB to get approval to sell their product in California. This application would include documentation of leak rates for the self-sealing valves used on the cans, documentation for a registered recovery facility that will recover and/or recycle used and partially used cans, information on procedures used to return cans to the recovery facility, labeling language, and educational outreach materials that will be available at the point of sale.

Recycling Program
The recycling program and self-sealing valve are designed to prevent emissions and allow recovery of the can heel, the refrigerant that remains in the can after it has been used to charge a vehicle. Retailers would be required to collect a $10 deposit, approximately equivalent to the price of a 12-ounce can, from consumers when the consumer purchases a can, and the deposit will be refunded by the retailer when the consumer returns the can. The manufacturer will transport cans from the retailer to a recovery facility in order to recover any refrigerant remaining in the can.

Education Program
Consumer practices can be improved through better knowledge of recharge techniques and knowing the importance of preventing emissions of global warming gases. It has been shown that knowledgeable consumers generate minimal emissions during recharge. Manufacturers must develop educational materials suitable for use by purchasers and users of the small containers. The information includes best recharging practices to minimize servicing losses, promotes repair of leaking MVAC systems, and creates an awareness of the impact of refrigerant on climate change.

## Emission Reductions and Costs

The current total annual emissions from small can usage is 0.85 $MMTCO_2E/yr$. Ninety-five percent of emissions, or 0.81 $MMTCO_2E/yr$, result from DIY recharge, and the rest are due to small can usage by the professional servicing industry. DIY emissions arise from three sources: servicing losses, can heel, and leaking MVAC systems. Implementation of this regulation would reduce emissions from servicing losses and can heel for an emissions reduction of 0.26 $MMTCO_2E/yr$.

The remaining emissions (0.55 $MMTCO_2E/yr$) are predominantly associated with leaking systems which will be addressed through other approaches, such as improving professional servicing and identifying and repairing leaky MVAC systems via the smog check program.

The proposed regulation is estimated to cost about $11 in increased consumer costs per $MTCO_2E$ reduced. The cost of the product (a 12-ounce container of HFC-134a refrigerant costs about $10) will be increased by about $1 to cover the cost of the self-sealing valve, the costs for recycling, and the cost of education programs. The increased cost is also attributed to a percent of customers not returning used cans, thereby losing their deposit (i.e., $10). These costs are about a factor of 15 lower than the cost of the originally proposed can ban.

**Public Process, Stakeholder Interactions**

Staff worked closely with stakeholders throughout the year-long development process of this regulation. Staff held two public workshops and three workgroup meetings in Sacramento. The public process proved valuable as interactions with stakeholders resulted in mitigation options that were not originally under consideration. The recommended regulation is the result of many hours of cooperative work between stakeholders and ARB staff. This regulation has potential to be exported to the rest of the nation.

**Implementation Timeline and Enforcement**

The regulation is recommended for adoption in January, 2009, and would be enforceable beginning January, 2010. The new requirements for small container labeling and educational material would go into effect on January 1, 2010. There would be a one-year sell-through period for cans manufactured before January 1, 2010. The target recycle rate is initially set at 90%, and rises to 95% beginning January 1, 2012. The Air Resources Board Enforcement Division would be responsible for testing the retailer's compliance with the educational display and recycling requirements. The Monitoring & Laboratory Division would test compliance of the cans for leak rate requirements. Based on reported data, the Research Division would calculate recycle rates and compare them to the targets specified in the regulation.

# I. OVERVIEW AND STAFF RECOMMENDATION

The California Global Warming Solutions Act of 2006 (Assembly Bill 32, AB 32, Núñez, 2006) creates a comprehensive, multi-year program to reduce greenhouse gas (GHG) emissions in California. The AB 32 program includes an Early Action plan approved by the Board in 2007. Under the Early Action plan, staff of the Air Resources Board (ARB or Board) worked closely with stakeholders and are proposing a Discrete Early Action regulation that would reduce GHG emissions associated with do-it-yourself (DIY) recharging of motor vehicle air conditioning (MVAC) systems (ARB, 2007a). This regulation is not only a Discreet Early Action, it is a part of the overall strategy for reaching the 2020 target as presented in the Draft Scoping Plan.

Automotive refrigerant used by DIY is sold in small containers. This regulation pertains to containers holding between 2 ounces and 2 pounds of any automotive refrigerant by weight having a GWP greater than 150. The containers are small cans and in this document the words containers and cans will be used interchangeably. Large canisters of refrigerant are used for professional servicing and stationary applications. Containers holding less than 2 ounces of refrigerant are used for special purposes such as injecting dye and/or oil, and they have a very low sales volume, thus they are exempt from this regulation. Regulations to address emissions of containers of refrigerant holding 2 pounds or more are under separate development.

The current predominant automotive refrigerant, HFC-134a, has a global warming potential (GWP) of 1,300. Future refrigerants approved by EPA for automotive use would likely have much lower GWPs; the proposed regulation would encourage adoption of automotive refrigerants with a GWP lower than 150. The impact of a 12-ounce container of HFC-134a refrigerant is equivalent to the GHG gas emissions from a typical California automobile burning 50 gallons of gasoline to drive over 1,000 miles. Approximately two million cans are sold annually in California at retail stores that sell automotive parts and products. This regulation would achieve emission reductions through:

1. Use of a self-sealing valve on the can.
2. Improved labeling instructions.
3. A recycling program for used cans.
4. An education program that emphasizes best practices for vehicle recharging as well as highlights the environmental risks associated with this product.

The regulation would annually affect an estimated 1.4 million Californians who service their own vehicle air conditioning systems. It would also affect a small number of professional businesses that choose to use the small cans rather than large canisters to recharge vehicle air conditioning systems. Small can

manufacturers, distributors, and retail outlets would be affected as they have responsibilities to implement all components of the regulation.

The regulation, a copy of which is provided in Appendix A, covers many facets needed to achieve the emission reductions. Typically a can is not fully emptied during the recharging process since the air conditioning system only requires part of the can contents. It would become illegal to dispose of or destroy any container containing any amount of refrigerant. Under the regulation, manufacturers would submit an application to ARB to get approval to sell their product in California. This application would include demonstration and documentation that valves used on the cans meet a performance standard, documentation for a registered recovery facility that will recover and/or recycle used and partially used cans, information on procedures used to return cans to the recovery facility, labeling language, and educational outreach materials that will be available at the point of sale.

The intent of the recycling program and self-sealing valve are to recover the can heel, the refrigerant that remains in the can after it has been used to charge a vehicle. Retailers will collect a $10 deposit, approximately equivalent to the price of a 12-ounce can, from consumers when the consumer purchases a can. The current purchase price is approximately $10, so the customer will have an initial outlay that is approximately double the current price. This deposit will be refunded when the consumer returns the can, after use, to the retailer where the can was purchased. The regulation states that the can should be returned within 90 days with a proof of purchase for refund of deposit.

Consumer practices should be improved through better knowledge of recharge practices and global warming issues. Each manufacturer who sells small cans of refrigerant will required to develop educational materials suitable for use by purchasers and users of the cans. The information is designed to promote best recharging practices in order to minimize servicing losses, promote repair of leaking MVAC systems, create an awareness of the impact of refrigerant on climate change, and potential risks to the MVAC system due to lack of professional equipment. This information will be required on can labeling, educational brochures that will be distributed by retailers, and on the internet. It is hoped that the consumer will be motivated to reduce emissions as a result of increased awareness of the issues.

Staff estimates that the current total annual emissions from small can usage is 0.85 $MMTCO_2E/yr$. Ninety-five percent of emissions, or 0.81 $MMTCO_2E/yr$, are caused by DIY recharge, and the rest are due to small can usage by the professional servicing industry. These emissions arise from three sources: servicing losses, can heel, and leaking MVAC systems. Implementation of this regulation would reduce emissions by 0.26 $MMTCO_2E/yr$. The estimated increased cost of the proposed regulation is about $11 per $MTCO_2E$. The cost of the product will be increased a small amount to cover the cost of the self-sealing

valve and industry costs for recycling and education programs. It is anticipated that industry will pass their increased costs to the consumer with an estimated $1 increase in can price. The increased cost is also attributed to some customers not returning used cans, thereby losing their deposit. Unclaimed deposits that are retained by the manufacturer will be spent on enhanced education and outreach designed to inform consumers of measures to reduce GHG emissions associated with DIY recharging of MVAC systems.

Staff worked closely with stakeholders including representatives from the Automotive Refrigeration Products Institute (ARPI, industry), the retailers, the California Integrated Waste Management Board (CIWMB), the California Product Stewardship Council (CPSC), the Mobile Air Conditioning Society Worldwide (MACS), the SAE International, and the California Bureau of Automotive Repair (BAR) throughout the year-long development process of this regulation. Staff held two public workshops and three workgroup meetings in Sacramento. The public process proved valuable as interactions with stakeholders resulted in mitigation options that were not originally under consideration. The recommended regulation is the result of many hours of cooperative work between stakeholders and ARB staff.

Staff recommends that the Board adopt this regulation. A significant emission reduction is achieved at a minimal cost compared to alternative proposals considered. The recommended measure is a model that can be copied elsewhere. It focuses directly on the emissions attributable to the small cans and will complement other efforts that focus on the vehicle. The recycle and education programs are a form of public outreach on climate change issues, generating positive behavior and extended producer responsibility.

The following sections include the need for emission reductions, affected industries and stakeholders, a description of the regulation, costs and economic impacts, implementation and enforcement, and alternatives considered. These sections should provide answers to most questions about the regulation.

## II. BACKGROUND

Under normal operation, many vehicles slowly lose refrigerant due to “normal” leakage and permeation. Larger leaks are generally due to compressor leaks, and malfunctioning hoses and connections. When a vehicle’s air conditioning system loses about 50% of its design refrigerant charge, cooling effectiveness suffers. Studies indicate that, on average, such a loss may occur for vehicles 6 to 8 years old. The vehicle owner has two choices for servicing the system in an attempt to restore cooling ability, self service and professional repair. Those choosing self service can recharge or “top off” the system using small cans of HFC-134a purchased at retail auto parts stores or other retail outlets. DIYers can purchase small cans of HFC-134a in retail stores for approximately $10 (NPD, 2008). Nominally, two or three 12-ounce cans are sufficient to fully recharge an empty MVAC system of a typical passenger car. Otherwise service should be done at a professional auto shop certified to perform AC maintenance with a cost to consumers of $100 to $2,000, depending on the severity of the problem.

A vehicle owner saves money by recharging an MVAC system with small cans of refrigerant compared to having a professional perform the recharge. However, the DIY may not properly identify a repairable leak and repair it due to a lack of adequate training and/or equipment. A DIY recharge of an MVAC system may unintentionally release more HFC-134a than a recharge performed by a professionally trained and industry-certified technician at a licensed auto repair facility. There is also increased risk of damage to the system by over- or under-charging the proper amount of refrigerant and lubricant in the system.

### A. IMPACT OF AUTOMOTIVE REFRIGERANT ON GLOBAL WARMING

HFC-134a is a hydrofluorocarbon (HFC) currently used as a refrigerant in most MVAC systems. It replaced the refrigerant R-12, a chlorofluorocarbon (CFC) identified as an ozone depleting substance (ODS) under the Montreal Protocol. HFC-134a is not an ODS, but is a potent GHG with a GWP of 1,300 (IPCC, 2007). The global HFC emissions from MVAC are estimated to be around 86 $MMTCO_2E$ in 2002 and are projected to grow rapidly to around 281 $MMTCO_2E$ in 2015 under business-as-usual (BAU) (Clodic et al., 2004). Nearly all HFC used in MVAC is HFC-134a. High-GWP GHGs constitute about three percent of the total $CO_2$ equivalent emissions in California in 2002 to 2004 (ARB, 2008a). The estimate of HFC-134a emissions in California during 2004 is 9 $MMTCO_2E$ (ARB, 2008b). About 4 $MMTCO_2E$ are from MVAC applications, which is based on a nationwide ratio of mobile AC to total HFC-134a emissions as estimated by U.S. Environmental Protection Agency’s (U.S. EPA) Vintaging Model, private communication with U.S. EPA staff, and California ratio of MVAC to total GHG emissions from MVAC.

## B. ENVIRONMENTAL IMPACTS

Measurements show that the global average temperature has increased by 1.6 $^{O}$F in the last 100 years, with most of it happening in the last three decades. This warming is linked to increasing atmospheric concentrations of GHGs resulting from human activities. The 10 warmest years of the last century all occurred within the last 15 years. As the average temperature increases, weather is affected, and rainfall patterns may change. We can expect to see worsening air quality, an increase in the number of weather-related deaths, and a possible increase in infectious diseases. Higher temperatures contribute to increased smog, which is damaging to plants and humans. Climate change also affects forests to increase fire hazards and make forests more susceptible to pests and diseases. Forest fires have occurred at unprecedented rates and earlier in the fire season than past years. Agricultural patterns will change as crops and productivity shift along with climate change. Physical changes such as these impact California's public health, economy and ecology.

Climate change affects the high Sierra Nevada snowpack. Throughout the 20$^{th}$ century, annual April to July spring runoff has been decreasing, with total water runoff declining by about ten percent over the last 100 years. 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 (ARB, 2004a).

Greenhouse gases remain in the atmosphere for many years, decades, and even centuries, so the problem cannot be eliminated quickly. As a result, the climate change effect of gases emitted years ago may not yet be fully realized. Emissions in GHGs are needed immediately to reduce future effects. The California legislature realized the urgency for reducing emissions of GHGs and as a result, in the AB 32 specified that ARB develop discrete Early Action measures in order to begin reducing emissions as soon as possible.

## III. REQUIREMENTS OF AB 32

AB 32, The California Global Warming Solutions Act of 2006, creates a comprehensive, multi-year program to reduce GHG emissions in California. AB 32, at Health and Safety Code section 38560.5, requires that ARB adopt regulations by January 1, 2010 to implement discrete early action GHG emission reduction measures. These measures must "achieve the maximum technologically feasible and cost-effective reductions in greenhouse gas emissions" from the sources identified for early action measures. AB 32 contains additional standards in Health and Safety Code section 38562 that apply to regulations that will be adopted for general emissions reductions consistent with ARB's scoping plan. Among other things, this section requires that reductions must be real, permanent, quantifiable, verifiable, and enforceable. ARB is also required to adopt rules and regulations in an open, public process. While section 38562 does not directly apply to early action measures enacted under section 38560.5, ARB is interested in ensuring that its early action measures, such as the proposed regulatory action meet the broader criteria for the GHG reduction regulations that will follow. For that reason, those criteria are summarized here, with staff's assessment as to why the proposed regulatory action meets them or is not specifically applicable to them.

The proposed regulatory action has been designated as a discrete early action measure and would reduce GHG emissions attributable to small containers of automotive refrigerant by establishing small container certification requirements that will require containers to have self-sealing valves, and requiring the implementation of a small container deposit and return and refrigerant recovery program. Small containers of automotive refrigerant are predominately used by do-it-yourselfers to recharge their MVAC systems. The following discussion explains why staff believes this proposed regulatory action meets the requirements of State law.

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.**

The proposed regulation was developed in consultation with affected parties in an open, public process. Staff conducted numerous outreach efforts to inform affected parties of the proposal and to obtain stakeholder comments. Outreach efforts included two public workshops and several individual consultation meetings. See Section X of this Staff Report for additional details.

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 multifaceted proposed regulation for small containers of automotive refrigerant was designed to maximize emission reductions uniformly through out the State, while minimizing costs. All manufacturers of small containers of automotive refrigerant intended for sale in California are required to meet the certification requirements to sell product. No manufacturer or retailer would be allowed to sell non-complying products in California, including internet or catalogue sales, therefore a DIY user anywhere in California will be unable to purchase non-complying products. It will become illegal to dispose of or destroy a small container of automotive refrigerant, except at a recovery facility. As a result, consumers must return used containers so the unused portion of refrigerant can be recovered and recycled. Improved labeling and the education program will assist the DIY in reducing emissions while servicing his/her MVAC. Since DIY pursue this practice throughout the State, reductions would occur throughout the State. Greater reductions will likely occur in population centers or areas with warmer weather that necessitate greater use of MVAC. The cost effectiveness of the proposed regulation is about $11 per $MTCO_2E$.

The estimated reduced emissions represent the maximum technically feasible reduction. Further reductions from this category were determined not to be technologically and commercially feasible, due to the necessity to continue servicing MVAC systems with the refrigerant in common use.

This regulation will become effective in one year, rather than a longer period, to maximize the emission reductions. Product will have a one-year sell-through period, then old product must be removed from store shelves.

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

In developing the proposed regulation, staff was especially aware of its potential impacts, and therefore incorporated measures to avoid disproportionately impacting low-income communities. As discussed above, staff decided not to follow an alternative proposal to completely ban the sale of small containers of automotive refrigerant. Such a measure would necessitate the use of professional servicing rather than DIY servicing, at a greatly increased cost. The proposed approach avoids imposing such a disproportionate hardship on low-income communities.

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.**

This requirement is not applicable to this proposed rulemaking.

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.**

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 conflict with existing laws or regulations.

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

The cost effectiveness of the proposed limit is about $11 per $MTCO_2E$. The cost of the product will be increased a small amount (about $1) to cover the cost of the self-sealing valve, the costs for recycling, and the cost of education programs. Additional increased cost is attributed to a percent of customers not returning used cans (additional $10), thereby losing their deposit. See section IX and Appendix G of Technical Support Document for a more detailed discussion.

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 adverse impacts to society or the environment. California would benefit from the reduction of GHG emissions and it is anticipated that the proposed requirement to recycle small containers of refrigerant would reduce the solid waste stream of containers that would likely be discarded in landfills. The number of cans and the packaging used should not increase. See section IX and Appendix G of Technical Support Document for a more detailed discussion.

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

The proposed regulation has several components to achieve GHG emission reductions from small containers of automotive refrigerant. An especially important component would require manufacturers to utilize a self-sealing valve on the containers to prevent refrigerant from venting to the atmosphere. Most containers do not currently incorporate this feature. This proposed requirement does not present an administrative burden.

The proposed regulations would require manufacturers to apply for and receive Executive Orders from ARB before they could sell or offer for sale their products in California. However, once a manufacturer obtains a certification, it does not need to submit a further application for certification unless it significantly changes the design or specifications of a previously certified product.

Under the proposed regulation, manufacturers would bear most of the administrative burdens associated with the recycling component of the regulation, but would also economically benefit from recovering the refrigerant from used containers. Manufacturers would also be required to develop product labels and educational materials to inform DIYers of best practices for using their products, although the development of these materials should only be an one-time event.

Finally, the proposed regulations would require both manufacturers and retailers to record and report data on sales and returned cans, although any administrative burdens should be minimal given the widespread use of computerized technology by both manufacturers and retailers to track sales information.

**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. If leakage were to occur, emissions benefits, jobs and other economic benefits to California would be lost. The proposed regulation applies to all manufacturers and retailers of small containers of automotive refrigerant that sell, offer for sale, or manufacture for sale in California those products, regardless of where those manufacturers or retailers are located (although currently, all small containers of automotive refrigerant are manufactured and packaged outside of California.) Therefore, the regulation would not create a situation where a manufacturer or retailer located in California would be placed in a competitive disadvantage compared to manufacturers or retailers out-of-state.

**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 suggests that high-GWP GHGs constitute about three percent of the total $CO_2$ equivalent emissions in 2002 to 2004. A preliminary estimate of HFC-134a emissions in California during 2004 is approximately 9 $MMTCO_2E$, of which approximately 4 MMTCO2E are attributable to motor vehicle air conditioning applications. The current emissions attributable to the usage of small cans of HFC-134a are estimated to be 0.85 $MMTCO_2E$ per year.

The proposed regulation would achieve emissions reductions of about 0.26 $MMTCO_2E$ per year. While this reduction may appear somewhat modest, when it is considered in conjunction with anticipated future GHG reductions from MVAC regulations, the total reductions could become quite significant. When each early action measure related to MVACs is considered alone, it yields relatively small emission reductions, but with regard to GHG emissions the aggregate emissions

are more significant. This situation necessitates achieving relatively small reductions from a number of distinct early action measures to achieve significant overall reductions. See section IX and Appendix G of the Technical Support Document for additional details.

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

The emissions and emission reductions from small containers of automotive refrigerant were calculated based on data submitted by manufacturers of the affected products and on independent research data commissioned by ARB. Data from the manufacturers were submitted in accordance with State law and were certified by an officer of each company that submitted the data. The GHG emissions and reductions were calculated based on GWP values defined by the Intergovernmental Panel on Climate Change 2007: The Physical Science Basis, IPCC Working Group 1 Fourth Assessment Report, 2007 (IPCC, 2007).

The proposed regulation would require manufacturers of small containers of automotive refrigerant to apply for and receive certification by ARB before they could sell or offer for sale their products in California, specifies the effective date of the regulation and the test methods used to determine if the products comply with the proposed certification requirements, and specifies recordkeeping requirements that would provide enforcement staff with the information needed to enforce the proposed requirements in the field. The proposed regulation also requires that products subject to the certification must display new labeling and be date coded. These identifiers enable enforcement personnel to ascertain if a product is certified for sale in California. Finally, the proposed regulation would enact reporting requirements for manufacturers, distributors, and retailers to allow staff to determine recycle rates and the quantity of refrigerant recycled. Once the regulation is approved by the Office of Administrative Law, the proposed regulation will become State law. Based on the above, upon the effective date of the proposed emission limit, the reductions become 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.**

The proposed regulation is the first GHG emission limitation affecting this product category. No other existing State, federal or other requirements would affect GHG emissions specifically attributable to small containers of automotive refrigerant sold in California. The state of Wisconsin currently prohibits the sale of small containers of automotive refrigerant, but that ban is not applicable to products sold in California.

**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.**

This regulation achieves its emission reductions as 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 available economic and scientific information available to develop the proposed regulation. The description in this section of the Staff Report documents that the proposal was developed in accordance with AB 32 requirements. Section IX of this Staff Report contains a detailed description of the economic impact of the proposed emission limit. A technological assessment of the feasibility of the proposed regulation is discussed in section V of this Staff Report.

## IV. COMPARABLE FEDERAL LAWS AND REGULATIONS

Although various provisions of the Federal Clean Air Act (CAA) and U.S. Environmental Protection Agency regulations generally regulate many aspects regarding the usage of non-ozone depleting refrigerants used in MVACs, they do not currently restrict or address sales of small containers of non-ozone-depleting automotive refrigerant.

Since November 15, 1995, section 608(c)(2) of the CAA [42 U.S.C. § 7671g(c)(2)] has generally prohibited any person from venting or releasing any substance that is used as a substitute for an ozone-depleting refrigerant into the atmosphere. In 2004, the U.S. EPA amended its regulations regarding refrigerant recycling to clarify that the section 608(c)(2) venting ban also extends to pure HFC and perfluorocarbon (PFC) refrigerants.

Section 609(e) of the CAA [42 U.S.C. § 7671h(e)] and Title 40, Code of Federal Regulations (CFR) section 82.34(b) have restricted, as of November 15, 1992, the sale, distribution, or offer for sale or distribution of ozone-depleting refrigerants (class I or class II substances) that are suitable for use in motor vehicle air-conditioning systems and that are in containers with less than 20 pounds of refrigerant, except to those technicians that have been trained and certified pursuant to an EPA-approved course.

On March 12, 2004, the U.S. EPA decided not to extend a proposed restriction on the sale of small containers of pure HFC or PFC refrigerants to certified technicians. U.S. EPA has provided input to the proposed regulation, but has not announced any plans to adopt a similar provision in the near future.

# V. PROPOSED REGULATORY PROVISIONS

The proposed regulation is included in Appendix A. It is accompanied by new Certification Procedures, which are included in Appendix B.

## A. Applicability and Exemptions

The proposed regulation would take effect on January 1, 2010. Because the proposed regulation does not involve or require a change in formulation, like many consumer product regulations, it may be implemented quickly. Industry is actively engaged in implementing the necessary changes and agrees with this implementation date.

Because most small containers of automotive refrigerant contain less than five pounds of refrigerant (they must be light enough for a DIYer to easily lift with one hand), the proposed regulation only applies to small containers containing between two ounces and two pounds of refrigerant by weight.

The proposed regulation affects only refrigerants with a GWP value greater than 150. ARB recognizes that alternative refrigerants may replace the current refrigerants. If a transition to low GWP refrigerants occurs, this regulation may not be applicable. This cut point is consistent with the EU Directive that allows only automotive refrigerants with a GWP less than 150. It allows for the use of HFC-152a, as well as other potential alternatives, should EPA approve their use in MVAC systems. With all other factors being equal, a switch to a refrigerant with a GWP of 150 would result in an 88-percent reduction in carbon dioxide-equivalent emissions compared to HFC-134a.

The proposed regulation would also contain a sell-through period that would allow small containers of automotive refrigerant manufactured before January 1, 2010 to be sold until December 31, 2010. Manufacturers would have to recall any containers after the sell-through period expires.

Finally, the proposed regulation would only apply to non-ozone depleting refrigerants because, as discussed above in section IV of this report, federal law currently restricts the sale of any ozone-depleting refrigerants for use in motor vehicle air-conditioning systems and that are in containers with less than 20 pounds of refrigerant to technicians that have been trained and certified pursuant to an EPA-approved course.

## B. Certification Requirements

The proposed regulation would require any manufacturer of small containers of automotive refrigerant to obtain a certification for its product before it could sell, supply, offer for sale, or manufacture for sale its products in California. ARB

would only certify those small containers of automotive refrigerant that comply with the following proposed certification requirements:

### 1. Self-sealing Valve and Leakage Rate

Each small container of automotive refrigerant must be equipped with a single self-sealing valve that automatically closes and seals when not dispensing refrigerant. The leak rate from each container must not exceed 3 grams per year when the self-sealing valve is closed, as determined by a new proposed test procedure (Appendices C and D). This leak rate was proposed by industry as a specification they could comply with, and this rate would apply to both new, full containers as well as partially full containers. Technology is currently available to meet this requirement. Self-sealing valves are available from several manufacturers and are routinely used on consumer products, and valves are available that meet the 3 grams per year leakage requirement.

Currently, most small containers of automotive refrigerant are not equipped with self-sealing valves. The user punctures the container with a dispensing device and releases the refrigerant. The stored refrigerant is then either transferred into the MVAC system, released to the atmosphere, or remains in the container. The refrigerant remaining in the can, called the can heel, will be released to the atmosphere with the eventual disposal of the can. However, the proposed self-sealing valve requirement will allow manufacturers to recapture the can heel that is otherwise vented to the atmosphere from current containers.

### 2. Recovery Facilities

Manufacturers would be required to identify and register with ARB each facility that would be used to recover refrigerant from a small container, and to provide information including the location and a description of recovery equipment and operating parameters. Recovery facilities would be required to use best operating procedures to minimize leakage of refrigerant to the atmosphere. Industry representatives have indicated that they are currently recovering refrigerant from damaged containers using existing equipment (the machinery used to fill the cans is simply operated in reverse to recover the can heel from the can).

### 3. Container Labeling Requirements

The proposed regulation would require each container of refrigerant to display, in both English and Spanish, information to promote consumer education of proper charging practices and of the environmental consequences of misuse of refrigerant.

The proposed regulation would require each container to be labeled with the following statement:

"Contents of this container contribute to Global Warming. It is illegal to destroy or discard this container or its contents. Return for $xx refund."

The dollar amount of the deposit would initially be set at $10, and could be increased, as proposed in the regulation.

Container labels would also be required to state: safety precautions, operating parameters for the vehicle engine, air conditioner and fan; recharging procedures, including identification of low pressure port, container rotation, time required for recharging, and how to disconnect the container; date of manufacture, a California specific code and the words "Approved for use in California" and "$XX refundable deposit, if returned within 90 days of purchase."

### 4. Education Requirements

Manufacturers would be required to develop educational materials for purchasers of small containers of automotive refrigerant that include information regarding: identifying and repairing leaks in the MVAC system, techniques to minimize can heel and servicing loss while transferring refrigerant from the container to the MVAC system, the environmental hazards associated with refrigerant emissions due to improper use and disposal of cans as well as failure to repair leaky MVAC systems, potential risks to the MVAC system due to lack of professional equipment and diagnostic techniques, and components of the container deposit and return program. Examples of container labels and educational materials are provided in Appendix E. Manufacturers currently have a tri-fold brochure and websites with instructions and photos for recharging an MVAC system. This medium will be modified to include additional educational information.

## C. Container Deposit and Return Program

The proposed container deposit and return program would work in conjunction with the self-sealing valve requirement to ensure that refrigerant remaining in used small containers as can heel is returned to and recovered by manufacturers.

Retailers would collect a deposit, at the time of sale, from a consumer of a small container of automotive refrigerant. The deposit amount would initially be $10 but is subject to increases, as described below. After using the refrigerant, the consumer would return the used container to the retailer within 90 days of purchase along with a valid proof of purchase to receive a full refund of the deposit. The retailer is not required to pay a refund for any containers that have been damaged such that its contents have been released to the environment. Finally, the retailer would be required to accumulate and store any used small containers before they are transferred back to the manufacturer.

The manufacturers would be responsible for administering a container recycling program and recovering refrigerant. They would: coordinate the collection of used containers from retailers and designated return agencies, provide collection boxes or bins to retailers, transport the returned containers to recovery/recycle facilities, and recover any refrigerant remaining in the returned cans at a facility registered with the ARB. Unclaimed deposits that are retained by a manufacturer must be spent on enhanced education and outreach programs designed to inform consumers of measures to reduce GHG emissions associated with DIY recharging of MVAC systems.

Staff calculates that the carbon emissions associated with transporting used cans to a recovery facility will be on the order of 0.02 % of the $CO_2$ equivalent of the refrigerant remaining in used cans.

The proposed regulation provides manufacturers two years to achieve a 90% used container return rate. After two years, the recycling target will increase to 95%. For any two year reporting period in which the return rate does not meet or exceed its target return rate, the Executive Officer may revise the deposit amount by an additional $5. Before increasing the deposit, the Executive Officer could consider any information submitted by manufacturers or retailers that increasing deposit amounts would not increase recycle rates.

**D. Reporting and Recordkeeping Requirements for Deposit and Return Program**

The proposed regulation would require manufacturers, retailers, distributors and recyclers to report sales data, returned can data, the amount of refrigerant recovered, along with the amount of that refrigerant recycled, reclaimed, or disposed of, and/or the amounts of unclaimed deposits retained and how those funds were spent to enhance consumer education. Staff would utilize this data to calculate the annual return rate of used cans of refrigerant.

Suggested reporting forms are provided in Appendix F. A detailed table of the reporting requirements and dates is presented in Table 1. This table has an important role in the evaluation of the return rate, as well as the determination of the amount of the can deposit. All important dates associated with the regulation are given in the table.

**Table 1. Proposed Schedule of Recycling and Reporting**

| | Small Container Type of Manufacture | Small Container Sale Allowed | Reporting Period & Target Return Rate | Comments |
|---|---|---|---|---|
| **Jan. 1, 2010 thru Sept. 30, 2010** | New | Any | #1 – 90% | Report due Dec. 1, 2010 |
| **Oct. 1, 2010 thru Sept. 30, 2011** | New | New | #2 – 90% | Report due Dec. 1, 2011; Evaluation of Return Rate and New Deposit Process |
| **Oct. 1, 2011 thru Sept. 30, 2012** | New* | New* | #3 – 95% | Report due Dec. 1, 2012; 6 months sell-through** |
| **Oct. 1, 2012 thru Sept. 30, 2013** | New* | New* | #4 – 95% | Report due Dec. 1, 2013; Evaluation of Return Rate and New Deposit Process |
| **Oct. 1, 2013 thru Sept. 30, 2014** | New* | New* | #5 – 95% | Report due Dec. 1, 2014 6 months sell-through** |
| **Oct. 1, 2014 thru Sept. 30, 2015** | New* | New* | #6 – 95% | Report due Dec. 1, 2015; Evaluation of Return Rate and New Deposit Process |
| **continue** | continue | continue | continue | continue |

* The can labels and SKUs must be changed if a new deposit rate is introduced.
** 6 months sell-through for old can labels and SKU if a new deposit rate is introduced.

### E. Container Disposal or Destruction Restrictions

Finally, the proposed regulation would prohibit any person from disposing or destroying a small container of automotive refrigerant unless the disposal or destruction is performed in accordance with the procedures specified in the regulation.

Manufacturers or their designated recovery facilities would be required to evacuate small containers of automotive refrigerant to less than atmospheric pressure, unless the containers were previously damaged. All other persons would have to return small containers of refrigerant that contain any quantity of refrigerant to the retailer, the manufacturer, or the manufacturer's designated recovery facility for future refrigerant recovery.

# VI. IMPLEMENTATION AND ENFORCEMENT OF THE PROPOSED REGULATION

## A. Implementation

ARB staff would review and either approve or disapprove applications for certification submitted by manufacturers, including documentation for self-sealing valves, container labeling, and educational documents. Staff would also review documentation that registers refrigerant recovery facilities designated by manufacturers. If a certification application complies with all specified requirements, ARB would issue an Executive Order certifying the small container of automotive refrigerant for sale in California.

The recycling component of the regulation requires recordkeeping and reporting requirements from several participants. ARB staff would review and approve the reports submitted by retailers, distributors, manufacturers, and recyclers. After the first reporting period, staff would calculate and report the annual return rate of containers. However, the can deposit fee would be reviewed and adjusted, if necessary, on a biennial basis.

## B. Enforcement

ARB enforcement staff would ensure that all small containers of refrigerant sold in California comply with the proposed regulation through inspection procedures. Retailers would be inspected to ensure they do not sell uncertified containers, that they comply with the can deposit and return program, and the point-of-sale consumer information requirements. Specifically, staff would confirm proper handling of returned cans, confirm that a deposit is collected when a can is sold and refunded when the can is returned, and observe the collection, storage and transfer of small containers.

Staff would also inspect manufacturers to confirm they accept and properly handle the used cans when the cans are returned. If an intermediate designee is involved in the return and recycle program, staff would inspect the designee for proper handling and coordination of returns, and proper refunding of deposits.

Staff would also inspect recovery facilities to ensure they are registered for recovery, and to confirm they are recovering refrigerant and reclaiming or destroying it. Finally, if necessary, enforcement staff would initiate enforcement actions against any entity that was violating the provisions of the proposed regulation.

## VII. ISSUES REGARDING THE PROPOSAL

ARPI conducted a brief pilot study in two Southern California cities during the spring of 2008 to determine consumer compliance with a recycling program. This short-term study, with minimal advertising, included a $5 deposit and resulted in a 75% return rate. Implementation of a statewide program with greater financial incentive to return cans should result in higher return rates. The proposed regulation establishes a return rate of 90% for the first two years, and a return rate of 95% after the first two years.

Industry has argued that because future small containers will incorporate self-sealing valves, consumers will be more likely to store partially used containers rather than return them within 90 days of purchase to obtain their can deposit fee, which will reduce the recycling rate. Staff believes that the proposed $10 per container deposit will provide sufficient incentive for the vast majority of consumers to return their containers, and has also provided industry flexibility in achieving the proposed return rates by basing the calculation of a return rate over a two-year period. Under current practices, DIY users of small containers of automotive refrigerant are accustomed to using the entire container or lose the remaining can heel rather than attempting to save partially filled cans for subsequent use. This is consistent with an ARB-commissioned study (Clodic et al., 2008) which shows that a noticeable reduction in cooling performance does not occur until the system charge is low by about one can for typical MVAC systems. Moreover, staff believes that a high deposit rate will discourage consumers from purchasing small containers of refrigerant for later use, and would encourage immediate use of such containers as well as avoid problems associated with lost cans or receipts, which results in decreased recycle rates.

## VIII. ENTITIES AFFECTED BY THE PROPOSED REGULATION

The proposed regulation will directly affect individuals who practice DIY recharging of MVAC systems, manufacturers of HFC-134a, companies that package and distribute the small containers of HFC-134a, retailers of small containers of HFC-134a, and potentially professional auto shops that service MVACs.

### A. Manufacturers and Recyclers

According to the 2006 Consumer Product Survey, there were 7 manufacturers selling small containers of automotive refrigerant in California. All of them are located outside of California. The sales of three of those manufacturers, represented by ARPI, constituted almost 90% of the market. All manufacturers would be responsible for installing self-sealing valves on the containers, administering and operating the container return and refrigerant recycling program, and developing the educational materials. Manufacturers would also be required to obtain certification of their product(s) and to maintain records of sales, returns and refrigerant recovery. Manufacturers are expected to pass the costs of these requirements onto their consumers. The price increase is unlikely to decrease demand due to unavailability of good substitute products. Furthermore, the proposed regulation would apply to any manufacturer that elects to sell its product in California The regulation might also produce a small increase in business for the professional MVAC servicing industry due to these added costs, but this is again not likely given that the proposed regulation would likely only increase the retail price of a small container of automotive refrigerant by $1.

The proposed regulation's can recycling program component would involve transporting used containers to a recovery and recycle facility. Manufacturers would recover any remaining refrigerant at their can filling facilities by operating the machinery in a reverse fashion. Refrigerant recovery machinery is presently available and is currently operated in reverse to recover refrigerant from dented and damaged cans. In general terms, a recovery facility will receive used cans and sort them by content. Used cans will then be fed into equipment that pierces the can while creating a positive seal to prevent venting of refrigerant. A vacuum will be applied to the can interior ensuring complete removal and recovery of the refrigerant heel. The recovered refrigerant is then transferred to a holding tank and prepared for either recycling or reclamation to ARI 700 purity standards. Recovery facilities anticipate reclaiming and using all recovered refrigerant. Empty cans will be collected for recycling.

### B. Retailers

Retailers would collect the $10 deposit from consumers at time the containers were purchased and would return this deposit when they receive the used cans

from the consumer. Retailers would provide space to collect and store the used cans before they are transported to the manufacturer or distributor and would display and distribute the educational materials provided by manufacturers.

### C. Consumers (DIYers)

The U.S. EPA Vintaging Model assumes that a properly functioning system should only need to be recharged after about 6 years, and has an average life of 16 years. This value is consistent with the assessment ARB staff developed in support of implementing AB 1493. For the vehicles 7 years old and older, a fraction will need repair or recharge. Of those vehicles, a fraction will operate without air conditioning, a fraction will receive professional service, and a fraction will be recharged by DIY. There is insufficient data to estimate those fractions, but there is enough data to estimate the total number of DIY recharges occurring per year. As described the Technical Support Document (Appendix G), this number is about 1.4 million recharges per year. Data from three different surveys show that some of the recharges are performed on normally functioning vehicles that only need to be recharged every few years, and others are performed on vehicles that need to be recharged more frequently, for example more than once a year. These different vehicles contribute differently to emissions, generate different costs, and their owners would react differently to major regulatory changes such as a can ban. All three surveys indicate that the average recharge frequency is about equal to one recharge per vehicle per year. To illustrate what that means, consider vehicle A being recharged twice per year, with vehicle B and vehicle C each being recharged every other year. Over two years, six recharges will occur, for an average of one recharge per vehicle per year.

For purpose of analysis, staff made the assumption that every DIY consumer recharges his/her vehicle not at all during the first 7 years, and then once every year for the following 9 years. Although the details of the emission reductions and cost benefit analysis will vary depending on the details of the distribution, the order of magnitude will not. That is because the most important factors driving the analysis are the number of recharge operations and the number of vehicles involved. Given the number of recharge operations, the number of vehicles is determined by the average recharge rate, not the specifics of the distribution.

Consumers would be affected by several aspects of the proposed regulation. They would be required to pay the $10 deposit per container at the time of purchase, and to return the used cans within 90 days of purchase to obtain a refund of that deposit. Consumers should also become better educated regarding the global warming impacts of automotive refrigerant and improve MVAC recharging techniques. Some consumers may elect to have their MVACs repaired and/or recharged by professional technicians based on information in the educational materials.

Based on industry input, staff estimates that the retail price of a small can of refrigerant will increase by about $1. The price increase will cover the cost of installing a self-sealing valve on each can, administering the container recycling and refrigerant recovery program, and preparing and distributing the educational materials. The current retail price of a small container of automotive refrigerant is approximately $10, and the deposit amount would initially be $10, so a consumer would have an initial outlay that is approximately double the current price. The deposit is refunded when the used container is returned to a facility participating in the program.

Based on household income reported for DIY users (Frost and Sullivan, 2006), approximately 15% of DIYers are considered low-income households. A household is considered to be low-income if its annual household income is less than twice the federal poverty level for a household of three. This criterion is similar to that found in the California Health and Safety Code that defines low-income households for the automotive repair assistance programs (Health and Safety Code, §44062.1). For context, applying this criterion for 2008 would define a low-income threshold of $35,200.

This proposed regulatory approach will impact the low-income population to a much lesser degree than banning the sale of small containers of automotive refrigerant in California, as the original AB 32 Early Action Plan suggested. Banning the sale of small cans would leave the low-income population with very limited options. They could either forgo repairing their MVACs or have the MVACs professionally serviced at much higher costs. Therefore, the proposed regulation represents a sensible approach for obtaining GHG emission reductions in the most cost-effective manner possible.

**D. Manufacturer and Retailer Interactions in the Can Recycling Program**

The proposed regulation would require a retailer to pay a deposit on each can to the manufacturer/distributor, and to collect a deposit from a consumer when a small container of refrigerant is sold, and to return that deposit when the consumer returns the used container with a receipt dated within 90 days of purchase. The deposit/refund process starts with the manufacturer. As the can travels to distributor, retailer, and consumer, the deposit travels the other direction (along with the wholesale price of the can). When the consumer returns the can and gets his deposit, the retailer must return the can to the manufacturer to retrieve the $10 deposit that was paid as part of the wholesale cost.

Figure 1 shows a possible flow chart that may occur as a result of the regulation. The solid lines trace the flow of cans from the manufacturer, down the left side to the consumer, and back up the right side to the manufacturer. The broken lines trace the flow of deposit money up the left side of the figure and back down the right side of the figure. The specific details of the deposit program are up to

manufacturers, distributors and retailers. Figure 1 is only an example, included for the purposes of clarification.

The proposed regulation only specifies the amount of deposit the consumer must pay. The regulation leaves a manufacturer the flexibility to adjust the deposit at different steps of the process. If a retailer incentive is needed to cover handling costs or promote a higher return rate, a manufacturer may decide to pay a small incentive to retailers when the used cans are collected and returned.

The manufacturer will keep the deposit of unreturned containers, but the proposed regulation would require manufacturers to expend any such funds to reduce GHG emissions, primarily through enhanced consumer education and outreach programs. The manufacturer must provide an accounting of how the unreturned deposits are used. Unclaimed deposits will be utilized to benefit the consumer through website support, development of educational materials, and training and outreach to the consumer via the retailer.

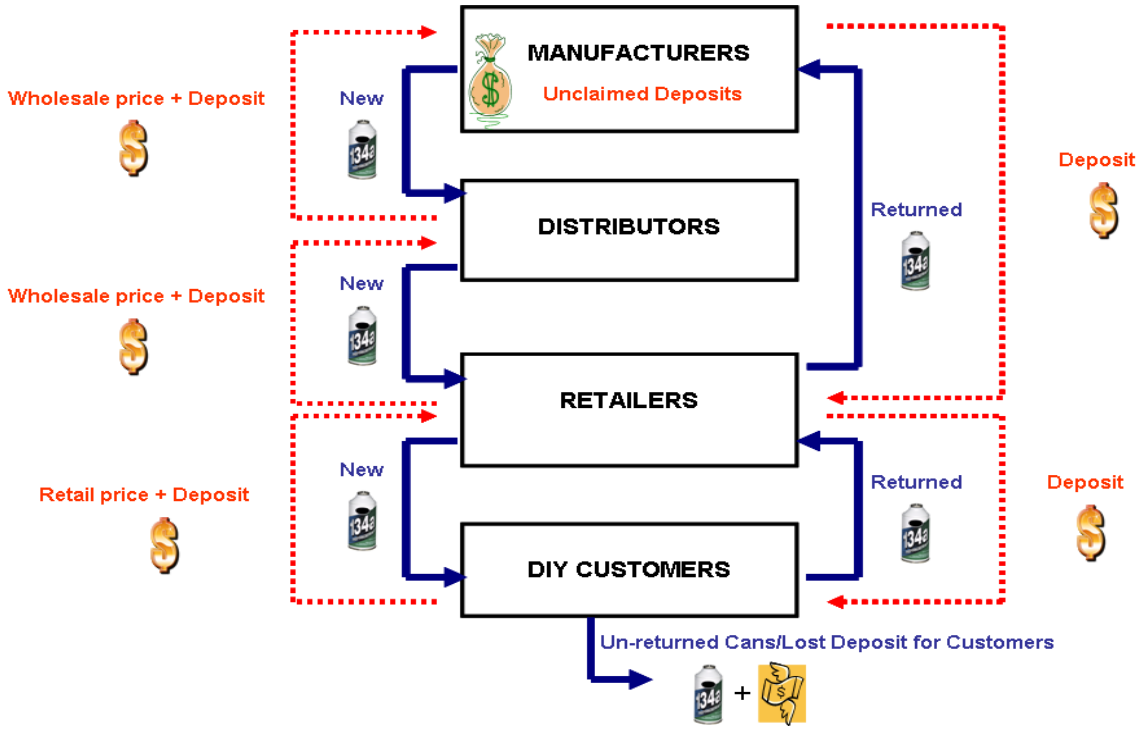


**Figure 1. Chart Showing the Deposit Process between the Affected Entities**

* The solid line traces the flow of cans from manufacturer to the customer (left side) and back to the manufacturer (right side). The broken line traces the deposit money from the customer (left side) to the retailer, and back to the customer (right side). Likewise the deposit money is traced from the retailer to the manufacturer and back.

# IX. AIR QUALITY, ENVIRONMENTAL, AND ECONOMIC IMPACTS

## A. Baseline Emissions

Staff surveyed manufacturers of small containers of HFC-134a to obtain 2006 sales data, and estimates that approximately 2 million small containers of HFC-134a were sold in California in 2006, containing about 654 metric tons of HFC-134a (ARB, 2007b). When factoring in HFC-134a's GWP of 1,300, this amount of refrigerant corresponds to sales of 0.85 $MMTCO_2E$ per year. Based on information from a mobile air conditioning trade association survey and national refrigerant usage apportionment (MACS, 2008; Atkinson, 2008a), an estimated 95% of total small cans sales are being used by DIYers. This corresponds to 0.81 $MMTCO_2E$ per year. The remaining cans are sold to professional shops although most professional shops purchase refrigerant in much larger canisters.

A DIYer recharging his or her MVAC system may emit refrigerant through three different mechanisms:

1. Release refrigerant from the MVAC system when the system is breached or from incomplete transfer of the can's content to the MVAC system (some content is vented to the atmosphere),
2. Release refrigerant from disposal of the container which is known to contain some refrigerant following a recharge (can heel), and
3. Failure to repair any repairable leak(s) in the MVAC system.

Based on ARB funded research (Clodic et al., 2008), the above emission processes account for the following percentages of refrigerant emissions, on average, for DIY practices:

1. *Servicing losses*: 11% is emitted directly to the atmosphere during the charging procedure,
2. *Can heel*: 22% remains in the can as heel. This percentage falls within the range of data observed in a U.S. EPA testing study for disposable container heel (U.S. EPA, 2007). Because most cans do not have sealing valves, most of this is released almost immediately to the atmosphere, and
3. *Delayed emissions:* 67% of initial mass contained in the can is effectively charged into the system (this will eventually leak to the atmosphere if leaks are not repaired).

The immediate emissions due to DIY servicing are therefore approximately 0.27 $MMTCO_2E$ per year (points 1 and 2 above), and the emissions from leaking, unrepaired MVAC systems are approximately 0.54 $MMTCO_2E$ per year (point 3 above). Most of the immediate emissions are due to improper recharging techniques. A small percentage of DIYers (25%) are responsible for 60% of the immediate emissions, which indicates that improved recharging practices are

effective in reducing emissions (Clodic et al., 2008). Figure 2 illustrates the sources of emissions associated with DIY use of small cans.

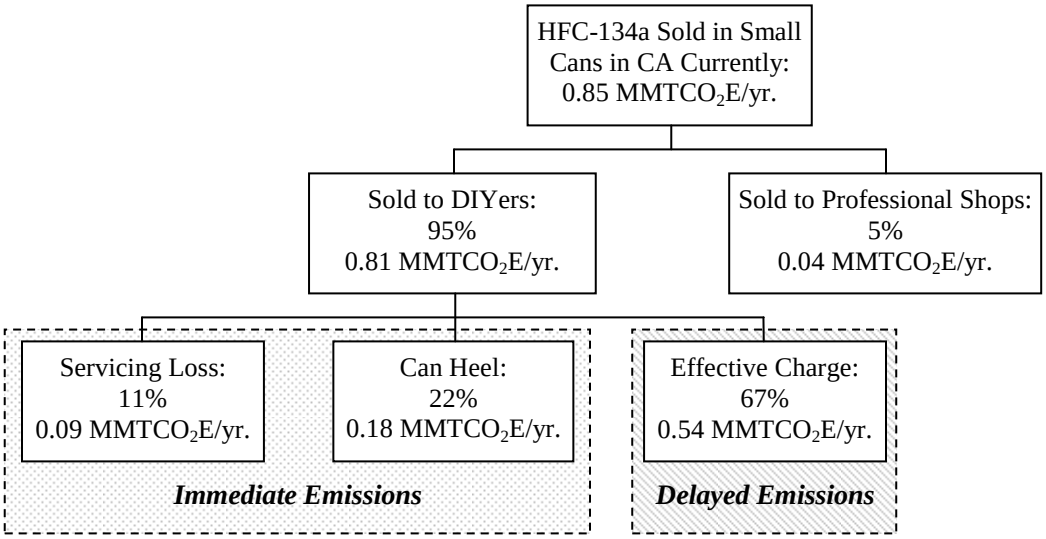


**Figure 2. HFC-134a Emissions Associated with DIY Usage of Small Cans**

Staff estimates that the emissions shown in Figure 2 will remain roughly unchanged through 2020 under business-as-usual (BAU) practices because several competing factors will likely offset each other's impact. First, the increase of passenger vehicle population and better refrigerant containment in newer MVAC will keep the number of leaky vehicles unchanged. The EMFAC Model 2007 estimates that the population of passenger vehicles in California will increase by around 400,000 each year through 2020. But newer MVAC systems have improved designs and improved production controls so that they are tighter and have reduced probability of becoming leaky. The latter cannot be quantified at this point. So a conservative assumption is made that the increased population and decreased probability of leaking produces a steady number of leaky MVAC systems.

Second, the decrease in MVAC nominal refrigerant charge size and improvement of refrigerant containment will keep the recharge frequency unchanged. The average nominal charge size for a new single evaporator MVAC decreases from 26.9 oz in 2000 to 22.3 oz in 2006 (Atkinson, 2008b). This trend will likely continue, but with a reduced pace over years. On the other hand, the improved refrigerant containment will reduce the leak rate of MVACs. In the absence of data to quantify the containment improvement, it is reasonable to assume that these two factors cancel out the effects from each other, leaving the MVAC recharge frequency unchanged. This is consistent with the approach used in the GREEN-MAC-LCCP Model, which does not differentiate recharge frequency for different model year vehicles (Papasavva et al., 2008). In the development of

AB 1493 regulation, ARB staff estimated that California MVACs emit 55 grams per year on average (ARB, 2004b). MVAC refrigerant emissions testing studies conducted by the European Automobile Manufacturers Association (ACEA) and Japan Automobile Manufacturers Association (JAMA) suggest that newer MVACs leak around 10 grams per year and very few MVACs emit significantly more than that (Atkinson, 2008c; Clodic, 2006). This substantial difference in leak rate may be attributed mainly to improved refrigerant containment of newer MVAC models as well as deterioration of containment over time.

Lastly, the amount of refrigerant consumed per recharge will not change due to the characteristics of DIY recharging. A DIY has no means of knowing the remaining refrigerant level in an MVAC or how to determine the proper amount of refrigerant to be charged. A DIYer terminates charging based on empirical or arbitrary criteria, such as the outflow air temperature, depletion of a can, and pressure gauge reading falling into a range specified in charging kit instructions. None of these criteria presents solid grounds for charging the proper amount of refrigerant (Clodic et al., 2008). On average, a DIYer undercharges MVAC systems. With a decrease in MVAC nominal charges, a DIYer may more accurately charge the system, or overcharge, but the number of small cans used per recharge is not dependent on the nominal charge size.

Based on the factors discussed above, staff estimates that the BAU emissions from DIY recharging are projected to remain roughly constant at 0.81 $MMTCO_2E$ per year through 2020. ARPI had projected a 1-2% annual sales growth under BAU, likely based on national sales trend (ARPI, 2006). This projection may not accurately reflect California's unique usage patterns and the various trends discussed above. The uncertainties associated with the assumptions in the staff analysis to support this document may overshadow at most a 1-2% annual change. Therefore, no attempt has been made to empirically adjust the BAU trend to match ARPI's projection.

## B. Estimated Emission Reductions

As outlined above in section V of this Staff Report, the proposed regulation is comprised of four main components:

1. Small cans of automotive refrigerant would be equipped with self-sealing valves to reduce losses during DIY service and to eliminate loss of the can heel after DIY service was completed.
2. Improved instructions on the can would educate DIYers of methods to reduce losses during service and to reduce the size of the can heel.
3. Manufacturers would establish and implement a can recycling program to recover refrigerant that is present in can heels.
4. Manufacturers would be required to develop an educational program with brochures and websites to inform DIYers of methods to reduce losses

during service, to reduce the size of the can heel, and to describe the can recycling program.

The proposed regulation is expected to reduce HFC-134a emissions by 0.26 $MMTCO_2E$ per year. The discussion below provides a general explanation how the proposed regulation would reduce refrigerant losses attributable to servicing losses, can heel and MVAC leaks. The Technical Support Document to this Staff Report (Appendix G) provides a more detailed discussion of the projected emission reductions attributable to the proposed regulation.

### 1. Servicing Losses

Refrigerant losses arising during servicing will be addressed by the combination of the self-sealing valve, the can labeling instructions, and the educational outreach program. These components will likely reduce servicing losses from 11% of can contents to minimal, which corresponds to an emissions reduction from 0.09 $MMTCO_2E$ per year to zero, for a net reduction of 0.09 $MMTCO_2E$.

### 2. Can Heel

Emissions from the can heel will be eliminated by the use of the self-sealing valve, provided the small containers are returned for recycling. A target return rate is set at 90% for the first two years, and 95% for the following years. Staff does not believe that a 100% return rate is achievable, but established these target return rates to achieve the maximum feasible amount of emissions reductions it believes is practical based on results from a brief pilot program recycling study conducted by ARPI during the spring of 2008.

The can heel from recycled cans is assumed to be captured with 100% efficiency under the best engineering practices. All of the can heel from unrecycled cans is assumed to eventually reach the atmosphere. The current emissions from the can heel are estimated to be 0.18 $MMTCO_2E$ per year. At a 90% return rate, this would be reduced to 0.02 $MMTCO_2E$ per year, for a net reduction of 0.16 $MMTCO_2E$ per year. At a 95% return rate the emissions would be reduced to 0.01 $MMTCO_2E$ per year, for a net reduction of 0.17 $MMTCO_2E$ per year. The U.S. EPA Disposable Container Heel Testing Study suggests that rotating the can while recharging for 10 to 15 minutes would significantly reduce the can heel. The improved instruction on the cans and the education program will reflect these preferred recharging practices and should help reduce the amount of can heel remaining in the containers after use. However, because no available study quantifies the emission reductions attributable to improvements in DIY recharging practices from improved instructions and the proposed education program, this analysis does not account for such reductions.

### 3. Emissions from Repairing Leaking MVAC Systems

In the Early Action report that the Board adopted in 2007, staff proposed a measure to incorporate MVAC testing and repair into the California smog check program. Staff is also considering other approaches for identifying and repairing leaks in MVAC systems that may be more viable than integrating an MVAC check into the smog check program. However, currently no emission reductions can be credited for reducing refrigerant emissions from leaks in MVAC systems associated with current DIY practices. Therefore, the delayed emissions associated with leaking MVAC systems remains at 0.54 $MMTCO_2E$ per year.

Total annual emissions are thus 0.56 $MMTCO_2E$ for the first two years and 0.55 $MMTCO_2E$ for the following years. And the corresponding annual emission reductions are 0.25 $MMTCO_2E$ and 0.26 MMTCO2E, respectively, as shown in Figure 3. Figure 4 illustrates the detailed breakdown of the emissions impacts of the proposed regulation when the final return rate target of 95% is reached.

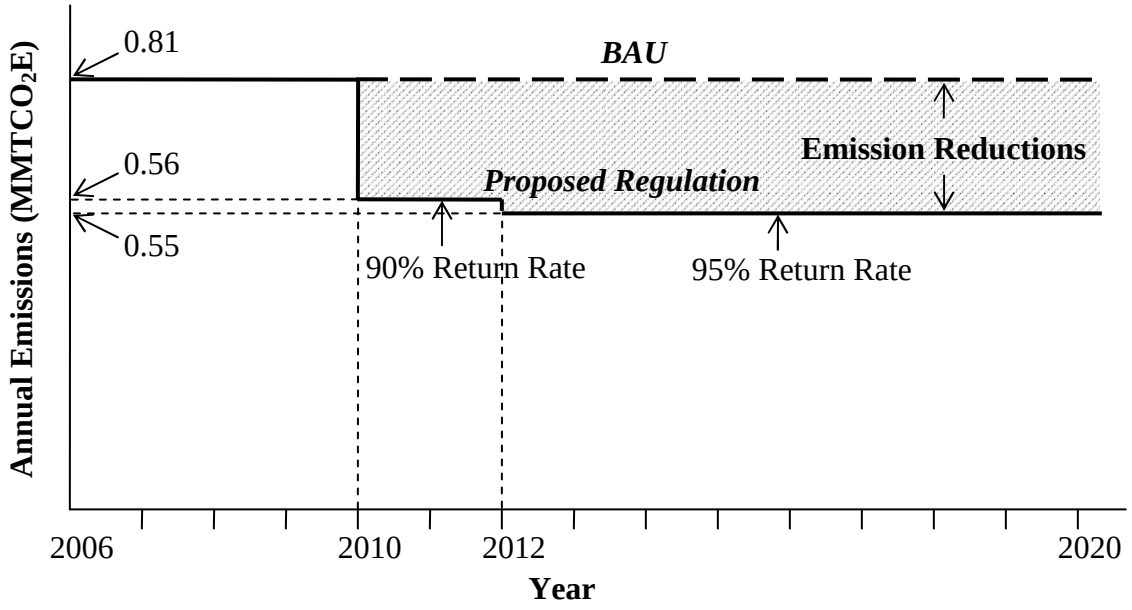


**Figure 3. Emissions Impact of Proposed Regulation**

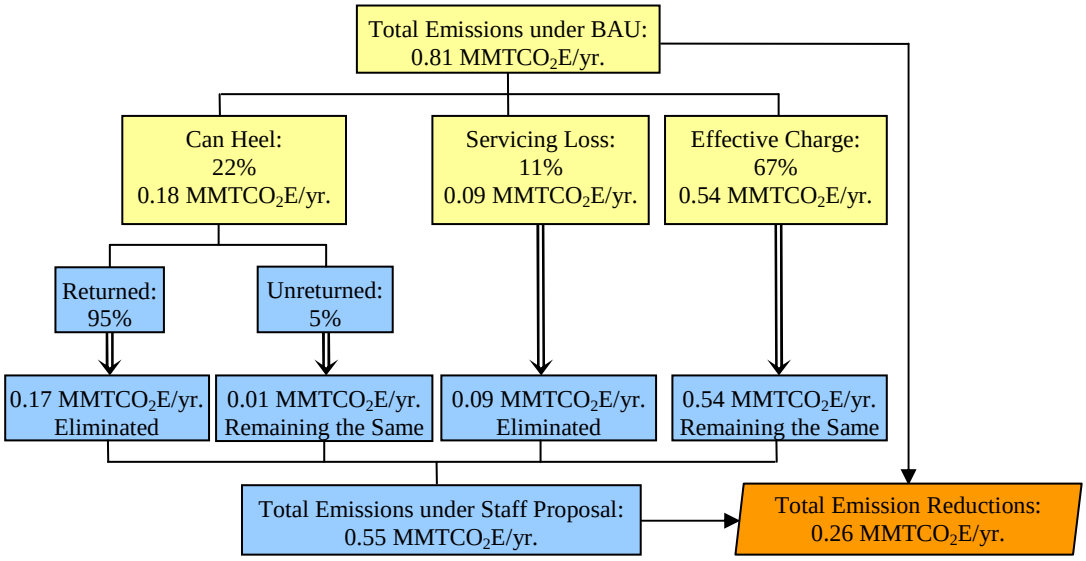


**Figure 4. Detailed HFC-134a Emissions Impact under Proposed Regulation (95% Return Rate)**

## C. Cost-Effectiveness

Staff has estimated the cost-effectivess of the proposed regulation to be $11 per metric ton of $CO_2$ equivalent of emission reductions. The methodology is presented in the Technical Support Document, Appendix G to this Staff Report. This cost is similar to other AB 32 Early Action measures, such as cool paints, landfill emissions, and stationary refrigerant sources.

## D. Costs and Economic Impacts

This section provides a general discussion of the proposed regulation's estimated costs and economic impacts. A more detailed analysis of these costs and economic impacts is provided in the Technical Support Document (Appendix G).

### 1. Costs to Consumers

Staff estimates that the proposed regulation would result in an increased per unit retail cost of $1 per small container of refrigerant. This cost increase would result from the proposed self-sealing valve and recycling and consumer education programs. Because the average retail price of a small can is approximately $10, the estimated price increase represents a ten percent increase over current prices. Consumers would also be required to pay an additional $10 deposit per

container, but this amount would be refunded if the consumer returned the used container within 90 days and with a receipt to the place of purchase.

### 2. Costs to Manufacturers

Manufacturers of small containers of automotive refrigerant would incur the vast portion of the costs associated with the proposed certification, recycling, educational, and recordkeeping components of the proposed regulation, but staff expects that these costs would largely be amortized into the market price of the containers. As discussed above, staff estimates that a manufacturer will incur a per unit cost of $1 for installing self-sealing valves and for administering the can return and recycling program, but would pass these costs on to the consumer. Manufacturers would be able to offset some of the costs associated with obtaining certification and producing educational materials with the value of refrigerant they would recapture under the can recycle program.

Manufacturers would likely incur minimal additional costs to comply with the proposed can recycling requirements. Industry representatives have indicated that they are currently recovering refrigerant from damaged containers using existing equipment (the machinery used to fill the cans is simply operated in reverse to recover the can heel from the can). The exact cost impact of these recovery operations is not known at this time but is likely to be minimal.

Similarly, costs associated with the proposed administrative and recordkeeping requirements, such as documenting container sales and returns, amounts of refrigerant recovered, and unclaimed deposits should be minimal, because manufacturers already track much, if not all, of this information as part of their normal daily business.

The entire small can industry would experience an additional administrative burden related to administering the recycling program. Employee time will be required to receive returned cans, refund the deposit, and maintain records. Time and space will be required to store the cans until they are transported to the recycling facility.

### 3. Impact on Small Businesses

Small auto parts stores may see increased administrative burden for record-keeping, handling the deposit funds, and handling, storing, and returning the cans for recycling, but the economic impacts should be minimal because these activities are part of their normal daily business.

Small MVAC service centers that purchase small cans to recharge MVACs would have increased purchase and deposit costs, similar to those of DIY consumers. These additional costs should be minimal because it is estimated that only 5% of

small cans are sold to professional MVAC servicing centers, and the service centers would pass the additional costs to their consumers.

### 4. Impact on Retailers

Staff estimates that retailers of small containers of automotive refrigerant would not be adversely impacted by the proposed regulation. Any increased costs are likely to be passed on to the consumers in the form of higher product prices. The price increase is unlikely to decrease demand for these products due to unavailability of good substitute products. Retailers, thus, are likely to maintain their profit margin on this product and the proposed regulation is not expected to affect them adversely.

The proposed regulation would require retailers to administer the can deposit and recycling program, which would result in increased administrative burdens for record-keeping, handling the deposit funds, and handling, storing, and returning the cans for recycling, but these economic impacts should be minimal because these activities are part of their normal daily business. However, staff expects that some non-dedicated auto parts stores, such as big box stores, supermarkets, drugstores, etc., may decide to stop selling small containers of refrigerant due to the administrative requirements of the regulation. This would reduce the availability of the product to DIYers.

## E. Alternatives Considered

Staff considered several possible regulatory alternatives to the proposed regulation. No alternative would be more effective in carrying out the purpose for which the regulation is proposed, nor would be as effective and less burdensome than the proposed regulation.

### 1. Banning Sale of Small Containers of Automotive Refrigerant

This alternative was initially explored by staff. Under this alternative, sales and usage of small containers of automotive refrigerant would have been banned, which would have required consumers to have their MVAC systems recharged or serviced by MVAC professionals. Both the state of Wisconsin and the European Union currently ban the sale of small containers of automotive refrigerant. The state of Minnesota recently considered, but ultimately decided not to enact a sales ban in its final MVAC refrigeration regulations. The intent of this alternative is to eliminate DIY servicing of MVACs and the associated GHG emissions that result from improper servicing.

This alternative would effectively require that only professional technicians service and repair MVACs, which should reduce refrigerant emissions compared to individual vehicle owners because professionals employ practices that result in somewhat lower emissions and they have access to equipment that DIYers

typically do not. Shifting MVAC recharging from DIYers to professional technicians would have several effects that help reduce emissions:

1) Losses during servicing are reduced because professionals release less refrigerant than DIYers during servicing MVACs (Clodic et al., 2008; Appendix G).
2) Losses due to can heel are smaller because the heel left by professionals in 30-pound cylinders is smaller on a relative basis than the heel left in small cans by DIYers (U.S. EPA, 2007; Clodic et al., 2008).
3) Likewise, heels left in small cans by professionals are probably smaller than heels left in small cans by DIYers, because professionals are familiar with the correct charging procedure for small cans.
4) Delayed emissions from leaking systems are less because the technicians can identify and repair leaks that the typical DIY can not. (California law requires that professional service technicians must provide a complete diagnostic evaluation to customers before recharging an MVAC system, but does not require that repairs be performed before recharging the MVAC system. Despite the absence of a repair requirement, staff analysis shows that a large portion of customers elect to complete repairs when they are advised repairs are needed [Appendix G]).
5) Finally, the shift to professional servicing moves the handling and use of refrigerant from the general consumer to a much smaller group of technicians, more able to be licensed and monitored.

Although the proposed regulation does not contain any measures intended to address requirements applicable to professional technicians or the handling of heels from 30-pound cylinders, these measures may be addressed in separate regulatory measures.

While increasing overall emission reductions, eliminating small can sales would greatly raise the consumer cost of MVAC servicing. Individuals would no longer be able to top off their system for $10 to $30. Instead they would require professional MVAC servicing. A diagnosis and top off would cost about $100 (Clodic et al., 2008), and repair of system leaks would cost many hundred dollars (MACS, 2008). Due to increased costs, ARB staff concluded this strategy was not cost effective. Additionally, it could place economic hardship on the low-income sector of the public that would face the greatest difficulty with higher repair bills.

### 2. Consumer Education Program with Certification

This alternative was proposed by a stakeholder who suggested that consumers should be required to complete a training course and obtain a certification before being able to purchase small containers of refrigerant. The advantages of this alternative are that the course would directly address problems associated with DIY recharging. For example, it would promote best practices techniques, inform

the consumer of damage that may occur to the MVAC system during recharge, and educate the consumer of the environmental impacts associated with use of refrigerant. Emissions would be reduced if consumers follow the best practice techniques; others may choose to not purchase small cans due to the training requirement. Staff rejected this option because it would be very time consuming for consumers, would be too complex to administer to a million or more individuals, and would likely have relatively small additional emission benefits.

## F. Other Mitigation Strategies Discussed During the Development of the Proposed

In addition to the regulatory alternatives discussed above in Section IX.E, other mitigation strategies were discussed, but were not considered as alternatives during the development of the proposed regulation. These strategies are discussed below

### 1. Mitigation Fee

The Climate Change Proposed Scoping Plan recommends applying a mitigation fee to high GWP compounds with long lifetimes and high potency, such as automotive refrigerants. High GWP gases are used in a broad range of applications, including significant usage in stationary and 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. 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 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.

Staff believes that it is best to defer development of a fee approach for this particular use of high-GWP compounds until a more comprehensive rule is developed. If a mitigation fee is applied to high GWP gases in the future, it would be in harmonization with this regulation.

### 2. Equipment to Extract Refrigerant for DIYers

One proponent has indicated he is developing equipment that would allow a DIYer to extract refrigerant from an MVAC system and then to recharge the

system only if the system is leak free. This equipment is in the development stage, and it has not undergone field testing by a significant number of consumers nor has it been reviewed or approved by any MVAC system organization. If this or any other similar new technology becomes available for DIY charging and recharging of MVAC systems, it will be considered in the future.

### G. Other Regulations Related to Mitigating Emissions of Automotive Refrigerants

To provide some perspective, the proposed regulation comprises just one of many existing measures intended to mitigate or eliminate losses of refrigerants. In September 2004, as authorized by Assembly Bill 1493 (AB 1493, Pavley, Ch. 987, Stats. 2002), the Board adopted regulations for new passenger vehicles and light-duty trucks beginning with the 2009 model year (ARB, 2005) which apply credits for the reduction of $CO_2$ equivalent emissions from HFCs used in MVACs against the tailpipe $CO_2$ emissions level.

The California Bureau of Automotive Repair (BAR) has two regulations that affect the servicing of automotive air conditioning systems. “Equipment Requirements for Automotive Air Conditioning Repair Dealers” (16 CCR 3351.6) requires shops engaged in servicing of automotive air conditioning systems to have the proper equipment available and provides specifications for the equipment including leak detectors, recovery machines, pressure gages, vacuum pump and thermometers. “Automotive Air Conditioning” (16 CCR 3366) requires shops engaged in diagnosis or servicing of automotive air conditioning systems to always completely perform a list of sixteen specific diagnostic steps including visual inspections, performance checks, and leak checks as part of their work.

ARB recently adopted a regulation that requires the Environmental Performance label on all new California vehicles to include information about emissions of global warming gases, including those from the operation of the air conditioner (ARB, 2008c). This information will now allow consumers to compare relative GHG emissions between different vehicles in addition to smog emissions as the original label intended. The new label will be affixed to the window of every new car sold in California beginning with model year 2009.

ARB is also currently developing another early action measure that is based on measures to reduce the solar heat load on vehicles parked outdoors (ARB, 2008d). A cooler vehicle interior would reduce GHG emissions by causing drivers to use less air conditioning. Potential approaches include reformulation of paint to reflect near-infrared sunlight (“cool paints”), parked car ventilation, and solar reflective window glazing. This measure is planned for a Board hearing in March 2009, and would affect 2012 and subsequent model year vehicles.

ARB is also developing a suite of measures to reduce direct and indirect emissions of high GWP refrigerants from stationary sources. One measure would require commercial and public facilities with large stationary air conditioning and refrigeration equipment to minimize emissions of high GWP refrigerants through reporting, leak repair, improved servicing, and end-of-life control (ARB, 2008e). Another measure being developed in coordination with California Energy Commission proposes new specifications for commercial and industrial refrigeration systems to both reduce emissions of high GWP refrigerant and to increase energy efficiency of the units (ARB, 2008f).

ARB recently adopted a regulation requiring that gases used in the consumer product Pressured Gas Dusters must have a GWP less than 150. This regulation will take effect on December 31, 2010 (ARB, 2008g).

Several local air districts in California prohibit the release of refrigerants into the atmosphere and restrict the sale of small cans of refrigerant. However, those local rules only apply to ozone-depleting substances such as CFC refrigerants, and not to non-ozone depleting substances such as HFC-134a.

The state of Wisconsin has regulations prohibiting the sale of refrigerant in small cans, and restricts the sale and use of refrigerant in larger containers to certified, state-registered technicians (ATCP 136). This was enacted in the 1990's as an extension of its R-12 restrictions and without consideration of its cost-effectiveness.

Recently, the State of Minnesota considered, but ultimately did not adopt a restriction on the sale of small cans of refrigerant. Instead, Minnesota will require reporting purchases of high-GWP gases, including automotive refrigerants. Minnesota will also require automobile manufacturers to report the refrigerant leak rates for new vehicles sold in the state, and these reports will be available to the public (Minnesota Senate, 2008).

As previously discussed, the federal Clean Air Act and the U.S. EPA prohibit venting refrigerants, including HFC-134a, to the atmosphere during servicing and repair of MVAC systems and during dismantling at end-of-life. The U.S. EPA also requires MVAC technicians to be certified (40 CFR §82.154).

In the EU, the sale and usage of small cans for recharging MVAC have never been allowed, and large bottles of refrigerant can only be sold to certified air conditioning technicians. In addition, the European Parliament has adopted a prohibition of HFC-134a in new vehicle types starting in model year 2011 (European Parliament, 2006). Only refrigerants with GWPs less than 150 will be allowed in the EU. Life cycle climate performance (LCCP) studies are being conducted to determine which refrigerants offer the best LCCP globally and for specific regions such as the United States (Papasavva et al., 2008).

# X. PUBLIC OUTREACH EFFORTS

The proposed regulation was initially proposed as a 'can ban' in the Climate Action Team Report to the Governor released in April, 2006. The can ban concept was presented at an AB 32 workshop in January 2007, then again brought to the attention of the public in June 2007, when the Board identified the can ban as a Discrete Early Action measure.

Since February 2008, staff has been notifying affected industries and other interested parties regarding the development of the proposed regulation. Staff held public workshops on February 5, 2008 and July 31, 2008, and workgroup meetings in February, April, and June of 2008. Interactions with stakeholders resulted in additional mitigation options that had not been previously considered.

Staff also interacted with stakeholders on an individual basis, particularly representatives from Automotive Refrigeration Products Institute (ARPI). ARPI proposed alternate mitigation options and conducted a pilot test on the feasibility and potential success of a consumer-based can recycling program. Other stakeholders also interacted with staff on an individual basis. A partial list of these participants includes representatives from the Mobile Air Conditioning Society Worldwide (MACS) and attendees of three SAE International sponsored Alternate Refrigerant Systems Symposiums. Staff also met with representatives from U.S. EPA, the European Commission, and the states of Wisconsin and Minnesota in individual meetings.

To incorporate the principles of Extended Producer Responsibility (EPR), staff collaborated with staff from the California Integrated Waste Management Board (CIWMB) and had repeated contacts with the California Product Stewardship Council (CPSC). CIWMB has established a framework that defines key features of EPR programs and is seeking legislative action that would provide CIWMB the statutory authority to establish EPR programs. Under EPR, producers are required to design and implement a system that eliminates the necessity for government administered programs to handle waste products. The burden of designing and implementing the program is therefore shifted from tax payers and local government to the producer and consumer. EPR places the responsibility of dealing with the waste products on all parties involved in making, distributing, selling, and using the product (CIWMB, 2008). The proposed regulation is designed in conformity with the EPR framework.

Retailers were contacted by both ARB staff and ARPI members. ARB staff specifically contacted the California Retailers Association to establish a working relationship for this proposed regulation. Representatives of the association were already on the list serve e-mail list. The announcement of the second public workshop was forwarded to representatives of WalMart, Target, Sears, K Mart, Orchard Supply, AutoZone, CSK Auto, Les Schwab, and Keystone Automotive.

Pursuant to staff's request, ARPI members notified their top retail and distribution partners of pending regulatory efforts in California. Through the assistance of ARPI, the members of the Automotive Aftermarket Industry Association (AAIA) have been formally notified of the proposed regulation.

Additional contacts were made with California retailers including auto parts stores, major retailers, and drug stores, to seek their comments on the proposed measure. ARB staff provided a brief verbal explanation of the proposed regulation over the telephone to each representative, and then sent a follow-up e-mail with a written summary of the proposed regulation highlighting the retailers' involvement, along with website links where additional information could be obtained. Retailers contacted include NAPA, Kragen, Pep Boys, Carquest, Target, Sears (which owns Orchard Supply Hardware and Kmart), Rite Aid, and Walgreen's. Individual meetings were held between retailers and ARB staff to discuss retailers' concerns.

In 2006 and 2007 ARB staff gave presentations that informed representatives from government, Europe, and the MVAC industry of California's actions and progress on MVAC Early Action measures. The conferences at the Alternate Refrigerant Systems Symposium provide a network for interacting with experts in this MVAC field.

# XI. CONCLUSIONS AND RECOMMENDATIONS

ARB staff proposes a new regulation to address GHG emissions attributable to GHG emissions associated with DIY recharging of MVAC systems as discussed in this staff report. The proposed regulation would consist of the following major components:

1. A certification program for small containers of automotive refrigerant that would require manufacturers to equip small containers with self-sealing valves.
2. Establish a container deposit and return program to ensure DIYers return used containers to retailers and that would allow manufacturers to recover any refrigerant remaining in the containers.
3. Establish container labeling and consumer education requirements to promote consumer education of proper charging practices and of the environmental consequences of misuse of refrigerant.
4. Establish recordkeeping requirements to enable staff to determine the effectiveness of the regulation and to monitor and ensure compliance with the regulation's requirements.

The proposed regulation fulfills the requirements applicable to discrete early action GHG emission reduction measures to "achieve the maximum technologically feasible and cost-effective reductions in greenhouse gas emissions" from the sources identified for early action measures. The proposed regulation and associated certification procedure and test procedures are achievable using existing technology and manufacturing processes. The emission reductions are cost-effective compared to other early action GHG measures under consideration by the Board. The proposed regulation is necessary to meet emission reduction goals and reduce climate change impacts.

No alternatives considered by the Board would be more effective in achieving the goals of this proposal, nor would be less burdensome to manufacturers or affected private persons.

Staff recommends that the Board approve its proposal to adopt Sections 95360 through 95370 of Title 17, California Code of Regulations, Certification Procedures for Small Containers of Automotive Refrigerant, Test Procedures TP-503, and Balance Protocol BP-A1 incorporated therein and provided in Appendices A through D of this report.

## XII. REFERENCES


40 CFR §82.154. Code for Federal Regulations, 7-1-05 Edition. http://edocket.access.gpo.gov/cfr_2005/julqtr/pdf/40cfr82.154.pdf

ARB, 2004a. Fact Sheet – The Greenhouse Effect and California. http://www.arb.ca.gov/cc/factsheets/ccbackground.pdf

ARB, 2004b. Initial Statement of Reasons for Proposed Rulemaking, Public Hearing to Consider Adoption of Regulations to Control Greenhouse Gas Emissions from Motor Vehicles, Staff Report, August 6, 2004. http://www.arb.ca.gov/regact/grnhsgas/isor.pdf

ARB, 2005. Relating to Public Hearing to Consider Adoption of Regulations to Control Greenhouse Gas Emissions from Motor Vehicles, Executive Order G-05-061. http://www.arb.ca.gov/regact/grnhsgas/eo.pdf

ARB, 2007a. Expanded List of Early Action Measures to Reduce Greenhouse Gas Emissions in California Recommended for Board Consideration, AB 32 Early Actions Final Report, October, 2007. http://www.arb.ca.gov/cc/ccea/meetings/ea_final_report.pdf

ARB, 2007b. ARB Consumer Product Survey for 2006.

ARB. 2008a. Climate Change Proposed Scoping Plan. October, 2008. http://www.arb.ca.gov/cc/scopingplan/document/scopingplandocument.htm

ARB, 2008b. California Greenhouse Gas Emissions Inventory Data – 1990 to 2004, 2008. http://www.arb.ca.gov/cc/inventory/data/data.htm

ARB, 2008c. Rulemaking to Consider Proposed Amendments to the Emission Control and Smog Index Labels Regulations, June 21, 2007. http://www.arb.ca.gov/regact/2007/labels07/labels07.htm

ARB, 2008d. Cool Paints and Reflective Glazing, ARB AB 32 Early Action Measure, 2008. http://www.arb.ca.gov/cc/cool-paints/cool-paints.htm

ARB, 2008e. High-GWP Tracking/Reporting/Repair/Deposit Program, ARB AB 32 Early Action Measure, 2008. http://www.arb.ca.gov/cc/reftrack/reftrack.htm

ARB, 2008f. Commercial Refrigeration Specification Program, ARB AB 32 Early Action Measure, 2008. http://www.arb.ca.gov/cc/commref/commref.htm

ARB, 2008g. Rulemaking to Consider Adoption of Proposed Amendments to the California Consumer Products Regulations, June 26, 2008. http://www.arb.ca.gov/regact/2008/cp2008/cp2008.htm

ARPI, 2006. Personal Communication during ARPI's Working Presentation to ARB, December 13, 2006.

ATCP 136. Mobile Air Conditioners; Reclaiming or Recycling Refrigerant, Wisconsin Administrative Code: ATCP 136. http://www.legis.state.wi.us/rsb/code/atcp/atcp136.pdf

Atkinson, 2008a. Refrigerant Use in the Mobile AC Service Industry, Presentation to ARB Public Workshop, February 5, 2008. http://www.arb.ca.gov/cc/hfc-mac/meetings/workshop_02052008/SAE.pdf

Atkinson, 2008b. State of the Industry, Presentation to the MACS Worldwide Tradeshow, February 2, 2008. http://refrigerants.dupont.com/Suva/en_US/pdf/SmartAutoAC/2008_MACS_Atkinson_State_of_Industry.pdf

Atkinson, 2008c. Presentation to 2008 MAC Summit, June 13, 2008. http://www.epa.gov/cppd/mac/Atkinson%202008%20MAC%20summit.pdf

CIWMB, 2008. Overall Framework for an Extended Producer Responsibility System in California. http://www.ciwmb.ca.gov/EPR/Framework/Framework.pdf

Clodic et al., 2004. Determination of Comparative HCFC and HFC Emission Profiles for the Foam and Refrigeration Sectors until 2015, Report Prepared with Support from U.S. EPA and ADEME, April 2004. http://www.epa.gov/spdpublc/snap/emissions/index.html.

Clodic, 2006. Refrigerant MAC Leakage – New Evidences from the Armines / ACEA Study, Presentation to the IEA Workshop "Cooling Car with Less Fuel", October 23 – 24, 2006. http://www.iea.org/Textbase/work/2006/car_cooling/Session3/3b%20Clodic%20New%20evidence%20on%20leakage.pdf

Clodic et al., 2008. Evaluation of the Potential Impact of Emissions of HFC-134a from Nonprofessional Servicing of Motor Vehicle Air Conditioning Systems, ARB Research Contract Draft Final Report, July, 2008. http://www.arb.ca.gov/cc/hfc-mac/documents/arb_smallcan_draftfinalreport_20080804.pdf

European Parliament, 2006. Directive 2006/40/EC of the European Parliament and of the Council of 17 May 2006 Relating to Emissions from Air-Conditioning Systems in Motor Vehicles and Amending Council Directive 70/156/EEC, Official Journal of the European Union, 14.6.2006, L 161/12. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:161:0012:0018:en:pdf

Frost and Sullivan, 2006. U.S. Consumer Buying Behaviors of R-134a Refrigerant for Light Vehicle Applications, September, 2006. http://www.arb.ca.gov/cc/hfc-mac/documents/ARPI_Report_121106.pdf

Health and Safety Code, §44062.1 http://www.arb.ca.gov/bluebook/bb04/HEA440621/HEA_44062_1.htm

IPCC, 2007. Climate Change 2007: The Physical Science Basis, IPCC Working Group 1 Fourth Assessment Report, 2007. ("Global Warming Potential Value" or "GWP Value" for this regulation means the 100-yr GWP value first published by the IPCC in it's 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 it's Fourth Assessment Report (AR4) (IPCC, 2007). Both the 1995 IPCC SAR values and the 2007 IPCC AR4 values are published in table 2.14 of the 2007 IPCC document. 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. If the compound is not listed in Table 2.14, then the GWP value will be determined by the Executive Officer).http://ipcc-wg1.ucar.edu/wg1/wg1-report.html

MACS, 2008. From Montreal to Kyoto: Two Decades of Change in Mobile AC Industry, 2008.

Minnesota Senate, 2008. Omnibus Energy Policy Bill, S.F. 3337, 2008. https://www.revisor.leg.state.mn.us/bin/getbill.php?session=ls85&number=SF3337

NPD, 2008. NPD Automotive Aftermarket Industry Monitor - Total U.S. Auto Parts Chain Retailers, Refrigerant Category – Topline Summary #2.

Núñez, 2006. California Global Warming Solutions Act of 2006, Assembly Bill 32, September, 2006. http://www.leginfo.ca.gov/pub/05-06/bill/asm/ab_0001-0050/ab_32_bill_20060927_chaptered.pdf

Pavley, 2002. Assembly Bill 1493, July, 2002. http://www.arb.ca.gov/cc/ccms/documents/ab1493.pdf

Papasavva et al., 2008. GREEN-MAC-LCCP, the Metric for MAC Environmental Superiority, Presentation to 2008 MAC Leadership Summit, June 13, 2008. http://www.epa.gov/cppd/mac/STELLA%20PAPASAVVA%20&%20ANDERSEN.ppt

U.S. EPA, 2007. Disposable Container Heel Testing Study Report, U.S. EPA, March 21, 2007, Contract No. EP-W-06-010. http://www.epa.gov/Ozone/title6/downloads/Disposable_Containers_Report.pdf